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Understanding Users Interactions and Reactions to Misinformation on Social Media: Analysing Behavioural Patterns and Network Structures - A Covid-19 Perspective

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

The University of Sheffield

Faculty of Social Sciences

Information School

March 2024

Abstract

Background: Social media platforms can be an excellent medium for disseminating public awareness and critical information that can be shared across large populations. However, the increasing use of social media as an information source brings challenges. Misinformation on social media can have immense implications for public health, risking the effectiveness of health interventions and endangering lives. This has become even more evident in the context of the COVID-19 pandemic, during which a range of misinformation, disinformation, conspiracy theories and propaganda were spread across social channels. Despite a considerable amount of research focusing on misinformation, including many studies concentrating on detecting misinformation and networks on social media from various perspectives and some studies focusing on factors that influence people's reactions to misinformation, there is a need for a better understanding of how individuals react to and spread information, an improved comprehension of digital literacy, source evaluation, and responsible content consumption and development of effective communication strategies to address health misinformation on social media.

Methodology: The study followed a mixed-method design using the exploratory sequential design. The first study recruited 1014 participants through Amazon Mechanical Turk (MTurk). A questionnaire was conducted to gain insight into how people interact with misinformation during a specific health emergency, COVID-19, in the context of English-speaking countries. The statistical analysis conducted involved descriptive and inferential analyses to address the research questions. In the second study, Twitter data were retrieved for three misinformation types based on keywords inspired by the first study. Twitter data were analysed via network analysis and topic modelling to obtain insights into the networks formed around this misinformation and to understand users' reactions within these networks. Despite the study aiming to investigate responses to misinformation across users from English-speaking countries, almost all participants (95%) came from the USA. Hence, the results largely capture the reactions and behaviors of U.S social media users narrowing the scope of the findings for users from other English speaking countries.

Findings: People react to misinformation differently depending on whether they agree or disagree with it and the source of the information, with common actions including reporting, ignoring or engaging with the author. Individuals use a variety of verification strategies, including consulting experts and evaluating source credibility. The results highlight the critical roles of internal and external authentication in determining the trustworthiness of information by explaining comprehensive strategies and techniques used to authenticate information. Theoretical Conceptual model of people reactions to misinformation refines Bautista et al. (2021), enhancing misinformation response strategies. The results also highlight that ignoring misinformation is the most common response, but people are more likely to engage with misinformation with which they agree. People who prefer government or health organisation sources tend to block or report misinformation, while those who prefer

mainstream news sources are more likely to engage in discussion. Easy to spot misinformation encourage greater user engagement in sharing or reporting misinformation compared to difficult to spot misinformation. . Additionally, based on false claims about the Pfizer vaccine, origins of the virus and vitamin D, misinformation on COVID-19 divides Twitter social networks into various groups of users. Retweets facilitate the dissemination of misinformation, constituting 85% of misinformation-related tweets. Influential actors propagate false narratives through their high-centrality roles within networks. Political polarization enables the proliferation of misinformation in ideologically biased environments. Fact-checking efforts are constrained by their limited reach and relative influence. Visual cues can help people identify misinformation. People often prefer to obtain COVID-19 information from social media, even though they encounter misinformation there and do not trust social media content. How individuals react and verify misinformation is influenced by key factors such as age, education and preferred information. This enhances our comprehension of how misinformation is disseminated in society and its consequences. It also shows patterns of sharing and ideological biases in misinformation dissemination. This can guide policies aimed at dismantling network structures and social media components that enable the spread of misinformation.

Implications: Combating misinformation requires a multifaceted approach that encompasses individual responsibility, responsible media practices, proactive education, respectful communication, and personal characteristics when identifying misinformation and reaction strategies. Diversifying information sources and fostering critical thinking skills empower individuals to assess credibility independently. Cultivating trust in credible sources is crucial to divert reliance from unverified content. Social media platforms must prioritise transparency, fact checking, and user education to halt the spread of misinformation, and we must target education and digital literacy initiatives to empower younger generations to distinguish between accurate and misinformation. Communication approaches must continuously adapt to address the evolving nature of misinformation and the dynamics of social media.

Keywords

Reactions, Misinformation, Twitter, Social Networks, COVID-19, Information Sources, Credibility, Attitude

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LIST OF ABBREVIATIONS

RQ	Research Question
RO	Research Objective
UK	United Kingdom
SNA	Social Network Analysis
CDC	U.S. Centers for Disease Control and Prevention
COVID-19	Coronavirus Disease 2019
Ebola	Ebola Virus Disease
NGO	Non-Governmental Organization
WHO	World Health Organization
US	United States
ML	Machine Learning
NLTK	Natural Language Processing Toolkit
SPSS	Statistical Package for the Social Sciences
NVivo	Qualitative Data Analysis computer software package
QDA	Qualitative Data Analysis
MTurk	Amazon Mechanical Turk
NodeXL	Network Analysis and Visualization software package

Acknowledgements

All praise is to God. I am grateful to God for his guidance in finishing this dissertation and for helping me attain this success.

I would like to express my sincere and heartfelt gratitude to the Kingdom of Saudi Arabia for its generous and unwavering support throughout my PhD journey. I am deeply thankful for the full financial sponsorship and the consistent care provided during my entire period of study abroad. This remarkable support reflects the country's strong commitment to education and human development. It has been a great honor to represent my beloved country, and I remain forever proud to be a son of this great country. With deep loyalty and love, I am committed to giving back and serving my country faithfully.

I want to thank everyone who encouraged me to complete this dissertation, including my family, supervisors, friends and colleagues, for their utmost gratitude. With your support and encouragement, I was able to go on with accomplishing my goal.

I extend my sincere gratitude to all my supervisors, who have been a constant source of support and guidance throughout my academic and professional journey. I would like to express my appreciation to Dr. Suvodeep Mazumdar, Dr. Vita Lanfranchi, Dr. Frank Hopfgartner, and Dr. Ziqi Zhang. Their unwavering commitment to providing me with invaluable insights and feedback has been instrumental in shaping my personal and professional growth. I am truly grateful for their mentorship and the knowledge they have imparted to me.

Particularly I would like to express my thanks to Dr Suvodeep Mazumdar who was my supervisor, supporter and friend throughout. He did whatever he could do for me to make me understand the subject as well as enhance my research skills. He remained patient with me during times of great difficulty while helping me overcome hurdles. It is true that he played a great role in guiding me to accomplish my dissertation, and what he gave me regarding knowledge, assistance, and direction will forever remain in my mind.

Additionally, I owe a debt of gratitude to my study companions, peers and friends, including Dr Anas Alsuhaibani, Jihad Al Wahshi, Dr Zied hosni, Taha Al-Saadi, Khalid Fallatah, Dr Abdulaziz Almanea and Dr Fahad Alenezi and all information school family who were very helpful throughout my Ph.D.program. We shared our ideas, gave suggestions, and offered support whenever things turned tough. We were an extended family, and they will always be remembered for their goodness. I want also to extend my thanks to all my relatives and friends in Saudi Arabia and UK who supported and encouraged me throughout this journey. They used to share with me happiness in any successful undertaking of mine and guide me through life's hardships. They were actually best friends, and I shall always treasure their friendship eternally.

I dedicate this achievement to my family, whose unwavering support and belief in me have been invaluable throughout my academic journey. Completing this dissertation marks a proud milestone in my professional and research career, and I look forward with enthusiasm to future contributions and continued growth in the field.

Dedication

I am deeply grateful to my family, who have been my constant source of love, strength, and encouragement throughout my academic journey. I owe special thanks to my beloved parents, Latifa Almufarrej and Abdullah Alnuhayt, whose endless support, prayers, and faith in me have been the foundation of all my achievements.

I want to express my deepest thanks and appreciation to my dear wife, Lames for her immense support and assistance during my Ph.D. She was with me all the way as a wife, friend, confidant and source of encouragement, especially when things were difficult for me. She took care of my daughter and managed the house for me so that I could concentrate on my studies. The sacrifices she made were innumerable; I cannot forget how kind she was to me. It would be impossible to sum up in words how grateful I am to you, Lames, my lovely wife, over this period of time since starting our PhD journey together. Can you remember when I was under pressure to write this thesis? All this while you were right there by my side, supporting me through it all, and because of that, I was able to make a groundbreaking thesis. But without your sacrifices it would just have been but a dream on paper, won't it? Your support didn't merely ease my burden; it encouraged me further and made one more step towards accomplishing a dream that will serve our whole family for years.

Again, I would like to express my sincere gratitude and appreciation towards my sweet daughter Latifa Alnuhayt who brought happiness into life and acted as an inspiration. She used delightfully to bring fun into my life, thereby helping me erase thoughts about my thesis in order for me not to feel stressed out anymore. Whenever she could wait impatiently every day as well as celebrate some of those victories along with her! Her presence came into my life as a blessing.

I want to express my thanks to my dear brother Abdulaziz Alnuhayt and my wonderful sisters Reem, May, Nowar, and Jood Alnuhayt, your unwavering belief in me, your encouragement, and your love have been a light that guided me through every challenge and inspired me to keep reaching higher.

I would also like to express my heartfelt gratitude to my maternal aunt, Aziza Almufarrej, who has been the unknown soldier behind all my academic successes. Her quiet sacrifices, unconditional love, and tireless support often went unseen, but they were deeply felt and instrumental in every step of my journey.

I truly consider myself incredibly blessed to have such an extraordinary family, one whose love, prayers, and belief in me have been my greatest blessings. Without them, I would not be where I am today. From the depths of my heart, thank you.

Publications, Presentations, and Awards

Publications

- Alnuhayt, A., Mazumdar, S., Lanfranchi, V., & Hopfgartner, F. (2022). Understanding reactions to misinformation-a COVID-19 perspective. In ISCRAM 2022 Conference Proceedings-19th International Conference on Information Systems for Crisis Response and Management (pp. 687-700). ISCRAM Digital Library.

Conference Participation

- *Understanding reactions to misinformation-a COVID-19 perspective* [Paper presentation]. Harmful Societies – The 2022 iHuman/Inclusive Societies Conference, Sheffield, United Kingdom.
- *Understanding interactions between social networks with misinformation during health crises* [Thesis abstract presentation]. ISCRAM 2022, Tarbes, France.
- *Understanding reactions to misinformation-a COVID-19 perspective* [Paper presentation]. Information School PGR conference at the University of Sheffield, Sheffield, United Kingdom

Chapter 1: Introduction

1.1 Chapter Overview

This chapter contextualises key terms and briefly overviews the research topic's background, including different types of misinformation and their impacts, social media platforms, and health outbreaks. This chapter covers the aims, questions and objectives of this research. It also discusses the importance of the study and outlines the various subsections that will be discussed in the upcoming chapters.

1.2 Problem Statement

Misinformation has been a topic of study for scholars for many years, even prior to the advent of social media, and remains an area of continuing research (Adams et al., 2023; Allport & Postman, 1947; McKernon, 1925; Zhao & Tsang, 2023). The spread of misinformation threatens society's well-being and the creation of public opinions (Cook et al., 2015; Vidigal & Jerit, 2022), leading to a decrease in the trustworthiness of information sources according to the public and causing non-compliance with health directives and reluctance to take vaccines (Powell et al., 2022; The US Surgeon General's Advisory on Building a Healthy Information Environment, 2021; Zhao & Tsang, 2023). In today's society, in which online information sources are influential, it is essential to study how people react when they encounter misinformation on social media (Ali et al., 2020; Fridman et al., 2020; Jackson et al., 2019; Tandoc et al., 2020; Vraga & Bode, 2017).

During the COVID-19 pandemic, misinformation was disseminated on an unprecedented rate and scale, producing a sense of uncertainty among people and affecting health communication, media, politics and education (Adams et al., 2023; Depoux et al., 2020; Greifeneder et al., 2020; Kouzy et al., 2020; Larson, 2018). The COVID-19 pandemic has revealed the significance of examining how people interact with misinformation, providing insights to counter misinformation and enhance public health guidance and decisions. Research on this topic has been limited (Tandoc et al., 2020; Tully et al., 2020). There is a lack of studies investigating how people engage with and respond to misinformation on social media. Additionally, there is a need to understand how the type of misinformation, different scenarios, and how individuals' attitudes, beliefs, and backgrounds impact their reactions to misinformation. There is also needs to investigate the social networks formed through user interactions with misinformation and understand the network characteristics that facilitate misinformation spread during health crises such as COVID-19.

Therefore, this study evaluated people's reactions to misinformation on Twitter and examined the factors influencing these reactions during the COVID-19 pandemic, providing insight into network structures that emerged from these interactions. Addressing this issue will improve our understanding of how individuals verify and react to misinformation to curtail its spread and ensure that accurate, reliable information is disseminated for public well-being and better-informed decision-making (Cook et al., 2015; Vidigal & Jerit, 2022).

1.3 Motivations

This study arises from the need to comprehensively investigate human behaviour towards misinformation, especially given that social media is a predominant source of both accurate and false information. A number of previous studies have looked into diverse perspectives

regarding misinformation; however, an area that still seems to need more understanding is exploring people's interactions and reactions to misinformation. This area needs to be filled in order to enhance the existing body of knowledge and provide a deeper theoretical and empirical framework that captures the complexity of these responses.

In doing so, this study will address this complication by detailing how people interact with and respond to misinformation, especially in relation to the outbreak of COVID-19, when it was important to disseminate reliable health messages globally. By gaining a deeper understanding of these dynamics, this research will not only assist in formulating effective measures to control the further spread of misinformation, but also in promoting the distribution of credible information to improve overall public health. This study has the potential to significantly contribute to the creation of a better-informed and more resilient society, better equipped to combat the negative effects of misinformation in the present and future.

1.4 Research Context and Background

1.4.1 Health Outbreaks

A disease is defined as an outbreak once cases of a particular disease increase due to an infection transmitted from person to person or from animal to person (World Health Organization [WHO], 2020). These health outbreaks may be epidemics or pandemics. The Centre for Disease Control and Prevention (CDC) (2020) defines an 'epidemic' as an unforeseen rise in the number of disease cases in a particular geographical region or country. In contrast, a 'pandemic' is an illness outbreak that spreads globally over countries or continents and impacts many people; typically, a pandemic typically has a higher mortality rate than an epidemic. (CDC, 2012; WHO, 2020). The most severe pandemic in the last century was the 1918 influenza pandemic (Taubenberger & Morens, 2006) caused by the H1N1 virus, which resulted in an estimated 50 million deaths worldwide and affected one-third of the human population (Taubenberger & Morens, 2006).

The last outbreak to affect many people in the world was the COVID-19 pandemic, which started in December 2019 when severe respiratory infections were reported in Wuhan, China (Huang et al., 2020). Generally, coronaviruses are zoonotic, which means that the virus was initially transmitted from animals to people (Jahanbin & Rahmanian, 2020). Transmission from animals to humans was deemed the source of this pandemic, as in the initial clinical check, several patients mentioned that they went to the fish market at the Huanan Seafood Wholesale Market in Wuhan (Huang et al., 2020; Ji et al., 2020; Lu et al., 2020). On 11 January 2020, the first deaths from the disease were recorded in China, followed by many more people testing positive around the globe, including Japan, South Korea and Thailand, with the United States having confirmed cases by 20 January 2020 (Majumder & Mandl, 2020). In mid-January 2020, no vaccine or appropriate medication for COVID-19 existed; therefore, there was extreme medical uncertainty (Abbasi, 2020). On 30 January 2020, the WHO announced that the COVID-19 outbreak was the sixth most significant global health crisis after H1N1 (2009), Ebola in West Africa (2014), polio (2014),

Zika ¹(2016) and Ebola (2019) (Yoo, 2020). On 11 February 2020, the WHO declared ‘COVID-19’ as the name for the coronavirus disease caused by 2019-nCoV. As COVID-19 spread, global medical experts began researching treatments for combating the disease (Dong et al., 2020), and in December 2020, COVID-19 vaccines were approved (Hanieh et al., 2021). However, these vaccines did not entirely prevent the transmission of the infection (Dawid et al., 2021).

The COVID-19 pandemic greatly impacted people and governments worldwide and caused the most extensive global economic recession of all time, as one-third of the world’s population was placed under lockdown restrictions (McFall-Johnsen, 2020). As explained by Tiefenthäler (2020), the pandemic affected the logistics of many industries and factories because of panic shopping and higher consumption across the world, which caused price gouging for some products (Nicas, 2020). In addition, the pandemic affected the medical field, causing shortages of personal protective items, such as medical masks, gloves and sanitary items. COVID-19 created a potential shortage of significant equipment, such as intensive care unit (ICU) beds and oxygen therapy in medical facilities (Tiefenthäler, 2020). The pandemic also severely impacted medical professionals with an increased workload, isolation and sickness (Tiefenthäler, 2020). Furthermore, the WHO provided guidelines and social factors for dealing with psychosocial issues caused by the COVID-19 pandemic (Van Bortel et al., 2016; WHO, 2020). In addition to its impact on the economy and health, the pandemic impacted educational systems with extensive closures worldwide. Based on data published by UNESCO (2020), closures of educational institutions, including schools and universities, were applied worldwide in 165 countries due to COVID-19, thus affecting more than 1.5 billion students. The COVID-19 pandemic also affected religion in many ways due to the cancellation of services and closure of mosques, churches and temples (Burke, 2020; Parke, 2020).

1.4.2 Social Networks

Twitter networks can be highly relational (Ch’ng, 2015). The social network layout of an online community contains individuals or organisations (called ‘nodes’), and the relationships within these nodes (called ‘edges’) represent social interactions among users (e.g., replies, retweets and mentions) (Al-Shargabi & Selmi, 2021; Gruzd & Mai, 2020). Furthermore, social networks are structured around users with similar interests (Martha et al., 2013), such as social interests (Yardi & Boyd, 2010), sociolinguistic patterns (Memon & Carley, 2020) and community relationships (spiritual, professional and ideological) (Ch’ng, 2015; Fornacciari et al., 2015). Social networks are created around users who regularly interact with each other through various types of interactions, such as replying, retweeting, mentioning and following hashtag usage. Various behaviours, such as support (e.g., tweet-ups), exchange (e.g., sharing knowledge), solidarity (e.g., expressing shared worldviews on particular topics) and sharing what they trust, have been observed online among Twitter users (Ahmed et al., 2020; Chen & Pirolli, 2012; Hooker, 2010; Loureiro-Koechlin & Butcher, 2013; Starbird & Wilson, 2020). These regular interactions between Twitter users generate

¹ The Zika outbreak of 2016 was a general public health crisis of global concern that led to the distribution of a substantial amount of misinformation on social media at that time.

debates that affect users' views (Starbird et al., 2019). However, not all people are equally motivated to engage in social interactions (Lee & Kim, 2014).

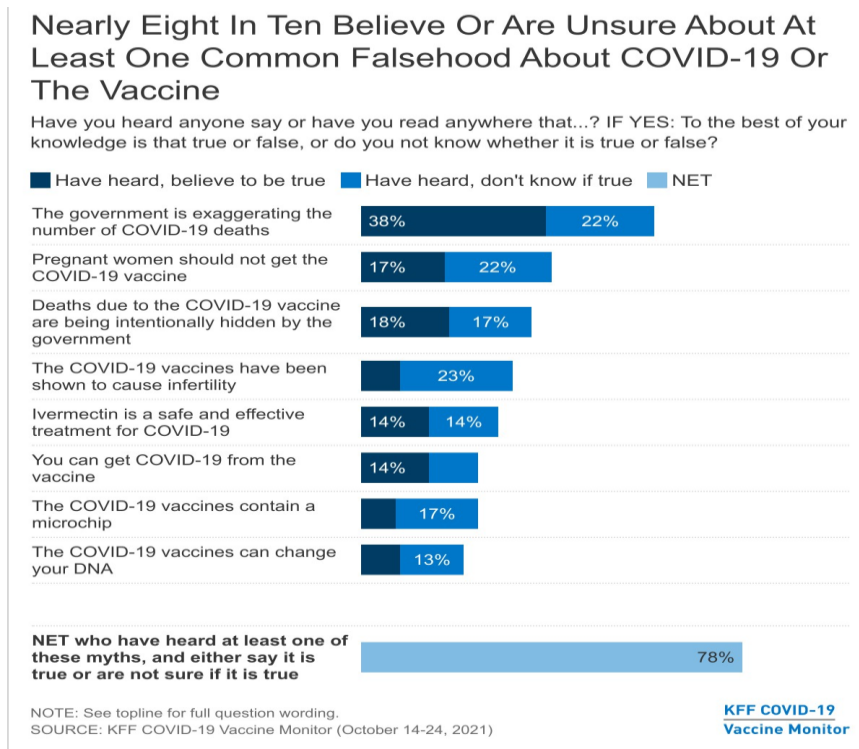
1.4.3 People's Reactions to Misinformation

During times of public health crises, the spread of misinformation on social media platforms can be dangerous for individuals and society as a whole. During a pandemic, there is potential for misleading and false content that can be spread across the world, partially due to the failure to provide sufficient information (Burns, 2010). During the COVID-19 crisis, misleading content stating that COVID-19 was intentionally created as a biological weapon was frequently shared (Knight, 2021). Similarly, widely spread misinformation statements included claims that COVID-19 symptoms were caused by 5G technologies instead of an infectious respiratory illness caused by the SARS-CoV-2 coronavirus (Andrews, 2020; Knight, 2021; Sorkin, 2020).

Studies have shown the diverse reactions of social media users towards misinformation. Al-Zaman (2021) studied users' comments on different types of COVID-19 misinformation posted on Facebook and found that 60.8% agreed with the claims, 16.1% denied the misinformation and 13.3% were uncertain about it. Moreover, they asserted that users were dismissive of and tended to deny or doubt political misinformation more than other types of misinformation. However, this study had some limitations since it was limited to Bangladesh, analysed only public comments to understand how users reacted and did not consider the sociodemographic context of the users. Geeng et al. (2020) identified seven ways in which social media users interacted with misinformation: skipping, accepting without much thought, being sceptical, expressing uncertainty about what is being conveyed, providing alternative views, sharing or liking, and misinterpretation. Ng and Loke (2020) observed how Telegram users responded to COVID-19 misinformation with such responses as affirmation and showed that 45% of their subjects denied or questioned the given data, while only 11% supported it. Tandoc et al. (2020) researched Singaporean social media stakeholders' reactions to false information and found that many people ignored misinformation but made corrections when they felt a post was coming from themselves or someone they knew. However, this study had some limitations, such as contextuality, as it focused only on Singapore.

During the COVID-19 pandemic, the Director-General of the World Health Organization, Dr Tedros said, "Misinformation on the coronavirus might be the most contagious thing about it" (WHO, 2020). As shown in **Figure 1**, approximately 80% of people either believed or were unsure about at least one misinformation claim regarding COVID-19 or the vaccine (KFF COVID-19 Vaccine Monitor, 2021). Roughly one-half (46%) agreed with misinformation claims or were unsure about one to three of these claims being false. One-third of participants (32%) reported having heard at least four of these claims and either accepting them as accurate or being unsure of their veracity. Similarly, Al-Zaman (2021) found that most users accepted COVID-19 misinformation claims. Experts have recognised the misinformation issue and are calling for action to address it (Depoux et al., 2020; Kouzy et al., 2020; Larson, 2018).

Figure 1 *People's Belief of Common Misinformation Regarding COVID-19*



Source: KFF COVID-19 Vaccine Monitor, 2021

1.5 Research Aims, Objectives and Questions

1.5.1 Research Aims

This study aimed to investigate people's reactions to misinformation within the context of English-speaking countries and explore the factors influencing the patterns of these reactions and network structures that arise from such interactions.

1.5.2 Research Questions

The following main research questions were developed from the research aim, which formed the foundation of this research project:

- **RQ1: How did people react to social media content that they believed to be health misinformation during the COVID-19 pandemic?**
- **RQ2: What factors influenced people's reactions to misinformation during the COVID-19 pandemic?**
- **RQ3: Were there associations between personal characteristics and misinformation reactions?**
- **RQ4: What characteristics of social networks formed around COVID-19 misinformation on Twitter, and how did users react within such networks?**

1.5.3 Research Objectives

To answer the research questions, this study had six research objectives.

- **Research Objective RO1:** To investigate how individuals reacted when they encountered misinformation on social media during the COVID-19 pandemic, how their reactions varied with different types of misinformation and in different situations, and what factors influenced them (RQ1 and RQ2).
- **Research Objective RO2:** To understand the range of online information sources that

are typically used by general members of the public in English-speaking countries that influence their opinion (RQ3).

- **Research Objective RO3:** To evaluate the association between information sources, personal backgrounds, people's attitudes towards social media platforms, and people's reactions to misinformation during the COVID-19 pandemic (RQ3).
- **Research Objective RO4:** To investigate social networks and their characteristics (e.g., density, modularity) that emerged from the way users interacted with selected misinformation cases on Twitter during the COVID-19 pandemic (RQ4).
- **Research Objective RO5:** To investigate the types of interactions that emerged when users interacted while engaging with content they believed to be misinformation on Twitter (RQ4).

1.6 Thesis Contribution

Both theoretically and empirically, this research fills essential gaps in the existing literature on health-related misinformation spread through social networks during health emergencies like the COVID-19 pandemic. In particular, the study expands upon theoretical knowledge of the verification processes employed by individuals by including demographic characteristics like age, education level, and sources of information. These determinants are also critical in explicating the cognitive and behavioural recovery of the user's mind from exposure to misinformation, thus contributing to the enhancement of theoretical frameworks concerned with information consumption behaviour applied in a digital context.

From a methodological perspective, the broad aim of the research is achieved through the mixed-methods exploratory sequential case study approach, which combines qualitative and quantitative methods to assess the prevalence of misinformation. The combination of advanced analytical methods such as social network analysis and the Latent Dirichlet Allocation (LDA) model provides a clear picture for the future portrayal of such types of research and how misinformation is transmitted and countered in a reliable and detailed way.

From an empirical perspective, the study draws conclusions and recommendations that are crucial for public health communication strategies aimed at combating misinformation. It highlights the importance of the public critically appraising any information they encounter, thereby equipping them with the necessary tools to navigate health crises and reduce the spread of misinformation.

This research, in conclusion, is invaluable as it showed how individuals confirm and address misinformation in social networks. By enhancing existing theories, creating better methods for others, and proposing specific solutions for the effective management of public health communication, this study significantly contributes to our understanding of health-related misinformation during emergencies.

1.7 Thesis Outline

This thesis is comprised of nine chapters, which are detailed below.

Chapter 1: Introduction

The first chapter of the thesis is the introduction, which provides the research objectives, context, approach and definitions. It covers an overview of topics such as health outbreaks, social networks and interactions, the research aim and objectives, the importance of the study, and an outline of the thesis.

Chapter 2: Literature Review

The literature review covers existing studies on misinformation types, spread factors, user reactions to misinformation, misinformation detection approaches, network analysis of misinformation and knowledge gaps.

Chapter 3: Methodology and Research Design

This chapter outlines the research philosophy ‘Pragmatism’ and methodology design used to achieve the research objectives. It discusses how data were collected for both the questionnaire and Twitter studies and how data were analysed using statistical and thematic analysis and topic modelling.

Chapter 4: Exploring Reactions to Misinformation - Results

This chapter summarises questionnaire responses based on participants’ demographics, preferred sources to verify information, social media platform usage, level of comfort in relying on social media, capability and trustworthiness assessment of social media platforms, attitudes towards social media platforms, and the impact of social media actions on the trustworthiness and reliability of COVID-19 information. It also examines how often participants encountered misinformation on social media and their reactions. Furthermore, this chapter carries out a detailed analysis of the reactions to shared misinformation under different scenarios. The chapter also covers a general understanding of reactions to misinformation through different types of scenarios.

Chapter 5: Factors Influencing Participants’ Reactions to Misinformation - Results

This chapter covers the ‘Inferential Analysis’ results, showing the relationship among variables. Topics covered in this section include the effect of the information source on participant’s reaction and attitude, the effect of attitude on identifying misinformation and reactions to misinformation, the effect of participant’s background on identifying misinformation, the impact of preference method for verifying information on identifying misinformation, and the impact of encountering misinformation on attitude and misinformation identification.

Chapter 6: Understanding Social Network Characteristics of Misinformation - Results

This chapter presents the results by analysing three misinformation claims to understand the social network structure formed around them. Descriptive statistics are presented to show the structural properties of the networks, as well as overall metrics for each misinformed network graph, together with themes explaining how users reacted within these networks.

Chapter 7: Discussion

This chapter provides a detailed discussion of the results, including interpretations and evaluations made against previous studies (e.g., similarities/differences), and explains how these findings answer the research questions.

Chapter 8: Conclusions

The last chapter discusses the most important findings and contributions, the limitations of the study, areas for possible extensions, and implications. Finally, this chapter highlights the ethical considerations of the research.

Chapter 2: Literature Review

2.1 Chapter Overview

Chapter 2 discusses existing studies on misinformation types, spread factors and motivations that facilitate the spread of misinformation, user reactions to misinformation, approaches for misinformation detection, and the use of network analysis to study misinformation. Finally, this chapter concludes by describing knowledge gaps and summarising the literature review chapter.

2.2 Literature Review Strategy

The literature review in this thesis was conducted by doing an extensive literature review on misinformation and its propagation, focused on COVID-19 pandemic. The review included establishing major themes and gaps in the scope of the literature. This was achieved through several processes outlined below:

Defining the Research Scope and Objectives: The first step was to define the parameters of the inquiry and its particular aims concerning the general aims of the literature review. These questions also called for purposes of addressing, imbuing into the studies broad information on why and how users post information and their behaviours to misinformation. In this regard, the research emphasizes the following terminologies to inform the study: 'behaviour', 'engagement', 'attitudes', 'interaction', 'sense-making', 'reactions', 'misinformation', 'fake' and 'social media characteristics' concerning how users interacted with the misinformation.

Identifying Relevant Sources: A wide variety of scholarly databases and digital libraries were used to ensure that peer-reviewed articles, conference proceedings, and other scholarly works were covered. The most significant databases were PubMed, IEEE, Google Scholar, Scopus and Web of Science. Furthermore, grey literature like reports from reputable organizations and government documents were also reviewed in order to obtain alternative views, particularly on the concepts of "health information", "public health communication", "health misinformation", "vaccine hesitancy", "polarization", "information sources," and "credibility".

Search Strategy and Keywords: To find this, specific keywords and phrases dealing with misinformation, the use of social media networks, network analysis, health communication, cognitive aspects, and user responses were employed. Boolean operators (AND, OR, NOT) were also applied to narrow down searches and ensure that the relevant results were obtained. For instance, The phrases that used including but not limiting to "misinformation AND social media," "COVID-19 AND misinformation," "fake news AND social networks," "disinformation AND misinformation," "rumours AND misinformation," "user reaction AND misinformation," "behaviour AND misinformation," "network analysis AND misinformation," "social networks AND misinformation," "echo chambers AND social

networks," "bots AND misinformation," "misinformation detection AND fact-checking," "misinformation prediction," "health misinformation AND public health communication," "vaccine hesitancy AND misinformation," "Twitter AND misinformation," "social networks AND misinformation," "credibility AND misinformation," "attitude AND misinformation," and "covid-19 BUT sources of information." All the keywords were strategically picked in a bid to fully comprehend the dynamics of misinformation. These terms were very useful, given a good sources that focused on the the nature of the misinformation, including how it spread, how users behaved with it, and how the structures of social networks contributed to the spread of misinformation.

Screening and Selection Criteria: The articles and papers obtained from the initial search were evaluated in terms of their relevance to the set research objectives. The studies included those published in the past 5 years, peer-reviewed literature, and research on misinformation, user reaction and social media. Out of the retrieved articles, only those abstracts that provided new insights were retained, and a close examination of the remaining articles was conducted later. A focus was also placed on articles and papers that investigated user behaviour or engagement, the users' attitudes and reactions to misinformation, and articles and papers in network analysis that dealt with concepts of social networks, echo chambers, and bots.

Organizing and Synthesizing Literature: The selected literature was organized into key areas such as the types of misinformation (including "fake news," "disinformation," and "rumors"), factors contributing to its spread, methods for detection (including "misinformation detection," "misinformation prediction," and "fact-checking"), user reactions, behavioral responses, network analysis studies, political agendas, cognitive factors, credibility, information sources, and the role of social networks. This organization helped identify patterns and trends within the literature and highlighted gaps that require further investigation. For instance, studies that utilized network analysis were reviewed to understand how misinformation spreads through social networks, echo chambers, and how these structures influence the dissemination of false information.

Critical Analysis and Knowledge Gaps: A critical evaluation of the selected studies was performed in order to assess their methodologies, results and implications. Apin, this analysis exposed some gaps within the literature, such as the mechanisms of information porosity in different demographic groups, how efficient the measures are on Facebook and Twitter, and network studies as a tool in investigating the characteristics of the proliferation of misinformation. At the same time, the literature review emphasized the absence of such works on the range of measures. networks analysis in the study of the relationships between echoes, bots, social networks and misinformation. These gaps define the focus of the research presented in this thesis.

Updating the Literature Review: In the case of updates made to the literature review, this was done because research on misinformation, especially during the COVID-19 pandemic, was constant in its progress. As such, the literature review was done at intervals with the intention of containing clear and up-to-date figures. Such keywords and search terms as "user reaction," "behaviour," "network analysis," "cognitive factors," "social networks," "vaccine hesitancy," "polarization," "credibility," "attitude," "information sources," "COVID-19," and "Twitter" were revisited so that more studies could be integrated into the current research.

Documenting the Process: While conducting a literature review, records of the search terms, databases, inclusion/exclusion criteria, and the selection process were maintained. Such documentation was crucial in enhancing the transparency and reproducibility of the literature review approach.

The literature review in this thesis aimed to enhance the understanding of how misinformation research is utilized in a health crisis by focusing on the literature that specifically discusses the dissemination of misinformation. A number of literature that ranged from studies on "fake news," "disinformation," "rumours," user and audience reactions and behavioural acts, network communication, cognition, information credibility, public opinion, politics, and social media was reviewed and the gaps created as well as the key themes influencing the research questions and methodology of the thesis were established.

2.3 Preferred Information Sources

People obtain information from a variety of sources, including health organisations, traditional media, friends and family, and social media, to address their concerns regarding infectious diseases, such as COVID-19 (Ali, 2020; Elizabeth, 2010; Soroya, 2021).

2.3.1 Organisational Information Sources

Organisational information sources, such as medical professionals and health departments, are viewed as trustworthy sources for general health information (Ali, 2020; Anske et al., 2007; Avery, 2010; Cairns, 2013; Diane, 2011; Fridman, 2020; Fridman et al., 2020; Hesse, 2005; Jackson, 2019; Marrie, 2013; Oberg, 2009). In a study of government sources, participants trusted the Food and Drug Administration (FDA) and CDC sources (70.3%), the local Department of Health (63.7%), the WHO (59.2%), the White House (45.8%), and others (15.8%) (Fridman et al., 2020). However, health information sources can be unreachable, especially for vulnerable populations in developing countries with different educational levels (Asha et al., 2018; Gehrau et al., 2021; Xuewei et al., 2019). There is also the potential for misinterpretation and breaches of patient privacy (Angel et al., 2017) or even cases in which the information is unsuitable for specific circumstances, leaving queries unanswered (Elizabeth, 2010; Gehrau et al., 2021; Oberg, 2009).

2.3.2 Traditional Media

Traditional media, such as television, radio, podcasts, newspapers and magazines, are also viewed as trustworthy information sources (Ali, 2020; Ali et al., 2020; Avery, 2010; Dutta-Bergman, 2004; Henrich, 2011; Wong, 2010) but are less trusted than organisational and government information sources (Cairns, 2013; Fridman, 2020; Marrie, 2013). Traditional media is an important source, as it makes people aware of crises (Henrich, 2011). A recent online survey of 11,242 US participants showed that traditional media sources were the most trusted COVID-19 information sources (91.2%) (Ali et al., 2020). However, research has also shown that people's trust in certain information sources, such as mainstream media, has steadily declined (Smith & Son, 2013). According to Funk and Kennedy (2016), only 38% of the participants had either 'a great deal' or 'a fair amount' of confidence in mainstream media, while 76% shared 'a great deal' or 'a fair amount' of confidence in scientists to act for the common good. However, a more recent study showed that participants relied on mainstream media (69.5%), with popular outlets including CNN (24.0%), Fox News (19.3%), and other local or national networks (35.2%) (Ali et al., 2020).

In contrast to ‘mainstream media’, ‘alternative news media’ contributes to a contradictory, menacing and distrusting worldview, positioning itself as a watchdog to mainstream media to promote its own ideological aims (Holt et al., 2019; Schweiger, 2017). Alternative news media also mirrors traditional mainstream media reports regarding their topical structure, and the actors involved make them difficult to differentiate (Boberg et al., 2020). There is a prevailing sentiment among the public that alternative news media disseminate false information and rumours that contradict what is reported by more established news outlets (Boberg et al., 2020; Gehrau et al., 2021).

2.3.3 Interpersonal Information Sources

Interpersonal information sources, such as family and friends, are a significant source of information (Avery, 2010; Dutta-Bergman, 2004; Edgerly et al., 2020), including for health-related issues (Fridman, 2020; Jackson, 2019; Marrie, 2013), and some people rely on these sources for their primary health information (Dutta-Bergman, 2004; Elizabeth, 2010). Interpersonal sources are more trusted by people due to their perceived accessibility and higher information quality (Christopher et al., 2019). Similarly, they are preferred for sensitive issues because they are perceived to be unbiased (Yiwei et al., 2019).

2.3.4 Social Media

People use social media platforms, such as Twitter, Facebook and Instagram, as sources of health information (Soroya, 2021; Statista, 2020) and, more recently, as a source for news (Ali & Rismanbaf, 2021; Maria & Manzon, 2020; Temple et al., 2021; Vinta & Sevilla, 2020). Users tend to engage on social media to discuss health crisis news or to discuss their own perspectives with other people experiencing the same or related health conditions and treatments, such as prescriptions, communicable diseases, drugs, chronic diseases, cardiovascular diseases, nutrition and smoking (Chou et al., 2009; Edin et al., 2021; Fox, 2011; Madhan et al., 2023; Saifuddin et al., 2022; Sarker et al., 2015; Vinta & Sevilla, 2020; Xiaolin et al., 2021). Social media also played a significant role in monitoring and spreading information about the COVID-19 pandemic (Carmela et al., 2022), as well as shaping people’s reactions to the pandemic (Ali & Rismanbaf, 2021; Maria & Manzon, 2020; Temple et al., 2021; Vinta & Sevilla, 2020).

Several studies have discussed the reliability and quality of information shared on social media platforms, such as Facebook, YouTube and Reddit (Kang, 2010; Samory & Mitra, 2018; Sharma et al., 2017). Although social media allows users to act as online information sources and share ideas, opinions and experiences (Albalawi et al., 2017; Marken, 2007), it is vulnerable to manipulation, such as analytics, clickbait and exaggeration (Marwick & Lewis, 2017). Social media platforms are trusted less than organisational and government information sources (Cairns, 2013; Fridman, 2020; Marrie, 2013), as the public perceives them as potential sources of misinformation and rumours, which are at odds with more reliable news outlets, leading to uncertainties and disquiet among the public (Boberg et al., 2020; Gehrau et al., 2021). Studies evaluating online social sources found them to vary in both quality and reliability depending on where the information was obtained (Binhan et al., 2023; Bora et al., 2018; Calvin et al., 2021; Davis et al., 2022; Kang, 2010; Mitchell et al., 2022; Salma et al., 2021). For example, YouTube videos are more likely to be misleading when they come from individuals, while videos from trustworthy sources, such as universities/health organisations, are more reliable (Bora et al., 2018). However, Cinelli et al. (2020) conducted a comparative

study of five social media platforms (Twitter, YouTube, Instagram, Reddit and Gab) throughout the COVID-19 pandemic and found that popular networks were less susceptible to the spread of misinformation.

2.3.4.1 Twitter as a Source of Information

2.3.4.1.1 Potential of Twitter as a Source of Information

Users' posts on Twitter can be a significant source of information since many trending issues are related to the latest news (Tyagi et al., 2019). For example, an extensive combination of tweets on Twitter regarding a particular emerging problem can provide a broad picture of public opinion (Goolsby, 2009; Oh et al., 2013; Veil et al., 2011). The use of Twitter offers a important chance for scientists, public health workers, emergency responders and online volunteers to benefit from the availability of timely significant information shared by concerned users during emergencies (Oh et al., 2013; Palen et al., 2010; Reynolds & Seeger, 2005; Starbird & Palen, 2011; Starbird et al., 2014; Veil et al., 2008). The use of Twitter for crisis communication has been explored significantly in the past (e.g., Hughes & Palen, 2009; Imran et al., 2015; Palen & Liu, 2007; Palen et al., 2010; Qu et al., 2011; Starbird et al., 2014), as it provides real-time information from individuals who are often the first to report on events, such as natural disasters, terrorist attacks and disease outbreaks (Depoux et al., 2020; Smith, 2010; Sutton et al., 2008). In real time, Twitter can offer data that may not be available on other public health channels or other normal official channels during a health crisis (Austin et al., 2021; Bhattacharya et al., 2012; Depoux et al., 2020; Eckmanns, 2014; Premkumar et al., 2023; Velasco et al., 2017). This information can be beneficial in eliciting immediate humanitarian assistance and providing valuable updates to mainstream media (Beaumont, 2008; Catherine et al., 2020; Muhammad et al., 2016). In addition, Twitter has played a key role in enhancing public health communication among residents' networks and health officials (Kostkova et al., 2014; Levac & O'Sullivan, 2016; Moorhead et al., 2013), functioning as a practical way for community members to notify or advise each other (Albalawi et al., 2017; Kostkova.al., 2014).

2.3.4.1.2 Challenges of Using Twitter as a Source of Information

Given the benefits of developing adequate information during a crisis, professionals should scrutinise whether Twitter information leads to good outcomes. Therefore, the challenges and limitations associated with Twitter as an information source should be considered to fully understand its potential. As Twitter was originally used to share opinions and experiences and criticise news and events (Chew & Eysenbach, 2010; Teresa et al., 2017), its format does not allow official public health officials to ascertain whether the information shared by users is accurate in responding to or raising public awareness during a health crisis (Vos & Buckner, 2016). Furthermore, tweets have a limited character count, thus resulting in short messages that may sometimes be grammatically incorrect or have word variations, making them difficult to understand (Moshe et al., 2022; Setiawan et al., 2016). Thus, the unstructured data on Twitter necessitate much effort to achieve a desired output (Srividhya et al., 2022). Several studies have shown that a considerable number of tweets consist of unreliable health information and that most tweets during a health crisis are unfavourable and do not go through peer review (Khamar et al., 2022; Vos & Buckner, 2016; Yee, 2015). One study found that almost half of professional accounts' health tweets in Arabic were false; however, this study had a small sample size and only evaluated tweets in

Arabic. Kouzy et al. (2020) revealed a higher percentage of misinformation from unverified accounts (33.8%) than from verified accounts (12.6%).

There are a few potential gaps in the literature. It is unclear how exposure to varied information sources shapes attitudes and behaviours (Erik et al., 2022). In addition, the news source partisan divide should be addressed while considering the role of information choice, including confirmation bias and source dependence on beliefs (Erik et al., 2022; Faia et al., 2022). Studies have shown that although misinformation decreased for alternative treatments and transmission, misinformation about COVID-19 vaccines increased (Isip et al., 2023; Rod et al., 2023). Thus, the relevant knowledge gaps concerning social media misinformation about vaccines also requires attention (Francesco et al., 2022). This has led some to propose non-expert fact-checkers as a solution, although little is known about how crowd-fact-checked information spreads and how to differentiate between true and false posts (Chiarra et al., 2022).

2.4 Misinformation and Its Spread

The spread of misinformation is not a new phenomenon and dates back to the beginning of print media. The term ‘fake news’ was first coined in the early 1900s after an article in Harper’s Magazine titled ‘Fake News and the Public’ mourned how newswires enabled the quick spread of misinformation (McKernon, 1925). This term saw increased use in news and academic research after the 2016 US presidential election (Flamino et al., 2023). Although various nuanced terms exist, in this study, ‘misinformation’ is explored as a generic concept that involves the spread of incorrect information either deliberately or accidentally through social media channels. The spread of misinformation unintentionally or purposefully within social media harms people, communities and entire countries during a health crisis (Tyagi et al., 2019), spreading quickly (Wang et al., 2019) and trending much more than accurate information (Sharma et al., 2017). Using a survey, Chadwick and Vaccari (2019) found that 42.8% of the UK news that social media users shared was unproven information and that 78.8% of UK social media users did not correct other users.

2.4.1 Types of Misinformation

2.4.1.1 Fake News. Fake news is defined as fabricated information that imitates the main news media content in format but not in the purpose or organisational approach (Lazer et al., 2018) and is utilised for several types of misinformation, including false context, false connection, manipulated content, fabricated content, misleading content and imposter content (Zubiaga et al., 2018). ‘Fake news’ overlaps with other words about misleading information, such as ‘misinformation’ and ‘disinformation’, which relate to messages, reports or views that are distributed quickly through social media but differ in their purpose and approach (Wang et al., 2019). Fake news comes in different types depending on whether it is deliberate.

2.4.1.2 Misinformation. The most generally quoted definition of misinformation is conceptualised as “cases in which people’s beliefs about factual matters are not supported by clear evidence and expert opinion” (Nyhan & Reifler, 2010, p. 305). Misinformation is also defined in health aspects as “a health-related claim of fact that is currently false due to a lack of scientific evidence” (Chou et al., 2018, p. 1). This definition helps health-related research

problems since opinions in the health field must be evaluated to determine whether they are accurate (Vraga & Bode, 2017).

2.4.1.3 Disinformation. ‘Misinformation’ is distinct from ‘disinformation’ which is “the deliberate creation and sharing of false and/or manipulated information that is intended to deceive and mislead audiences, either for the purposes of causing harm, or for political, personal or financial gain” (House of Commons Digital, Culture, Media and Sport Committee, 2018, p. 2). Disinformation can also be defined as a strategy of reversing public relations, which involves damaging the reputation of an opponent and undermining their goals and strategies (Bittman, 1985). It has also been well recognised as a campaign strategy in which information is utilised to mislead people about a particular governmental objective (Starbird et al., 2019). Therefore, disinformation consists of misleading content created by persons or groups knowing that the information is inaccurate and with the aim of causing harm (Jack, 2017; Wardle & Derakhshan, 2017).

2.4.1.4 Rumours. A rumour is another term used in misinformation literature for unverified information that can be either true or false (Krafft & Spiro, 2020). Drawing from the foundational work of Allport and Postman (1947), the propagation of rumours often stems from the human need to make sense of events while simultaneously assuaging and rationalising anxiety-induced emotions. Therefore, rumours can lead to misinformation or disinformation and may even be considered gossip (Krafft & Spiro, 2020). Many experts define rumours as unofficial information caused by a collection of doubts in communities in which trustworthy information has not been presented (Allport & Postman, 1947; DiFonzo & Bordia, 2007; Kapferer, 2013; Rosnow, 1991; Shibutani, 1966).

2.4.1.5 Conspiracy Theory. According to Brian (1999, p. 116), a “conspiracy theory is a proposed explanation of some historical event (or events) in terms of the important causal agency of a relatively small group of persons, the conspirators, acting in secret”. Conspiracy theories often provide other descriptions of actual events and uncorroborated or false claims (Sunstein & Vermeule, 2009) and continue to use narratives until the presence of official mainstream facts decreases doubts about the validity of the information (Bessi et al., 2015).

2.4.2 Explanations for the Spread of Misinformation

The spread of misinformation has been on the rise (Lauren et al., 2023; Vicol, 2020). Understanding how it is spread is important for developing effective strategies to curb its dissemination (Chen et al., 2015; Vellani et al., 2023). Factors affecting the spread of misinformation include the need for interaction, sense-making behaviour, distrust of science, political agendas, and cognitive and technical factors.

2.4.2.1 Need for Interaction. People interact with others on social media to seek others’ opinions and express one’s own thoughts, such as sharing new rumours, gossip stories and urban legends (Guerin & Miyazaki, 2006; Lauren et al., 2023). For instance, Chen et al. (2015) found that the need for interaction and self-expression were primary reasons for college students in Singapore to share misinformation on social media.

There is mounting evidence that polarisation on social media platforms also contributes to the spread of misinformation. Polarisation on social media occurs when a user posts in support of a conspiracy-like narrative (Bessi et al., 2016). Bessi et al. (2015) examined the spread of environmentally, dietary and geopolitically relevant misinformation through quantitative analysis to understand how these different topics were perceived within

the conspiracy echo chamber of Italian Facebook. The findings revealed that when users were more active, they were more likely to engage in all categories, including environment, diet, health and geopolitics. Online communities that promoted conspiracy theories often exhibited polarisation.

2.4.2.2 Sense-making Behaviour. During crises, many people tend to look for a form of resistance (Park, 2010) and engage in collective sense-making behaviour to interpret situations (Ghani et al., 2015; Starbird, 2020), which is considered a normal human reaction to a stressful scenario (Starbird, 2020). Sensemaking is a process that engages people in making sense of a stressful scenario to minimise the stress caused by that situation (Park & Folkman, 1997, as cited in Park, 2010), thus assisting them in adaptively handling any crisis (Frankl, 2006). Therefore, people identify and evaluate the stressful situation (Park, 2010) to determine an explanation and achieve positive feelings, such as courage, hope, comfort and motivation toward this difficult scenario (Walsh, 2012). People invest in knowledge even when the benefits are uncertain, thus filling a critical gap in cognition (Zachary et al., 2021), and sensemaking helps in comprehending complex information and unreliable sources (Mei-Hua et al., 2009). Many experts agree that people tend to spread their uncertain opinions during a crisis to make sense of what is going on (Ghani et al., 2015; Heverin & Zach, 2012; Kou et al., 2017; Park, 2010; Reyna, 2012; Starbird, 2020; Starbird et al., 2014, 2020). For example, a qualitative analysis of conspiracy theorising on Reddit during the Zika pandemic found that conspiracy discussions appeared as people tried to make sense of the health crisis (Kou et al., 2017).

2.4.2.3 Anti-Science. Anti-science refers to people who have lost their faith in science and instead prefer their personal opinions (Huber et al., 2019). This distrust of science is one of the reasons for the increase in misinformation (Lewandowsky et al., 2017). A poll conducted by Pewresearch (2015) demonstrated that the percentage of people who think that science has ‘made life more difficult’ increased by 50% from 2009 to 2015. Another poll showed that only 35% of the participants had high trust in scientists (YouGov, 2017). However, the percentage of people who did not trust scientists at all increased by more than 50% between studies published in 2013 (YouGov, 2013) and 2017 (YouGov, 2017). This distrust of science and academic experts has a broader pattern, leading Tom Nichols (2017) to name his book ‘The Death of Expertise’. Distrust in science can be a severe problem for communities, as many people trust individual’s thoughts and give them equal weight to experts’ opinions (Huber et al., 2019).

As a result, several factors contribute to the apparent distrust of science. First, governments often use scientific findings to justify policies that are unpopular among the public, making science appear to be part of the problem (Smith, 2023). Conservative hostility towards science stems from a broader distrust of governmental regulation, especially in environmental and public health sciences, thereby further undermining trust in scientific findings (Furman, 2020). Secondly, there is a demand for empirical evidence in science that leads to statistical manipulation, thereby compromising the credibility of scientific evidence (Oreskes, 2022). Data mining has led to research in which scientific findings have no theoretical basis, causing mistrust (Baron, 2019; Geoffrey, 2022). Furthermore, tools such as the internet and social media have facilitated disinformation and conspiracy theory dissemination, which has eroded scientists’ credibility and created suspicion over their work

(Nicolo et al., 2006; Smith, 2023). The pressure on science to be accountable and the reliance on experts for knowledge generation has contributed to scepticism and mistrust from the public (Weingart, 2023).

2.4.2.4 Anti-Vaccination. Some studies have focused on the anti-vaccination movement and its impact on health. This movement has been carried out by groups that spread misinformation about vaccination during disease outbreaks, leading to increased vaccine hesitancy among people (Cooper et al., 2018; Succi, 2018). The anti-vaccination movement is not a new phenomenon; it dates back to the 18th century when the smallpox vaccine was introduced (Succi, 2018). Vaccine hesitancy is a term coined in 2012 by the WHO to describe people's attitudes towards vaccination, ranging from acceptance to refusal (Cooper et al., 2018). Anti-vaccination groups are effective at spreading misinformation, often distorting scientific evidence and data, using emotional language, and employing a variety of other methods to undermine public trust in official health organisations (Betsch & Sachse, 2012; Kata, 2012). Social media users might conduct their 'own research' before deciding whether to vaccinate. However, anti-vaccination groups have already applied many techniques, including distorting science, changing hypotheses and attacking official health organisations' corrections (Kata, 2012). For example, in 1998, the previous specialist Andrew Wakefield published a paper purporting a link between autism and the measles, mumps and rubella (MMR) vaccine. Despite having his clinical licence revoked, Wakefield continued to spread misinformation about the vaccine (Larson, 2018), which unfortunately led to decreased vaccination rates, outbreaks of disease and the risk of death (Cooper et al., 2018). Similarly, in Ireland and Denmark, individuals spread stories on television news and social media about young babes being harmed by the human papillomavirus (HPV) vaccination, resulting in a decrease in national immunisation rates from over 90% in 2000 to below 20% in 2005 in Denmark (Larson, 2018).

2.4.2.5 Political Agendas. Political agendas play an important role in spreading misinformation, as misleading information is generated for political interests, resulting in the dissemination of disinformation (Wardle, 2017). For instance, during electoral campaigns, misinformation is strategically used to distort voter opinions and decision-making processes, thereby influencing political outcomes (Benaissa, 2021). Nation states use disinformation as a covert weapon of war towards military, political, economic and ideological goals (Murphy, 2023). Therefore, coordinated campaigns with people posing as ordinary citizens are conducted to affect election status and further national politics (Berta et al., 2022). For example, Starbird (2017) studied conspiracy theories surrounding the Sandy Hook School shooting and revealed high levels of conspiratorial content sponsored by the Russian government. This shows how political agendas shape stories meant to target politics using social media as a battleground for misinformation and disinformation campaigns. Burton and Koehorst (2020) argued that YouTube is a major source of news on ideologically charged channels, contributing to increased misinformation in political discussions. The World Wide Web, which constantly combines half-truths, contributes to a divided political system and influences traditional media agendas for spreading misinformation (Rojecki & Meraz, 2016). Overall, intentional creation, distortion during electoral campaigns and the strategic use of disinformation by politicians as a tool of war facilitates the spread of misinformation (Benaissa, 2021; Dias et al., 2022; Murphy, 2023; Wardle, 2017). Consequently,

governments increasingly regard disinformation as an espionage tactic belonging to fourth-generation warfare with the need for collective defence against subversion (COV.UK, 2018; Ministry of Defence, 2018). For more information about how misinformation spreads via networks, please refer to section 0.

2.4.2.6 Cognitive Factors. People tend to share things that align with their beliefs (DiFonzo & Bordia, 2007), which can be affected by information repetition (Floyd et al., 1945), their cognitive representations (Gnanaprakash, 2013), past experiences (Landau, 2007), political awareness (Mitchell et al., 2018), religious views and motivated reasoning (Greeff & Thiel, 2012; Pargament, 2011), age and education level (Mitchell et al., 2018), correction (Blank & Launay, 2014; Walter & Murphy, 2018), motivated reasoning (Silverman, 2016), cultural values (Denis, 2007), fluency and coherence of the story (McGlone & Tofighbakhsh, 2000; Reber & Schwarz, 1999), and philosophical beliefs (Frankl, 2006). In addition, misinformation can spread due to other causes, such as repetition of misinformation influencing people's judgments, unclear or incomplete information, perceived accuracy, sensationalism, and emotional language (Kou et al., 2017; Larson, 2018; Sijing et al., 2022; Stefano et al., 2023). However, when people feel anxious or afraid about something, information is judged differently (Allen et al., 2014; Berger & Milkman, 2014; Chadwick & Vaccari, 2018, 2019). Such characteristics and features are highly important in affecting what people think and believe (Krüger et al., 2015). Vicario et al. (2016) showed that Facebook users tended to choose and share information relevant to a particular narrative, disregarding others (Vicario et al., 2016). Unfortunately, people are willing to share fake news even when they know it is untrue, which is more due to lazy thinking than ideology (Pennycook & Rand, 2018; Pennycook et al., 2020).

2.4.2.7 Characteristics of Social Media Platforms. The characteristics of social media platforms play a role in spreading misinformation. Functionalities supported by platforms, such as WhatsApp, Facebook, Reddit and Twitter, have come under criticism because they propagate misinformation (Caplan et al., 2018; Hern, 2020; Kou et al., 2017). For example, WhatsApp increases the message rate through its forward feature, thus promoting the spread of misinformation (Hern, 2020). Similarly, Reddit's interface supports conspiracy theories because users can quickly respond to posts and participate in detailed discussions on various topics (Kou et al., 2017). Users are often ignorant about where information comes from or how reliable it is, leading to misrepresentation (Zade et al., 2023). The retweet function on Twitter is a major driver for the rapid spread of misinformation (Ashwin et al., 2022; Bao et al., 2022; DeVerna et al., 2024) because most retweets occur within the first hour of posting, making it difficult to trace them back to the originator and increasing the difficulty of fact-checking (Starbird et al., 2014, 2019).

Social rewards and punishments, such as 'likes' and 'dislikes', are not linked with factual correctness but rather an incentive for popularity, encouraging users to prioritise popularity over accuracy (Globig et al., 2023). Social media's ease of entry allows individuals with ulterior motives to spread disinformation online, leading to a lack of faith in social media platforms as an information source (Shu Zengyi, 2023). Social media platform operators have been criticised for failing to provide enough support to prevent the dissemination of fake news; thus, users use existing features against misinformation (Jahanbakhsh et al., 2022). Some studies have suggested the implantation of informative tagging policies that expose the veracity

of the content (Yang et al., 2023; Zade et al., 2022), the introduction of confidence-rating buttons, or an incentive structure that promotes accurate information sharing while punishing misinformation spreaders (Globig et al., 2023; Howe et al., 2023). Jahanbakhsh et al. (2022) suggested new affordances such as structured accuracy assessments, user-specified trust indications and configurable social feed filters to help fight against misinformation.

2.4.3 User Reactions and Engagement with Misinformation

Misinformation has been linked to the spread of dangerous beliefs, which can lead to hesitancy in taking vaccines and scepticism towards science, thus inhibiting effective responses to health crises (Ahsan et al., 2013; de Saint Laurent et al., 2022; Indira & Radha 2023; Ismail et al., 2022; Morgan et al., 2021; Nowak et al., 2021; Saling et al., 2021). Understanding people's reactions to misinformation is crucial in determining how it spreads and influences their views and why it sometimes remains uncorrected (Cacciatore, 2021; Cook et al., 2015; Pennycook et al., 2023) and developing interventions to minimise its spread (Fernandez & Alani 2021; Greene & Murphy 2021; Kjær et al., 2022; Levy et al., 2021; McPhedran et al., 2023; Parker et al., 2021; Pennycook et al., 2023; Shan et al., 2023; Vidigal & Jerit 2022; West & Bergstrom, 2021). This understanding will help decision-makers make decisions based on facts while also increasing awareness among people to mitigate the negative consequences of misinformation (Almaliki, 2019; Bahrami et al., 2019; Fenton, 2019). Counteracting the effects of misinformation is imperative, as it can lead to collective preferences that are distinct from those predicated by accurate information (Kuklinski et al., 2000; West & Bergstrom, 2021). The literature offers valuable insights into how individuals react to misinformation, demonstrating that people's reactions to misinformation are complex and varied and influenced by a number of factors, including beliefs, attitudes, cognitive processes, memory, cognitive biases and retrospective warnings (Ecker, 2017; Freeze et al., 2021; Mayo, 2019; Tully et al., 2020; Piccolo et al., 2021; Sanderson & Ecker, 2020). There are still people who do not correct misinformed persons due to several factors, such as self-orientation, relationships and content (Gurgu et al., 2013).

2.4.3.1 Encountering Misinformation

People might encounter misinformation in a variety of situations, such as when interacting or talking with others (Ayuk, 2015; Blank et al., 2013; Brubaker et al., 2009; Gabbert et al., 2004; Schreiber & Sargent, 1998), when using search engines and social media platforms, when browsing the internet and engaging unreliable sources, when encountering government propaganda, and when reading manipulated Wikipedia entries, business reports or letters (Blank et al., 2013; Brubaker et al., 2009; Fallis, 2015; Malone & Heaton, 2010; Sanderson & Ecker, 2020; Schreiber & Sargent, 1998; Swire-Thompson & Lazer, 2020). Misinformation is not limited to specific sources, as people can find it on traditional news websites, government sites, non-governmental organisations (NGOs), journals and magazines (Cook et al., 2015; Sadiku et al., 2018). People may even encounter misinformation from their own imagination, which may be shaped by their perceptions based on societal norms (Aghajari et al., 2023). Unfortunately, exposure to misinformation negatively impacts our thoughts, actions and memory (Fridman et al., 2023; Greenspan & Loftus, 2021).

2.4.3.2 Information Authentication and Its Influencing Factors

It is important to authenticate the information encountered on social media (Gërguri, 2022; Oh & Lee, 2019). When assessing information, it is necessary to verify its source,

check it against multiple sources, assess its credibility and scrutinise its presentation method (Fallis, 2004). Additionally, awareness of the existence of misinformation on social media positively relates to information authentication (Majerczak & Strzelecki, 2020). In the USA, people verify information via family members, search engines and major news outlets, as their trustworthiness in terms of accuracy is highly regarded (Edgerly et al., 2020). Fact-checking news headlines tends to decrease when there are others around compared with evaluating headlines alone (Jun et al., 2017). People tend to verify via headlines when they think that information is accurate or comes from a credible source (Edgerly et al., 2020). The Kaiser Family Foundation (2021) found that about 78% of American adults believed at least one piece of misinformation about COVID-19 or were unsure if it was correct. Tandoc et al. (2018) proposed a model suggesting that individuals rely on internal and external authentication of news. However, verification goes beyond individuals' actions since misplaced trust may hinder thorough authentication (Talwar et al., 2019). Online trust is negatively associated with news authentication before sharing (Talwar et al., 2019), while the importance someone attaches to an issue or misinformation increases the probability of verifying its accuracy (Flanagin & Metzger, 2000; Lee, 2019). Fear and anxiety cause high levels of information verification (Sun, 2022), driving individuals towards reliable sources for information seeking. The below figure shows a conceptual model for Acts of correcting health misinformation on social media that created by Bautista et al., 2021. This conceptual model are not showing all people reactions to misinformation, it would very interesting if it show how prepole react to misinformation and how different sceanrios or misinformation types effect people reactions.

Figure 2 Conceptual model for Acts of correcting health misinformation on social media.

Source: (Bautista et al., 2021)

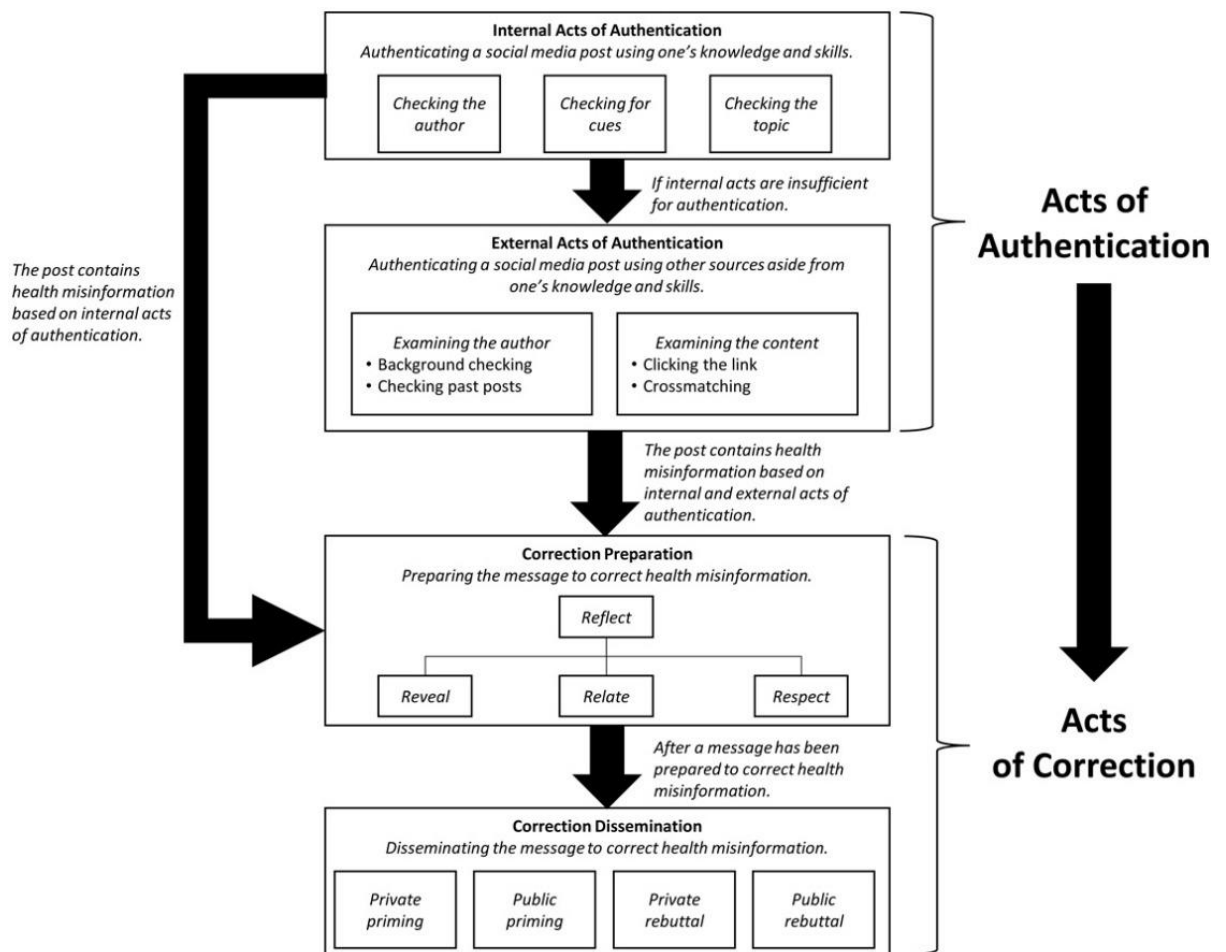


Figure 2 shows the **Bautista et al. (2021) model** outlines a structured approach to correcting health misinformation on social media through **Acts of Authentication** and **Acts of Correction**. Authentication involves verifying credibility internally (checking author, cues, topic) and externally (background checks, content analysis).

Income, education level, internet skills and attitude towards information verification are among the key predictors of detecting misinformation on social media (Khan & Idris, 2019; Majerczak & Strzelecki, 2020; Qerimi & Gërguri, 2022). Liberals perceive fact-checking sites differently from conservatives, with liberals being more positive and more likely to use them than conservatives (Robertson et al., 2020). However, some less educated, economically vulnerable individuals have difficulty differentiating between real and fake news (Qerimi & Gërguri, 2022). Scholars have noted situations wherein news exposure is effective and in which the audience's media literacy may be useful to them, such as cognitive strategies for verifying information and implementing health literacy programs (Gërguri, 2022; Oh & Lee, 2019). Media literacy programs and education also enable people with the basic skills needed for rational decision-making processes (Gërguri, 2022; Oh & Lee, 2019).

2.4.3.3 Countering Misinformation and Its Influencing Factors

There are various strategies for countering misinformation, such as promoting science literacy, enhancing critical thinking skills, post warnings, priming the right information and resistance training (Ecker et al., 2022; Westhoff et al., 2023). In addition to interventions

such as accurate reporting and credible communication problem (Greifeneder et al., 2021; Kyriakidou & Cushion, 2021), searching for additional information and relying on past experiences are two strategies widely used to counter misinformation (Freiling, 2019). However, some studies of health-related contexts within social media platforms emphasise the role of cues, debunking approaches and communication strategies while addressing the legitimisation of bad information (Di Domenico et al., 2022; Li et al., 2022; Scales et al., 2023; Vraga & Bode, 2022; Wu et al., 2022). The difficulty lies in how far misinformation has gone viral (Zucker, 2020), especially when people choose to disagree with facts, change beliefs or share humour (Appling et al., 2013). Some repeated fake news seems intuitively true, continuing its spread even after corrections have been made (Effron & Raj, 2020). However, even correcting misinformation may not fully prevent its impact, as individuals may still be influenced by the original misinformation, despite understanding and remembering the correction (Cook et al., 2015; Ecker, 2017). Denying or questioning part of the information is considered significant in user responses to misinformation, which are mostly affirming or questioning it (Ng & Loke, 2020).

Crowdsourced correction on social media platforms, official accounts publishing denials and credible presentations by experts have been identified as effective strategies for detecting, countering and replacing incorrect beliefs with accurate information (Lupia, 2013; Mendoza et al., 2010; Starbird et al., 2014). Moreover, spreading misinformation and exposing its sources can reduce the credibility of the story and increase reader scepticism (Di Domenico et al., 2021; Nekmat, 2020). High-quality sources play a crucial role in correcting misinformation as well as reducing the spread of misinformation and reducing anxiety during health crises (Andrews et al., 2016; Bode & Vraga, 2015, 2018; Eines et al., 2019; Gesser-Edelsburg et al., 2018; Nagpal et al., 2015; Oyeyemi et al., 2014; Sharma et al., 2017; Thelwall & Stuart, 2007; van der Meer & Jin, 2020; Vraga & Bode, 2017). Various studies have emphasised the significance of official accounts and organisations, credible presentations by experts, crowdsourced behaviour, fact-checking websites, social media platforms that label and delete misinformation, and encouraging critical thinking skills in correcting and countering misinformation (Ahmed, 2018; Ahmed et al., 2020; Andrews et al., 2016; Lupia, 2013; Mendoza et al., 2010; Seguí et al., 2020; Starbird et al., 2014; The Lancet, 2020). Despite efforts by health organisations during the COVID-19 pandemic, misinformation overwhelmed corrections, which was also indicated in studies on misinformation shared on Twitter and YouTube related to the 2014 Ebola outbreak (Nagpal et al., 2015; Oyeyemi et al., 2014; Starbird et al., 2014).

Emotional considerations are necessary during health crises to control and direct people effectively (Gesser-Edelsburg et al., 2018). Users tend to ignore misinformation but are more likely to correct it if it involves them or the people they know (Tandoc et al., 2020). Commenting on other people's posts has been found to improve relationships between the commenter and the recipient (Ellison et al., 2014). In contrast, commenting or correcting from a negative perspective could potentially harm relationships (Koutamanis et al., 2015).

2. 4.3.4 Factors that Influence the Acceptance and Sharing of Misinformation

2.5.4.1 Impact of Information Sources on the Acceptance and Sharing of Misinformation. Many studies have investigated how information sources impact the acceptance and dissemination of misinformation. Filkuková et al. (2021) and Enders et al.

(2023) indicated that news consumption, media use and trust in information sources, mainly social media, influence the acceptance of misinformation. Information from unknown sources may be difficult to verify, influencing users' decisions to accept or deny the information (Nekmat, 2020; Taghipour & Soleymani, 2023). Relevant presentations made by credible sources, such as experts or government organisations, can help individuals replace incorrect beliefs with accurate information (Lupia, 2013; van der Meer & Jin, 2020). However, Buchanan (2020) did not find evidence that the authority or credibility of a source affects sharing behaviour. Sharing fake news and exposing its source reduces credibility and increases scepticism among users (Di Domenico et al., 2021; Nekmat, 2020). Therefore, users tend to believe stories more if their source is highly credible (Bhattacharjee, 2022; Sterrett et al., 2019). Additionally, those who have greater trust in news sources on social media are more likely to engage with content that may be false or misleading (e.g., like, share or comment on the posts of friends and family members) (Morosoli et al., 2022). Di Domenico et al. (2021) found that sharing misinformation was reduced when the sharer had a weak interpersonal relationship with the receiver and that sharing fake news through a weak tie decreased trust in the news source and increased the perception of the intent to deceive. However, these effects were not observed when fake news was shared by a strong tie.

Interestingly, a survey recording the online behaviour of 3000 participants before and after the 2018 US midterm elections found that being exposed to fake news was associated with a decline in mainstream media trust and that fake news exposure was also associated with an overall increase in political trust and especially trust in congress and the justice system (Ognyanova et al., 2020). The study explained that given that Republicans have control over all branches of government, consuming predominantly right-leaning fake news content could boost confidence in political institutions. In fact, individuals who are already supportive of current political institutions tend to have even higher levels of political trust when they consume pro-government content. Supportive current political institutions tend to have even higher levels of political trust when they consume pro-government content.

2.5.4.2 Impact of Attitude on Acceptance and Sharing of Misinformation. Users' attitudes and beliefs play a role in accepting and spreading misinformation (Buchanan, 2020; Ecker et al., 2013; Morosoli et al., 2022; Susmann & Wegener, 2023; Taghipour & Soleymani, 2023). Ecker et al. (2013) performed two experiments to examine the influence of pre-existing attitudes² on the reliance on misinformation and the effectiveness of corrections and revealed that correcting misinformation may not completely reverse its impact on memory and reasoning, indicating that pre-existing attitudes affect the use of attitude-related information but not the effectiveness of corrections. The successfulness of corrections that oppose pre-existing attitudes relies on whether accepting them necessitates a change in underlying attitude (Ecker et al., 2013). Morosoli et al. (2022) surveyed six countries to explore the drivers of online misinformation dissemination and revealed that political orientation, personality traits and heavy social media use increase the likelihood of sharing misinformation and that individuals who use social media often tend to interact with posts

² Preexisting attitudes refer to beliefs, opinions or biases held before encountering new information (Ecker et al., 2014).

from their friends and family by liking, sharing or commenting on them. Confirmation bias is salient, as users are more likely to believe and spread information that is consistent with their beliefs (Buchanan, 2020; Kim & Dennis, 2019). Morosoli et al. (2022) showed that individuals tended to interact with posts related to topics that aligned with their pre-existing beliefs and those that held personal significance to them. This held true even when the information presented in the post was inaccurate or unverified. Furthermore, withdrawing from false beliefs can lead to discomfort, which may affect the persistence of belief and the use of misinformation, particularly when it agrees with pre-existing attitudes (Susmann & Wegener, 2023). Buchanan (2020) found that people who believed in misinformation and were aware of it were more likely to share it on social media.

2.5.4.3 The Impact of Background Factors on the Acceptance and Sharing Misinformation. Several background factors, including personality (Buchanan, 2020; Chen, 2016), gender (Buchanan, 2020; Filkuková et al., 2021), age (Buchanan, 2020; Taghipour & Soleymani, 2023), personality traits (Taghipour & Soleymani, 2023), education level (Buchanan, 2020; Filkuková et al., 2021), marital status (Taghipour & Soleymani, 2023), lack of media literacy (Taghipour & Soleymani, 2023), lack of health literacy (Taghipour & Soleymani, 2023), digital literacy (Buchanan, 2020), critical thinking skills (Taghipour & Soleymani, 2023) and cognitive load (Laato et al., 2020), play a role in the acceptance and spread of misinformation (Cinelli et al. 2020; Taghipour & Soleymani, 2023). Further investigation should concentrate on identifying the user groups that are most vulnerable to the spread of misinformation (Morosoli et al., 2022). For example, men and less educated individuals are most likely to engage with misinformation (Chadwick & Vaccari, 2019; Guess et al., 2019; Morosoli et al., 2022).

Users' contextual conditions, such as mental disorders and cognitive dissonance, are caused by critical conditions (Taghipour & Soleymani, 2023). Talwar et al. (2019) confirmed that online trust, self-disclosure, fear of missing out (FoMO) and social media fatigue were positively associated with sharing fake news (intentionally) (Talwar et al., 2019). A fast lifestyle also affects the acceptance and spread of misinformation (Taghipour & Soleymani, 2023). People are more likely to share unverified information online when they feel overwhelmed by it (information overload) (Laato et al., 2020).

News consumption also contributes to the acceptance of misinformation. Filkuková et al. (2021) confirmed that participants who endorsed misinformation tended to show lower news consumption, higher internet use and higher trust in information provided by social media (Filkuková et al., 2021). The use of media also contributes to the acceptance of misinformation. For example, Enders et al. (2023) examined the relationship between beliefs in conspiracy theories and the use of media and found that individuals who are targeted and obtain their news from social media expressed their beliefs in some types of conspiracy theories and misinformation (Enders et al., 2023).

2.4.4 Approaches to Misinformation Detection

Identifying misinformation is crucial in social media, where large volumes of information are quickly propagated from unverified sources or influencers (Qazvinian et al., 2011). Misinformation has some shared characteristics that can be used for prediction and detection, which are based on previous misinformation data, such as rumour misinformation, user profiles and diffusion patterns, using both supervised and unsupervised artificial

intelligence techniques (Derczynski et al., 2015). A misinformation detection system can identify uncertain posts in the early stages and warn users that the posted information could be false (Zhao et al., 2015). Many studies have been conducted on misinformation detection in social media, which can be categorised as one of two approaches: automatic ‘misinformation detection’ for known misinformation that was already identified (e.g., Castillo et al., 2011; Derczynski et al., 2015; Ghenai & Mejova, 2017; Gupta et al., 2013; Hamidian & Diab, 2015, 2016; Qazvinian et al., 2011; Seo et al., 2012; Sicilia et al., 2017; Takahashi & Igata, 2012; Zhao et al., 2015) and techniques for automatic ‘misinformation prediction’ of unknown misinformation that has not yet been identified (e.g., Ahmet et al., 2016; Tolosi et al., 2016; Zhao et al., 2015, 2016; Zubiaga et al., 2016b, 2018).

2.4.4.1 Predefined Misinformation Detection

The first approach to detection uses *a priori* knowledge on tweet topics by training the classifier³ with previous misinformation tweets, which is limited based on what has already been determined to be misinformation (Hamidian & Diab, 2015, 2016; Qazvinian et al., 2011; Sicilia et al., 2017). For example, the classifier trained to detect the misinformation ‘The coronavirus travels on 5G mobile networks’ will classify a new tweet such as ‘5G mobile networks caused coronavirus’ as being related to predefined misinformation but will not classify another such as ‘Apple working on adding 5G mobile networks feature to their new iPhone during coronavirus crisis’ because it is not related to a predefined rumour (Hamidian & Diab, 2015b, 2016 as cited in Zubiaga et al., 2018; Qazvinian et al., 2011). Castillo et al. (2011) used a J48 decision tree classifier⁴ to distinguish between credible and non-credible misinformation, relying on various factors, such as users’ tweets, posts, re-tweets and behaviour-based propagation features from citations to external sources. These sources included messages from the text of the posts and topic-based information. The classifier was tested with Twitter posts, and the outcomes demonstrated quantifiable variations in the way that Twitter posts were spread, which could be used to automatically identify misinformation as credible or not credible with precision and recall between 70 and 80%. Gupta et al. (2013) used a dataset that contained fake images that were spread during the Hurricane Sandy crisis to train a decision tree classifier that achieved 97% accuracy. However, they only used non-visual features, such as propagation patterns, URLs, tweet features and user features, explaining the high precision of their classifier to the similarity of many images. Ghenai and Mejova (2017) suggested a classifier to detect Zika virus rumours on Twitter by analysing over 13 million tweets related to Zika virus reports and using fact-checking websites and the WHO to identify misinformation. Topics related to misinformation were highly unpredictable, making it difficult to detect them. Researchers have found a way to use automated techniques to detect tweets that may contain rumours when the themes of dubious misinformation are identified. However, their classifier has limitations since it was

³ Assigning data into specific categories using an algorithm is called classification. This process identifies entities within a dataset and draws conclusions to label or define them. Commonly used classification algorithms include linear classifiers, SVM, decision trees, k-nearest neighbour and random forest. <https://www.ibm.com/topics/supervised-learning>

⁴ The J48 algorithm, which is also referred to as the C4.5 algorithm, is a well-known approach in machine learning that is utilized to examine both continuous and categorical data. <https://medium.com/@nilimakhanna1/j48-classification-c4-5-algorithm-in-a-nutshell-24c50d20658e>

trained with only a limited amount of misinformation data identified by non-social media websites.

2.4.4.2 Early Detection of Misinformation

The second approach for detecting misinformation uses new misinformation prediction, in which the classifier is trained with some generalizable patterns. For example, Zhao et al. (2015) presumed that shared information was linked to enquiring Twitter posts, which could be used to identify misinformation. In other words, misinformation would provoke Twitter posts from sceptical users who questioned the truthfulness of the information by sharing lexical expressions in posts, including ‘unconfirmed’, ‘really?’ or ‘not true’. These querying Twitter posts were then grouped by similarity to some groups that considered a rumour (Zhao et al., 2015, as cited in Zubiaga et al., 2018). However, this strategy may not generalise very well (Zhao et al., 2015, as cited in Ahmet et al., 2016), as indicated by Zubiaga et al. (2018), who evaluated the effectiveness of this approach in rumour detection.

Tolosi et al. (2016) studied a large dataset consisting of misinformation and non-misinformation tweets to monitor the Twitter stream and flag the most likely tweets to become misinformation using feature analysis with user ID, user profile, text style and URL domains as a basis for the prediction of rumours across breaking news story events. They found that the distribution of most features were specific to the event and that this bias affected the performance of the classifier, which achieved lower than expected, with an F1 measure around 65%. It is difficult to distinguish misinformation and non-misinformation, as features change dramatically across events (Tolosi et al., 2016, as cited in Ahmet et al., 2016). Tolosi et al. (2016) emphasised that models should be tested on datasets that cover various stories to ensure a more realistic evaluation. However, these results from the work-based approach on the tweet level were then adjusted by Zubiaga et al. (2016b), who demonstrated a more generalisable research-based approach using the context of the events (Zhao et al., 2016; Zubiaga et al., 2016b, as cited in Ahmet et al., 2016).

Zubiaga et al. (2016b, 2017) proposed an alternative approach to monitoring queried tweets, which was suggested by Zhao et al. (2015) and Tolosi et al. (2016). Zubiaga et al. (2016b, 2017) suggested using context learning during the event, arguing that not all misinformation requires enquiry, which can lead to low recall. Their hypothesis was that a single tweet may not provide enough context to determine whether it is misinformation (Zhao et al., 2015; Zubiaga et al., 2016b, 2017, as cited in Ahmet et al., 2016). They applied a Conditional Random Field (CRF) classifier that learns from the characteristics of sequential posts of tweets to determine whether a tweet post comprised a rumour during the event. The classifier identified every new tweet post, regardless of whether the tweet post was a rumour, depending on what had been learned and posted during that event (Zhao et al., 2015; Zubiaga et al., 2016b, 2017, as cited in Ahmet et al., 2016).

2.4.5 Network Analysis in Studying Misinformation

In times of crisis, it is difficult to determine what is happening on social platforms, such as Twitter, due to the significant concerns that emerge from misleading debates (Ahmed et al., 2020; Cinelli et al., 2020; Hooker, 2010; Jin et al., 2014; Starbird & Wilson, 2020). Several studies have provided valuable insights into how social dynamics within online communities contribute to the spread of misinformation within social groups (Bennett & Livingston, 2018; Guo & Vargo, 2020; Pasek et al., 2015; Shin et al., 2017, 2018; Southwell

& Thorson, 2015; Weeks, 2015; Zhen et al., 2023). The rapid spread of misinformation in online communities is driven by two social mechanisms: networked social influence involving biased information dissemination through user behaviour and strategic information manipulation by fake news sites and bots (Zhen et al., 2023). Networked social influence is driven by the norms and structures of social networks, which allow for the spread of biased information and even fake news through user behaviour, such as selective sharing and commenting (Hameleers & van der Meer, 2020; Vosoughi et al., 2018; Zhen et al., 2023). The ideological connections to misinformation sharing (Morales et al., 2023) and the polarisation impact of echo chambers (Bessi et al., 2015; Lazer et al., 2018; Zehmakan, 2021) emphasise the importance of understanding social network structures for effective intervention strategies (Pierri et al., 2020; Rao et al., 2022; Zhu et al., 2020). Strategic information manipulation is the intentional dissemination of false information via the use of fake news websites and bots using tactics, such as agenda-seeding (Bessi & Ferrara, 2016; Mejias & Vokuev, 2017; Zhen et al., 2023).

Bots play a significant role in the dissemination of misinformation and the shaping of public opinion (Bessi & Ferrara, 2016; Del Vicario et al., 2016; Ferrara, 2017; Milman, 2020; Wojcik et al., 2018). For example, Wojcik et al. (2018) found that 66% of links with misleading content were shared by bots. Campaigns have also been linked to the polarisation of public opinion and its formation, as retweeting accounts often contain extremist content (Lazer et al., 2018; Rao et al., 2022; Zehmakan, 2021).

Some studies have investigated potential ways to identify misleading and harmful content using systematic differences to identify networks that disseminate news and misleading content (Pierri et al., 2020). Social learning, which is the learning of information and skills by watching others, has been identified as one of the reasons for the spread of misinformation, but people who are sensitive to social rewards, who, for example, are aware of getting likes and retweets, play a role in combating misinformation (Aston, 2022). Despite the exciting trends that have been revealed in the network of misinformation dissemination, fact checking remains an important tool in combating misinformation (Shao et al., 2018).

A growing body of literature has focused on studying the spread of misinformation on Twitter during health crises (Ahmed et al., 2020a, 2020b; Jin et al., 2014; Starbird & Wilson, 2020). Ahmed et al. (2020a) conducted social network analysis of Twitter discussions related to 5G conspiracy theories during the COVID-19 crisis and found that users who voiced their opinions against conspiracy theories or users who shared humorous tweets inadvertently raised the topic's profile. In another study, Ahmed et al. (2020b) undertook a social network analysis of Twitter posts concerning one of the popular theories suggesting that the COVID-19 pandemic was a hoax and that many hospitals were in fact 'empty', identifying YouTube as the most common information source referred to by users and observing that ordinary citizens were the primary drivers of the spread of misinformation. Starbird (2017) focused on the spread of conspiracy theories during the mass shooting that occurred at the Sandy Hook School in 2012 and highlighted that users sharing conspiracy theories critiqued mainstream media by promoting alternative media to substantiate their arguments. Additionally, Jin et al. (2014) evaluated rumours and conspiracy theories on Twitter in the context of Ebola and developed a dynamic query expansion model to classify tweets using keywords and hashtags. The study identified several conspiracy theories and rumours, such as that snakes are linked

to the origin of the Ebola epidemic and that the iPhone 6 was contaminated and infecting people with the Ebola virus. However, this study did not reflect the intentions of the users, whether they were posted to create controversy or whether the user believed the rumour. Ahmed (2018) argued that critical insight could be obtained by incorporating a more qualitative approach in which tweets were classified as a rumour, humorous or a feature of the online world that made users engage with this content.

A growing body of literature has focused on understanding how discussions about health misinformation unfold, often from differing viewpoints. For instance, Starbird and Wilson (2020) conducted an interpretative analysis to highlight how disinformation campaigns unfolded on Twitter against the White Helmets group and mapped the structure of the Twitter conversation around White Helmets, identifying both pro-White Helmets and anti-White Helmets clusters. Their analysis of Twitter data revealed significantly more content challenging the White Helmets than content supporting them through the consistent and complimentary use of social media platforms or ‘alternative’ news websites. However, this study’s main limitation was that it only covered an English-speaking audience, as Arabic tweets should be regarded as the primary source of tweet data based on its selected case ‘White Helmets’. Additionally, Ahmed (2018) examined networks and discussions related to medical abortion procedures on Twitter and found that two main groups emerged in these conversions: pro-abortion and anti-abortion. In another study, Ahmed et al. (2020) conducted a social network analysis study of Twitter conversations to identify the key themes related to e-cigarette safety, and the resulting network graph highlighted influential users discussing the topic, with several groups emerging. The discussions within these groups centred on two key topics, pro-vaping and anti-vaping views, although Twitter users were uncertain about the accuracy of the information they discussed (Ahmed et al., 2020). However, the study had limitations in that it was unable to encompass all tweets related to the topic and examined only tweets in English. Arguably, a more comprehensive approach with a wider range of data would have been more valuable.

Table 1 Summary of Key Findings from the Literature Review

Section	Key Findings
Preferred Information Sources	• People rely on institutions such as health organizations, media, family and friends, social networks to obtain information about infectious diseases like COVID-19. • Different institutional sources appear to be the most reliable, and social networks are the least reliable due to a disposed to of misinformation. • There has been a fall in the level of trust in the mainstream media, while alternative news media have been seen as biased (Ali, 2020; Fridman, 2020; Soroya, 2021)

Twitter as a Source of Information	• Twitter is widely recognized for providing real-time coverage of events, especially during periods of crisis however, the nature of the platform makes it difficult to in verifying its facts. • There exists an abundance of misinformation and a significant portion of the population disseminates it unintentionally, due to cognitive biases (Ecker et al., 2013; Morosoli et al., 2022). • Twitter supplies people with information that may not be found on other forms of media but comes at the risk of people being misinformed at a fast rate (Oh et al., 2013; Starbird et al., 2014; Veil et al., 2011).
Misinformation and Its Spread	• Misinformation is propagated because of factors such as connection motives, sense-making, anti-science, political agendas, cognitive biases, and features of social media networking sites (Ecker et al., 2013; Ghani et al., 2015; Lewandowsky et al., 2017; Starbird, 2020; Morosoli et al., 2022). Some social media structural elements such as the forward feature in WhatsApp and the discussion panels in Reddit help spread misinformation (Kou et al., 2017; Hern, 2020) • Misinformation travels far faster than the truth which can have detrimental consequences in times of health crises(Tyagi et al., 2019; Wang et al., 2019; Sharma et al., 2017).
Acceptance and Sharing of Misinformation	• There is a variety of factors which include the information sources used by the users, attitudes, beliefs, the personality traits, and education level which can escalate the rate in which people accept and propagate misinformation. • It is reported that social media contributes greatly in the dissemination of misinformation as users share content which they believe to be true regardless of the fact that it may not be true. • The causes of this behavior may be the combination of selective exposure to certain type of individuals, echo chambers, or network effects of similar ideology or polarization (Buchanan, 2020; Filkuková et al., 2021; Taghipour & Soleymani, 2023).
Misinformation Detection	

	• There are two types of detection methods namely predefined misinformation detection and the use pattern recognition systems to detect already known misinformation. However, problems or challenges still arise because there is the inconsistency or variability of a particular type of misinformation regarding context and content and detection techniques used also perform differently depending on the sort or type of platform and content of information. (Hamidian & Diab, 2015; Zubiaga et al., 2018; Tolosi et al., 2016).
Network Analysis of Misinformation	• Social factors within online communities, for example, network social influence or the intentionally organized by bots and fake news sites which might lead to further dissemination of misinformation. Echo and agenda posing techniques also increase the rate of misinformation spreading. • Because of the various network forms, the understanding of these networks is fundamental for the development of appropriate countermeasures against misinformation spread over social media platforms(Bessi & Ferrara, 2016; Jin et al., 2014; Starbird, 2017; Ahmed et al., 2020).

2.4.2 Literature Gaps

The literature on misinformation is extensive, but there are some notable gaps.

1. While there has been considerable research on detecting misinformation and fake news (e.g., Ghenai & Mejova, 2017; Hamidian & Diab, 2015, 2016; Lukasik et al., 2016; Sicilia et al., 2017; Zhao et al., 2015; Zubiaga et al., 2018), strategies to counter misinformation, channels through which individuals encounter misinformation (e.g., Blank et al., 2013; Gabbert et al., 2004; Sanderson & Ecker, 2020; Schreiber & Sergent, 1998), and outlets contributing to its spread (e.g., Sadiku et al., 2018), the literature lacks in-depth investigations into how individuals specifically engage with and react to misinformation on social media.
2. There is a need to understand how the attitudes, beliefs and backgrounds of individuals influence their reactions to misinformation during health emergencies, such as the COVID-19 pandemic.
3. Despite some studies focusing on the factors that influence people's responses to misinformation, such as the effect of memory, cognitive biases and retrospective warnings (Freeze et al., 2021; Mayo, 2019; Sanderson & Ecker, 2020), there is a need for a deeper exploration of other factors and how they influence people's reactions to misinformation.
4. While many studies have examined networks on social media from various perspectives, there is a need to investigate the social networks that emerge from users' interactions with misinformation and understand what factors help spread the misinformation. This would involve a social media platform to develop interventions

that help prevent the spread of misinformation.

Addressing these gaps would provide valuable insights into the intricacies of shaping individuals' reactions to misinformation and inform more targeted interventions to promote accurate information consumption in an era in which online encounters with misinformation often go unchallenged (Gurgu et al., 2023).

2.4.3 Summary

This literature review provides an understanding of previous studies focusing on addressing the issue of misinformation during health crises such as COVID-19. Regarding information gathering, the general opinion is that health institutions and other traditional forms of media are more reliable; emerging forms of media, notably Twitter, create limitations in terms of reliability and credibility. Despite the fact that Twitter allows users to access events in real time, the platform structure often facilitates the adverse dissemination of misinformation. Many issues can be cited in the wave of misinformation, including social network structure, human cognitive biases, etc. The characteristics of the users play an essential role, further augmented by the existence of echo chambers. New schemes of AI and other means that are being utilized today to detect misinformation also struggle due to the multisidedness of misinformation. The review also highlights some unanswered questions in the existing literature, including those regarding user interaction with misinformation and social networks responsible for misinformation dissemination. In any case, it concludes by calling for additional studies to understand how individuals handle misinformation, which is needed to develop effective strategies.

Chapter 3: Research Methodology and Research Design

3.1 Chapter Overview

To address the gaps identified in the previous chapter, two studies were conducted: a questionnaire study of the public and a Twitter study. The data were analysed using both statistical and thematic analyses. Chapter 3 describes the design adopted for this research to achieve the aims and objectives stated in section 1.5. This chapter also articulates the dominant research philosophy of pragmatism, discusses the implemented methodology, justifies the choice of mixed methods and explains why this strategy was deemed appropriate. This chapter outlines the study's research design and discusses the data collection procedures and how the data were analysed. Finally, the chapter reports the findings of the participant profiles from the questionnaire study.

3.2 Philosophical Paradigm and Methodology

3.2.1 Research Philosophy

Positivism, interpretivism and pragmatism are three of the philosophical approaches guiding social science research, with each offering distinct perspectives of reality, the researcher's role and research methods (Barzegar & Oriti, 2022; Ikram & Kenayathulla, 2022). Positivism employs scientific methods to study objective reality, emphasising empirical observation, identifying general laws governing human behaviour and using quantitative methods for statistical analysis (Caldwell, 2015; Karupiah, 2022; Park et al., 2020). Interpretivism highlights the subjective and complex nature of social reality, valuing the meanings people attach to their experiences and employing qualitative methods to explore subjective experiences and meanings in context (Goldkuhl, 2012; Potrac et al., 2014; Thanh & Thanh, 2015). Pragmatism emphasises practical outcomes and flexibility in understanding the world, addressing real-world problems and employing a mix of qualitative and quantitative methods based on context, with an emphasis on practical solutions (James, 2020; Legg & Hookway, 2008; Shields, 1998). **Table 2** shows the selected research dimensions.

Table 2 Overview of the Research Dimensions

<u>Research Dimension</u>	<u>Selected Research Dimension</u>
Research Philosophy	Pragmatism
Research Methodology	Mixed Methods
Methodology Design	Exploratory Sequential Design
Data Source	A survey and Twitter are used as the primary data sources

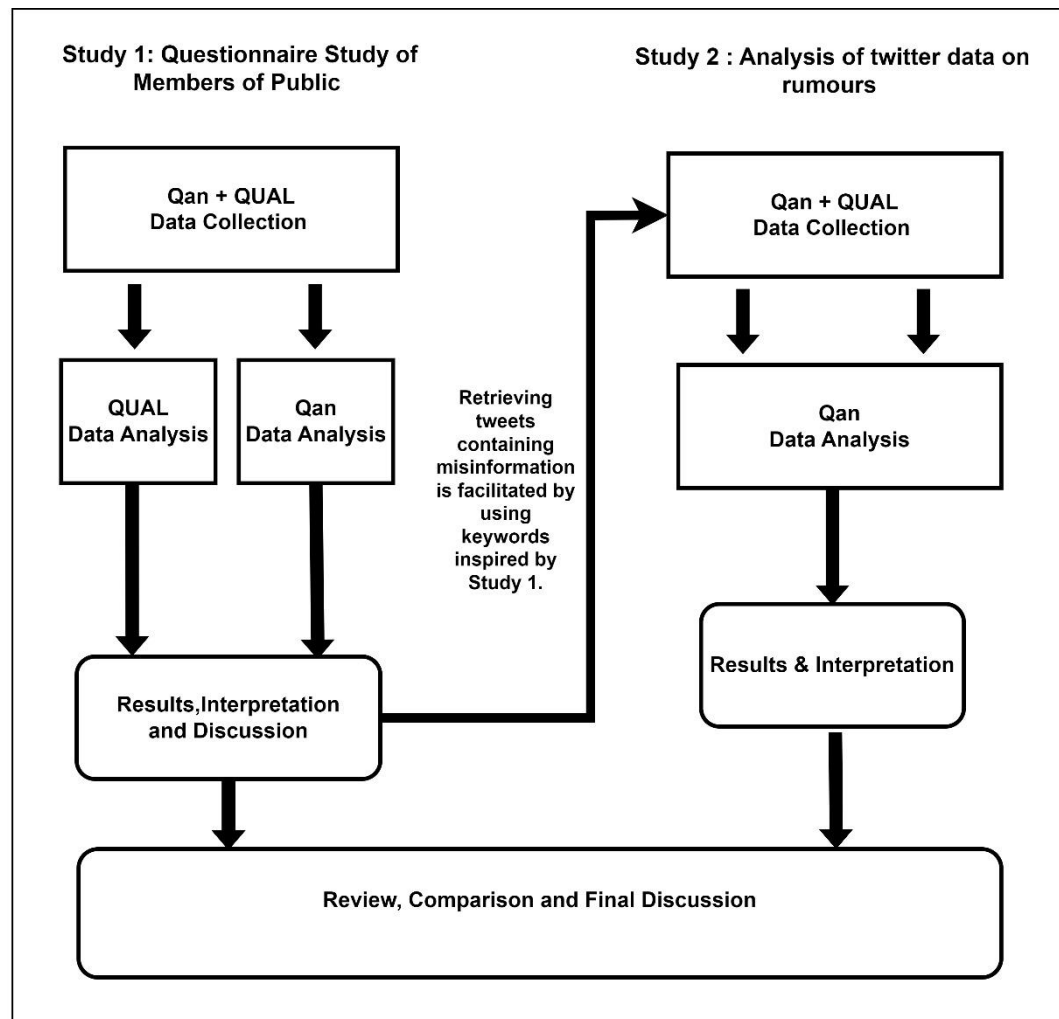
3.2.1.1 Chosen Philosophy and Rationale. This thesis adopts a pragmatic philosophy, which takes a deconstructive approach, recommending the use of qualitative, quantitative or mixed methods based on the research question (Gobo, 2023; Johnson & Onwuegbuzi, 2007). Pragmatism aims to bridge the gap between positivism and interpretivism by sidestepping contentious issues of truth and reality (Feilzer, 2010, p. 8). It focuses “on ‘what works’ as the truth regarding the study questions under investigation” (Tashakkori & Teddlie, 2003b, p. 713).

3.2.1.2 Mixed Methods. The chosen approach is a mixed method that integrates perspectives and concepts from qualitative and quantitative methodologies to address the research question (Johnson & Onwuegbuzie, 2004, 2007; Morgan, 2007; Onwuegbuzie, 2002; Tashakkori & Teddlie, 1998). Many social scientists recommend the adoption of pragmatic philosophy and the application of mixed methodologies (e.g., Johnson & Onwuegbuzie, 2004; Morgan, 2007; Onwuegbuzie, 2002; Tashakkori & Teddlie, 1998), as it enhances the depth of research knowledge of the phenomena and provides high confidence in the validity of the results (Bouchard, 1976; Greene et al., 1989; Tashakkori & Teddlie, 2003, 2010). The mixed method enables a comprehensive picture to be obtained by combining qualitative and quantitative benefits into one design (Bban, 2008; Lopez-Fernandez & Molina-Azorin, 2010).

3.2.2 Research Design

Exploratory sequential design was used to understand all aspects of the problem, quantitatively and qualitatively (Bban 2008; Creswell, 2003). In an exploratory sequential design, the researcher begins by collecting and analysing qualitative data; then, the insights are used to inform the collection of subsequent quantitative data (Onwuegbuzie et al., 2010).

Figure 3 shows the adopted Exploratory Sequential Design, which included two primary studies, each utilising different types of data, a questionnaire and Twitter data. **Table 3** shows the sequence of steps and tools used in this study, including Amazon Mechanical Truck (MTruck), SPSP, NVivo and NodeXL Pro.

Figure 3 *The Adopted Exploratory Sequential Design*

Source: modified from Creswell and Plano Clark (2011)

Table 3 *Overview of the Research Techniques and Tools*

Sequence	Research Technique	Tools
Study 1		
1	Questionnaire design	Google Forms ⁵
2	Data collection	Google Forms
3	Data preparation	Microsoft Excel & SPSS
4	Thematic analysis (Open-ended questions)	NVivo
5	Creating words clouds	Python wordcloud library
6	Statistical data analysis	SPSS

⁵ <https://www.google.com/intl/en-GB/forms/about/>

Study 2		
7	Retrieve Twitter data	NodeXL Pro ⁶
8	Network analysis	NodeXL Pro
9	Creating words clouds	Python wordcloud library
10	Topic modelling	Python: Latent Dirichlet Allocation (LDA)

3.3 Study 1: Questionnaire Study of the Public

3.3.1 Questionnaire Design

The questionnaire designed for the survey of members of the public contained several sections aimed at collecting different types of information, as shown in **Table 4**.

Table 4 *Overview of the Sources of the Questionnaires Used to Create the Sections*

No	Section	Subsection	Sources in the literature
1	Background Factors	(e.g., Age, Education, Employment status, Location)	(e.g., Ajzen, 2005; Buchanan, 2020; Filkuková et al., 2021; Taghipour & Soleymani, 2023)
		Information (Experience)	(e.g., Ajzen, 2005; Landau, 2007; Freiling, 2019).
2	Source Factors	Trustworthiness	(e.g., Janis & Hovland, 1959; Fallis, 2004; Mendoza et al., 2010; Edgerly et al., 2020; Bhattacharjee, 2022; Sterrett et al., 2019)
3	Attitude	Attitude towards Social Media	(e.g., Ajzen, 2005; Buchanan, 2020; Ecker et al., 2013; Morosoli et al., 2022; Susmann & Wegener, 2023; Taghipour & Soleymani, 2023)
4	Observable Communication Effect (Actual Behaviour)	(e.g., Authentication, Reactions, Agreement)	(Ajzen, 2005; Janis & Hovland, 1959; Lupia, 2013; Mendoza et al., 2010; Starbird et al., 2014; Buchanan, 2020; Ecker et al., 2013; Nekmat, 2020; Morosoli et al., 2022;

⁶ <https://nodexl.com/>

			Susmann & Wegener, 2023; Taghipour & Soleymani, 2023; Taghipour & Soleymani, 2023)

Google Forms was used to create the questionnaire and collect responses from participants. The questionnaire was organised into the following seven sections (Appendix REF):

3.3.1.1 Section 1: Demographics - Understanding Participants. This section included three demographic questions about participant age (age group), education level and employment status to provide a greater understanding of the participants. Additionally, two questions asked the participants about their preferred online information sources for general information and news about COVID-19.

3.3.1.2 Section 2: Social Media Consumption and Use. This section aimed to gather five principal types of data: (a) the comfort level of participants in relation to social media platforms as information sources; (b) their preferred social media platforms for obtaining information about the COVID-19 pandemic (e.g., Twitter, WhatsApp and Facebook); (c) how often participants encounter content on social media that they believe is misinformation; and (d) how they judge the credibility of information derived from social media platforms (open-ended question).

3.3.1.3 Section 3: Information Sources and Information Credibility. This section included two open-ended questions aimed at identifying the five most preferred sources for information about COVID-19 and what aspects participants consider to be credible and trustworthy information.

3.3.1.4 Section 4: Social Media Trustworthiness. The questions in this section aimed to determine how the participants feel about: (a) the trustworthiness of the information on their preferred social media platforms, (b) the capability of their preferred social media platforms to help them respond to the COVID-19 health crisis, and (c) the steps taken by their usual social media platform to counter misinformation or share misinformation. This section also attempted to (d) determine how participants verify information to ensure that it is trustworthy and credible.

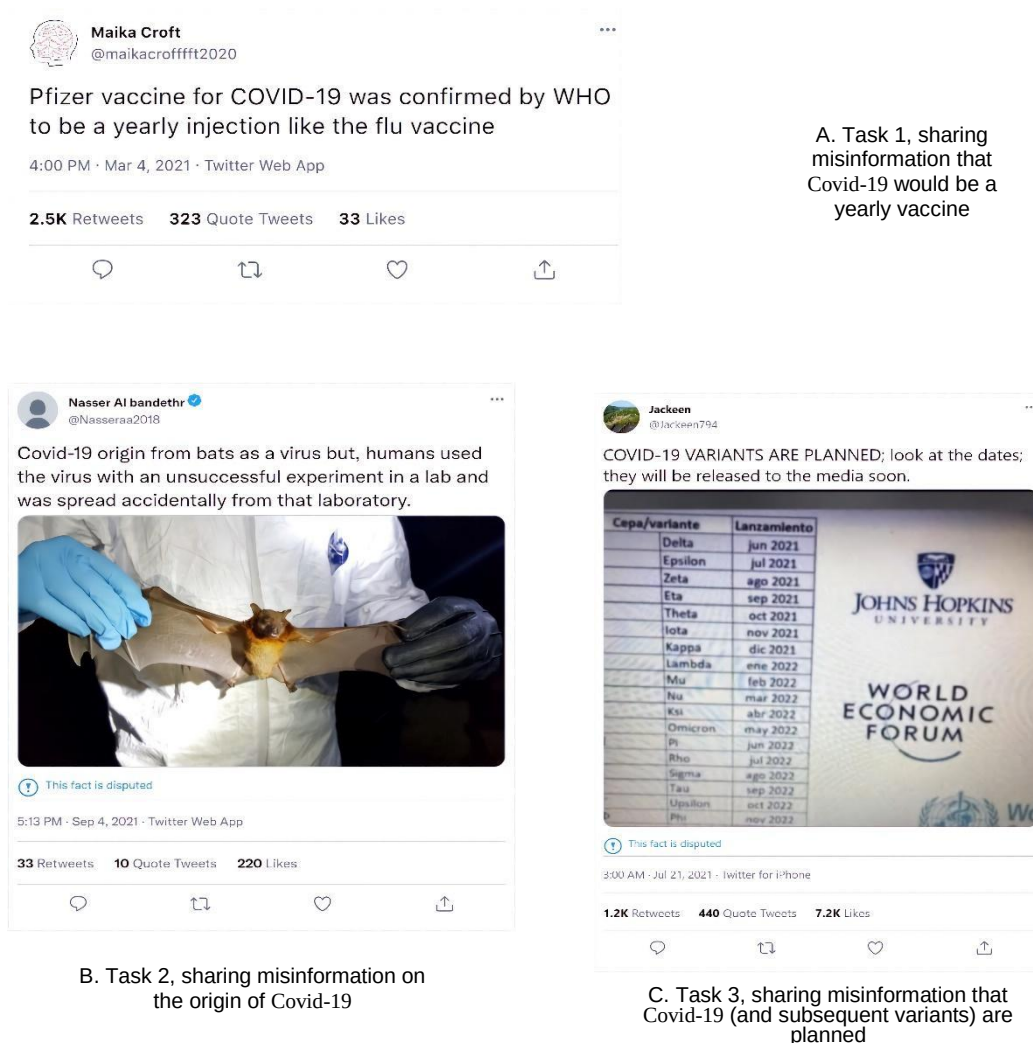
3.3.1.5 Section 5: Understanding Generic Reactions to Misinformation. Participants were presented with a set of possible (generic) reactions (such as reporting to a social media platform, blocking users, ignoring the post) if they were to encounter information on their preferred social media platform that they believed to be misinformation. An open-ended option was also provided to capture any reaction that had not been envisaged by the researchers. Participants were asked open-ended questions with a series of different scenarios on how they would react if the misinformation were shared by a friend, their manager or supervisor, or a trusted source.

3.3.1.6 Section 6: Reactions to Misinformation. This section aimed to determine how participants might react if they read something on their favourite social media platform that they believed to be misinformation by exhibiting a defined behaviour in response. Participants were asked open-ended questions with a series of different situations, including

(a) reading a shared misinformation tweet by a friend; (b) reading a shared misinformation tweet by a manager or supervisor; and (c) reading a shared misinformation tweet from a trusted source. Participants were given the option to explain their reactions if they were not listed in the available options via an appended open-ended response.

3.3.1.7 Section 7: Scenario-Based Behavioural Tasks. In this section, a set of three synthetic tweets (based on real tweets) were provided for the participants that included misinformation. The participants had three minutes to investigate (by researching the topic) these posts and were asked to agree/disagree with the fact shared on Twitter. They were then invited to outline the sources they relied on to reach their decision. A further question was designed to understand how participants might react to the tweet with a set of common reactions (and an open-ended ‘other’ category to capture any reaction that was not listed). Finally, participants were asked to share their experiences of combating misinformation on social media. The available reaction options provided were the same as in Section 2 to allow for cross-sectional comparison. The topics of misinformation were chosen to highlight contemporary COVID-19 misinformation topics at the time of the questionnaire’s design in early 2020. Although other misinformation topics, such as the link between COVID-19 and 5G, were popular, this study was limited to the following three topics: vaccines, COVID-19’s origin and COVID-19 variants. This decision was based on the importance, relevance and timeliness of these topics. Vaccine hesitancy was a concern for global health at the time and a much-discussed topic in the media. The origin of the COVID-19 virus was a persistent topic of misinformation, generating many conspiracy theories, including the one selected. Concerns about variants were also a controversial topic, generating several theories and making it an interesting topic to explore. **Figure 3** presents the three posts (tweets) that were synthetically created to elicit participant reactions if they were to encounter them on their preferred social media platforms.

Figure 3 *Behavioural Tasks to Understand How Participants Would React to a Simulated Tweet Sharing Misinformation. Usernames and Twitter Reactions Are Fictitious, While the Tweet Text and Media Were Influenced by Real Tweets*



3.3.2 Data Collection

This study relied on a questionnaire-based survey design using Google Forms⁷, with data analysis conducted via both quantitative statistical and thematic analyses. At the start of the questionnaire, participants were provided with information about the research aims and

⁷ Google Forms is a free, easy-to-use cloud-based survey creation tool from Google. This tool was chosen for several reasons, including its ability to collect over 1000 responses, which was a crucial requirement for this study. Furthermore, Google Forms allows endless questions and unlimited answers, and many related studies have used Google Forms (e.g., Al-Naam et al., 2022; Dzieciolowska et al., 2021; Joseph, 2021).

how their data would be used and managed. This information was designed to enable participants to decide whether they wished to proceed with the questionnaire. Additional information was available on an appended information sheet.

3.3.2.1 MTurk Recruitment. To ensure high participation, the crowdsourcing website MTurk⁸ was used to deliver the questionnaire, which was designed to determine how social media users perceive misinformation. The MTurk Survey Link template was created to deliver the questionnaire and direct workers to the survey, targeting MTurk users from English-speaking countries⁹. Google Forms was used to create the questionnaire and collect participant responses. To manage the results of surveys on Google Forms, workers were asked to provide their Worker IDs at the end of the survey to match them up with the IDs in the human intelligence task (HIT) in the reviewing stage for data quality.

The survey was created as a microtask in the MTurk platform, with each participant rewarded \$2.04 in return for their contribution. On average, it took 20 minutes for participants to fill out the form. The payment for their participation was calculated in accordance with previous studies (Cunningham et al., 2017; Thorson, 2016).

3.3.2.2 MTurk Micro Task. The MTurk microtask was created to accept 1155 responses to garner at least 385 responses, allowing for non-completion, poor quality input (e.g., “Ok” and “good”) and withdrawn consent based on the target population of 360 million English speakers worldwide at a 95% confidence level and a 5% margin of error (Szmigiera, 2021). Participants in MTurk responded to a set of initial questions designed to ensure that they satisfied the inclusion criteria required for participation in the study. Only those participants that met these criteria could commence with the survey tasks. The inclusion criteria for participants were as follows:

- a. English-speaking;
- b. Aged 18 years or over;
- c. Number of HITs approved must be greater than 100¹⁰;
- d. HIT approval rate (%) for all requesters’ HITs must be greater than 90%¹¹.

The high approval rate is important because MTurk workers on platforms may lack the necessary expertise to assess options accurately (Procaccia & Shah, 2015). In addition, their incentives may not align with requesters, leading to biased or unreliable responses (Shah &

⁸ To ensure high participation, the MTurk platform, as one of the best-known online crowdsourcing platforms on the marketplace, was selected. It was used to recruit participants to perform micro-tasks referred to as human intelligence tasks (HITs) in exchange for a small fee or ‘reward’ (Buhrmester et al., 2011). While many other crowdsourcing platforms are available, this study focused on MTurk for questionnaire delivery because it is a reliable source for social science research (Bor et al., 2020; Roitero et al., 2020; Williams Kirkpatrick, 2021) and facilitates the rapid recruitment of multiple participants (Paolacci et al., 2010). Additionally, researchers can define participation criteria, such as only recruiting participants from English-speaking countries or participants who have high approval ratings.

⁹ Our MTurk survey was open to participants from the following countries (based on English being the primary language in these countries: Antigua and Barbuda, Australia, The Bahamas, Barbados, Belize, Canada, Dominica, Grenada, Guyana, Ireland, Jamaica, Malta, New Zealand, St. Lucia, St Vincent and the Grenadines, Trinidad and Tobago, the United Kingdom, and the United States of America

¹⁰ A high number of HITs approved (100) indicates that the participant has considerable experience and validation of their work quality by HIT requesters.

¹¹ A high approval rate indicates that the participant has made consistently high quality contributions to the platform.

Zhou, 2020). Therefore, MTurk was adjusted with an HIT approval rate (%) of greater than 90% because participants with higher approval rates are believed to generate better quality data and exhibit higher engagement behaviours (Kumar et al., 2023; Procaccia & Shah, 2015). A 90% HIT approval rate was selected after reviewing recent studies to ensure high-quality responses and engagement (e.g., Alceste et al., 2021; Choi et al., 2022; Gao et al., 2018; Jones et al., 2019). The total number of responses for the questionnaire was 1573, of which 1014 were accepted after discounting poor quality responses, withdrawn consent and duplicate responses from the same worker. The quality was assessed via their open-ended responses and their response to a set of three questions.

3.3.3 Data Cleaning

After the participants' responses were collected, a data cleaning and validation process was conducted in order to maintain the validity and relevance of the data that would be utilized in analysis. The following steps were taken to clean and refine the dataset:

1- Screening for Incomplete Responses: In the first place, the responses were examined in terms of completeness. Any participant who failed to respond some of the basic questions or quit the survey at any point in time was removed from the dataset. This assisted in ensuring that the analysts retrieved for analysis those participants that made their shots in full.

2- Identification of Invalid Responses: Where responses are so different in nature that they have no connection with the participants. Most of these included:

Response Patterns: When a respondent answers all Likert scale questions the same, when demonstrating a significant speed in completing a questionnaire which indicates that he or she did not care for the survey, etc. All Response Patterns that were suspected to fit this scenario were rated as invalid and were not recruited into the data set.

Off-Topic Responses: In the case of open-ended responses, entries were scrutinized for any connection to the purpose of the survey. Nonetheless, if responses were completely off the-topic like irrelevant remarks, meaningless phrases, answer which did not fit the question, these were discarded. For instance, if a participant answered a question about Covid-19 misinformation with a response that had nothing to do with the topic, the answer was treated as irrelevant and removed.

• **Spam Responses:** Any responses seeming to be spam or automated, like repeated ranting of certain keywords or advertising unrelated to the survey, were omitted from the dataset.

3- Final Review: After these steps, the researcher systematically examined all the responses so that only the meaningful, whole and on topic answers would be presented. The purged data was later on cleared for all future research.

This set of procedures allowed contingency for the reliability and quality of data used for the study to lower the chances for biased or invalid conclusions.

3.3.4 Data Preparation

After being exported from MTurk into a spreadsheet, the responses were cleaned by removing those that were invalid, such as those with invalid characters or off-topic responses, using Microsoft Excel. The close-ended responses were imported into IBM SPSS Statistics 28.0, while the open-ended responses were imported into NVivo. To prepare the close-ended responses, each Likert scale response was allocated a numeric value based on the following five-point coded scale: “Extremely likely”, “Likely”, “Neither likely/unlikely”, “Unlikely” and “Extremely unlikely” with the codes for responses being 0, 1, 2, 3 and 4, respectively. Responses to the behavioural experiments ranging from “I definitely disagree” to “I definitely agree” were coded with values from 0 to 4. Additionally, multiple choice responses, such as “checked boxes”, were divided into close-ended questions with “yes” or “no” responses. Each response value of a “yes” or “no” question was recorded as 0 or 1, respectively. The open-ended responses were prepared by converting the Listed Top 5 online sources, Friend Scenario, Supervisor or Manager Scenario, and Trusted Scenario into close-ended questions with “yes” or “no” responses. Each response value of a “yes” or “no” question was recorded as 0 or 1, respectively.

3.3.5 Data Analysis

3.3.5.1 Systematic Approach to Survey Data Analysis

In analyzing the survey results presented in Section 4.7, a systematic and structured approach was employed to ensure the reliability and validity of the findings.

Quantitative Analysis (Close-Ended Responses)

Responses to close-ended survey questions were quantitatively analyzed using the IBM SPSS software. Measures of descriptive statistics of frequencies and percentages were computed to summarize the results succinctly. Furthermore, chi-square tests of independence were performed to evaluate the relationships between categorical variables with the level of significance fixed at $p < 0.05$. This approach allowed to determine the statistically significant associations of the variables of interest that were consistent with the research questions and hypotheses ensuring to investigate and address the important trends and patterns in the research data.

Qualitative Analysis (Open-Ended Responses)

Thematic analysis was conducted on the open-ended survey responses using NVivo Software. Open-ended responses were coded by a researcher, deterministically and inductively in the absence of a preset framework, as recommended by Lincoln and Guba (1985) and Elo et al. (2014). The procedure included looking for significant phrases within the texts, assigning such to appropriate topics, and studying the peculiarities of the responses to identify any similarities and differences. Due to this painstaking process, the qualitative data were analyzed in a predictable manner, thus allowing for further understanding of participants’ perceptions on the issue of misinformation. The research supervisors also went through the

coding output in order to check the performance of the interpretations with regards to the research objectives.

This systematic approach allowed to integrate both quantitative and qualitative methodologies thus ensured a comprehensive analysis of the survey data, providing robust conclusions that align with the study's research objectives.

3.3.5.2 Answering the Research Questions (RQs)

In the previous chapter, there was integration of both qualitative and quantitative approaches in order to holistically respond to the research questions which were formulated at the beginning of the study. This understanding of data allowed for the consideration of all the findings:

Quantitative Results:

Statistical analysis of the data was carried out using IBM SPSS¹². In order to provide additional evidence concerning the patterns of false information engagement and user behavior, statistical analysis of the frequency distributions and chi square tests involving the closed-ended survey was carried out with a p-value of less than 0.05 considered significant. These results contributed towards some aspects of RQ1 and RQ2 by elaborating how demographic factors and social media use influenced the response to misinformation.

Qualitative Results:

The qualitative data analysis software, NVivo13, was used to evaluate the responses to the open-ended questions, which were manually coded. In the coding process, text fragments were selected, coded and interpreted by a human coder to capture the latent meaning of the text. The coder (in this case, the researcher) created and applied the concept categories from the text fragments without a theory-based categorisation matrix, in accordance with Lincoln and Guba (1985) and Elo et al. (2014). Additionally, the coder continued the grouping to identify any similarities or differences between the concept categories (Elo et al., 2014). The concept categories were generated objectively using ordinary, accurate and concrete language, with the resultant formulations being as brief as possible, following Popping (2015). Subsequently, the coder assigned themes to the text fragments to enable the research

¹² SPSS was selected for its excellence in helping researchers analyse quantitative data with accurate graphical representation. SPSS also features an excellent user interface and a complete statistical package, allowing researchers to investigate the relationships between variables critically. SPSS's Data Transformation feature was used to transform data during preparation both before and during the analysis when necessary. SPSS was used to analyse close-ended questions. The complete questionnaire answers have been included as a CSV file in SPSS, making the data ready for analysis.

¹³ Nvivo was used to analyse the open-ended questionnaire responses. NVivo was chosen to for its extraordinary ability to manage the classification of unstructured text and the ability to modify it with ease. Additionally, NVivo was useful for visualising the data, as it was used to create a word cloud of the words most frequently used by participants. Using NVivo also enabled the export of all codes and themes to an Excel file, which could then be entered into SPSS to calculate the percentage and number of participants for each code and theme.

questions to be-addressed. The results were then reviewed by the research supervisors to determine whether the results were accurate according to their experiences (Elo et al., 2014).

The themes identified through manual coding helped explain the reasoning behind the patterns observed in the quantitative data, further addressing the research questions by revealing user sentiments and experiences that could not be captured through numerical data alone.

Merging Quantitative and Qualitative Insights:

By merging quantitative and qualitative insights, the study was able to answer the research questions. The quantitative data provided insights related to larger patterns and important associations, the qualitative data provided detail insights to quantitative findings that enhanced the overall conclusion. For instance, while demographic analysis through statistical results was able to determine what demographic factors influencing users to engage with misinformation, thematic analysis helped explain the emotional dynamics and cognitive perspectives that drove users to engage in such behavior. When combined, these results gave a more comprehensive understanding of how users behaved to misinformation during the COVID-19 pandemic.

This integrated approach ensured that the research questions were not only answered statistically but also enhanced by an interpretation, reading, of the collected data thus providing the study with a holistic conclusion.

3.3.6 Hypothesis Development

This study's hypotheses are informed by multiple psychological theories to capture the complex nature of misinformation processing and response. **Motivated Reasoning** and **Confirmation Bias** theories explain how individuals favor information aligning with preexisting beliefs, which is crucial for hypotheses on news sources and political biases. However, because reactions to misinformation also depend heavily on the source's perceived trustworthiness, **Source Credibility Theory** is included to explore how trusted sources, such as government agencies, affect misinformation acceptance.

In addition, misinformation can create psychological discomfort when it conflicts with personal beliefs, which is where **Cognitive Dissonance Theory** helps explain varied reactions based on individuals' backgrounds. Finally, **Dual Process Theory** is applied to capture differences in cognitive styles—analytical versus intuitive—that influence one's ability to detect misinformation. Using multiple theories provides a robust, multidimensional framework to understand the distinct but interrelated factors shaping how people engage with misinformation.

1. Motivated Reasoning Theory / Confirmation Bias Theory

3.3.6.1 Impact of Information Sources on Reactions to Misinformation. The three hypotheses listed in Table 5 are developed based on the *theories* including

Motivated Reasoning Theory¹⁴, Confirmation Bias Theory¹⁵ and Source Credibility Theory¹⁶.

Table 5 *Hypotheses About How Information Sources Impact Reactions to Misinformation*

Developed Hypotheses	Relationship Evidence	Theory
H1: Individuals' reactions to misinformation depends on their preferred sources for news and information. H1.1–H1.52: Individuals who preferred (government sources public health agencies conservative/lean republican democrats/lean liberal) will be more likely to (share report block users request more information). Please see Appendix A1 - list of hypotheses for more details	Previous studies indicate some relationships between information sources and reactions to misinformation (e.g., Bhattacharjee, 2022; Buchanan, 2020; Di Domenico et al., 2021; Edgerly et al., 2020; Enders et al., 2023; Filkuková et al., 2021; Nekmat, 2020; Sterrett et al., 2019; Taghipour & Soleymani, 2023). Descriptive results also indicate the impact of preference for types of information sources on identifying and reactions to	Motivated Reasoning Theory, Confirmation Bias Theory and Source Credibility Theory
H2: Individuals' agreement with misinformation posts		Source Credibility Theory

¹⁴ Motivated Reasoning Theory posits that individuals process information in a biased manner, favoring conclusions that align with their pre-existing beliefs and desires. This leads people to accept misinformation that supports their views and reject information that contradicts them. Motivated Reasoning Theory supports the idea that individuals are more likely to accept and share misinformation if it aligns with their existing political or ideological beliefs, leading to varied reactions depending on their preferred news sources.

¹⁵ Confirmation Bias refers to the tendency to seek out, interpret, and remember information that confirms one's pre-existing beliefs while ignoring or discounting contradictory evidence. This bias reinforces existing views and can lead to selective exposure. Confirmation Bias supports the idea that individuals will react to misinformation based on how well it aligns with their existing beliefs. Those who trust government sources may reject misinformation more readily, while those aligned with partisan sources may accept it without scrutiny.

¹⁶ Source Credibility Theory posits that the perceived credibility of a source, determined by its expertise, trustworthiness, and attractiveness, heavily influences how the audience perceives and acts upon the information provided by that source. This theory explains why individuals who view government or authoritative sources as credible are more likely to reject misinformation and take corrective actions. It also underpins why people might believe misinformation if it comes from a source they consider credible

depends on the information sources that they rely on to verify information that they see on social media platforms. H2.1–H2.6: Individuals who rely on (newspapers academic journals books aggregated news websites (e.g., Google News) will be able to identify the misinformation they encounter on social media. Please see Appendix A1 - list of hypotheses for more details	misinformation (e.g., 5.6.3 The Impact of Information Source Preference to Find Information on the Ability to Identify Misinformation)	
H3: Individuals’ reactions to misinformation depends on their level of agreement with misinformation. H3.1–H3.10: Individuals are more likely to (engage in a discussion with the author share the post and add their view ask the author for the information source ask the author of the post not to share tag an expert or friend to make them aware share the post separately via other social media platforms report the post to the social media platform block the user who shared the post use the snooze option to snooze the user who shared the post) if they (agree disagree) with the	Descriptive results indicate the impact of level of agreement with misinformation and reactions to misinformation (e.g., 5.6 <i>Cross-task Analysis: Identifying Misinformation Across Difficulty Levels</i>).	Source Credibility Theory/ Cognitive Dissonance Theory¹⁷

¹⁷ Cognitive Dissonance Theory explains the mental discomfort individuals experience when they encounter information that conflicts with their beliefs, values, or actions. To alleviate this discomfort, they may change their beliefs, seek consonant information, or dismiss the conflicting information. Cognitive Dissonance Theory explains why individuals may react differently to misinformation based on their agreement with it and their personal or social background. Those who experience dissonance might engage in behaviors to reduce it, such as rejecting misinformation or altering their perceptions.

misinformation post. Please see Appendix A1 - list of hypotheses for more details		

3.3.6.3 Impact of Background Factors on Identifying and Reacting to Misinformation. The two hypotheses listed in Table 7 are developed based on the theories including *Cognitive Dissonance Theory* and *Cognitive Dissonance Theory*.

Table 6 Hypotheses About How Background Factors Impact the Reaction to and Identification of Misinformation

Developed Hypotheses	Relationship Evidence	Theory
H6: Individuals' background factors affect their ability to identify misinformation. H6.1–H6.3: Individuals' (age education levels employment status) affect their ability to identify misinformation. Please see Appendix A1 - list of hypotheses for more details	Previous studies indicate some relationships between background factors, including age, and the ability to identify misinformation (e.g., Buchanan, 2020; Taghipour & Soleymani, 2023) and education level (e.g., Buchanan, 2020; Filkuková et al., 2021).	Cognitive Dissonance Theory
H7: Individuals' background factors affect their reactions to misinformation. H7.1–H7.7: Individuals' (age education levels employment status) affect their likelihood of (sharing reporting willingness to discuss ask for the information source ignore) a misinformation post. Please see Appendix A1 - list of hypotheses for more details	Descriptive results indicate the impact of background factors on reactions to misinformation (e.g., 4.4 Factors Impacting Participants' Interactions with Misinformation).	Cognitive Dissonance Theory

3.3.6.4 Impact of the Verification Approach on the Identification of Misinformation. The hypotheses listed in Table 8 are developed based on the *Dual Process Theory*.

Table 8

Hypothesis About How Verification Approaches Impact the Identify Misinformation

Developed Hypotheses	Relationships Evidence	Theory
H8: The way individuals verify information affects their ability to identify misinformation. H8.1–H8.11: Individuals who generally verify information by (checking if the information conforms to their understanding of the topic looking at a profile to see if they can trust the information searching to see whether the post has been shared or mentioned on other posts or social media platforms looking at the number of shares that the post obtained looking at the quality of the picture looking at other people’s replies and discussions one of their trusted experts using search engines to conduct some basic research looking at peer-reviewed research papers one of their trusted friends) will be more likely to identify misinformation. Please see Appendix A1 - list of hypotheses for more details	Descriptive results indicate the impact of the verification approach on the ability to identify misinformation (e.g., 5.6.4 The Impact of the Verification Approaches Used on the Ability to Identify Misinformation).	Dual Process Theory

3.3.6.5 Impact of Encountering Misinformation on Attitudes Towards Social Media. Based on the evidence found in the literature and the descriptive results of this study, the hypothesis presented in Table 9 relates to the impact of encountering misinformation on social media on individual’s attitude towards that platform.

Table 7 *Hypothesis About How Encountering Misinformation Impacts Attitudes Towards Social Media*

Developed Hypotheses	Relationship Evidence

H9: Encountering misinformation on social media affects individuals' attitudes towards the platform. H9.1–H9.6: Individuals' perceptions of social media (feel uncomfortable trustworthiness capability intentionally provide misinformation social media hub fail to provide the information not really enforcing their policy for sharing misinformation with violators) will be affected when they encounter misinformation on that platform. Please see Appendix A1 - list of hypotheses for more details	Descriptive results indicate the impact of exposure to misinformation on attitudes towards social media platforms (e.g.0).

3.4 Study 2: Analysis of Twitter Data on Rumours

Network data were collected for three misinformation cases spread on Twitter.

3.4.1 Identifying Misinformation Cases

The researcher started by identifying the misinformation on which they wanted to collect data and looking at the results of a previous study (Error! Reference source not found.) that asked participants what they did when they encountered misinformation. The most common response was to alert or correct misinformation. The researcher also looked for examples of misinformation using the search interface on the Twitter website that had been corrected by fact-checking websites. Based on this information, the researcher developed a regular expression that they could use to identify misinformation on Twitter. The keywords looked for tweets that contained the words “**fact url:covid**”. This keyword helped to identify misinformation cases that were recently spread related to COVID-19 on Twitter and corrected by one of the fact-checking sites.

3.4.2 Experimenting with Keywords

Once the researcher had a method of identifying misinformation, they experimented with different keywords to find those that would return the most tweets for each piece of misinformation. The researchers used their intuition to come up with keywords and looked at the results of their previous study (Study 1) to identify keywords that people mentioned were helpful.

For each case of misinformation, a Twitter dataset was generated based on keyword searches about users who had posted tweets related to that specific case of misinformation topics. The below process was followed in all the three cases:

- 1- **Data Collection Objective** The aim was to map the structure of networks in which originated the misinformation tweets and the users who interact with these tweets, for example, via repost, replies or

mentions. This way, the datasets emphasize that there was a social network and such interactions concerning these misinformation topics at the specified times.

- 2- **Keywords Selection and Search:** For every case, a set of keywords was synthesized that covered the scope of the case content and the keywords of the misinformation (for instance, ‘Pfizer’ and ‘heart’; ‘Pfizer’ and ‘miscarried’; ‘COVID’ and ‘lab’) and these combinations were used to seek tweets made during the trending time. These keywords were chosen because they were the most common words associated with the misinformation topic and briefly trended on about the misinformation topic on Twitter during the specified periods.
- 3- **User Extraction Criteria:** Twitter users were included in the dataset if they:
 - Posted a post that contained the relevant keywords.
 - Were mentioned in a tweet containing the keywords.
 - Were involved in the discussion by replying to a post that contained the relevant keywords.

3.4.3 Data Collection

Upon identifying the best keywords, the search box in NodeXL-Pro¹⁸ was used to search for tweets that contained the keywords. The system used for data collection was a computer running Microsoft Windows 8, which was used to retrieve data in Microsoft Excel 2010 with the professional version of NodeXL (release code: +1.0.1.428+). URLs were automatically expanded within NodeXL. Data collection was performed from <24 August 2022> to <24 October 2022> and occurred before Twitter API was restricted. The researcher collected data on three misinformation cases:

3.4.3.1 Misinformation Case 1 - Linking the 2nd Pfizer Vaccine and Heart Problems. This misinformation case claimed that a new study proved that the Pfizer vaccine caused harmful effects on the heart and blood vessels in about one-third of adolescents who followed the Pfizer vaccine. The dataset consisted of 11,950 Twitter users whose tweets contained the keywords “Pfizer” and “heart” or who were replied to or mentioned from 15 August 2022 at 11:22 UTC to Wednesday, 24 August 2022 at 23:23 UTC. These specific keywords were selected, as this combination was the most popular and briefly became a trending topic on Twitter in mid-August 2022. Users were included in the dataset if they sent a tweet or were mentioned or replied to in these tweets during the timeframe in which data were retrieved.

3.4.3.2 Misinformation Case 2 - Linking the Pfizer Vaccine and Miscarriages. The second misinformation case claimed that Pfizer documents suggested that during its COVID-19 vaccine trial, 44% of pregnancies resulted in miscarriages. The dataset consisted of 4775 Twitter users whose tweets contained the keywords “Pfizer” and “miscarried” or who were replied to or mentioned from 16 August 2022 at 01:51 UTC to Thursday, 25 August 2022 at 00:44 UTC. These specific keywords were selected, as this combination was the most popular and briefly became a trending topic on Twitter in mid-August 2022. Users were

¹⁸ NodeXL Pro was chosen to analyse tweet data by generating network statistics, metrics, visualisations, filtering and displaying attributes to highlight structures in networks. NodeXL Pro has a Twitter Search Network importer that extracts the network of tweet data from the past 8–9 days.

included in the dataset if they sent a tweet or were mentioned or replied to in these tweets during the timeframe in which data were retrieved.

3.4.3.3 Misinformation Case 3: The COVID-19 Virus Was Created in a Lab. The third misinformation case claimed that the COVID-19 virus was created in a lab. The dataset consisted of 18,902 Twitter users whose tweets contained the keywords “covid” and “lab” keywords or who were replied to or mentioned from 18 October 2022 at 11:29 UTC to Monday, 24 October 2022 at 20:45 UTC. These specific keywords were selected, as this combination was the most popular and briefly became a trending topic on Twitter at the end of October 2022. Users were included in the dataset if they sent a tweet or were mentioned or replied to in these tweets during the timeframe in which data were retrieved.

3.4.4 Misinformation Verification Process

To ensure that the collected have misinformation tweets, and was not generalized Tweets towards the given keywords, the following verification process was utilized across the three studied cases of misinformation:

- 1- **Initial Keyword Search:** Tweets were searched in the first instance in relation to the selected topic by examining the related keywords for that topic (for instance “Pfizer and heart,” “Pfizer and miscarried and ” and “ COVID and lab”). That was used as the first step of inclusion for the dataset.
- 2- **Manual Review of Collected Tweets:** After the retrieval of the tweets, a manual review process was conducted to ensure that the collected tweets related to the misinformation claims being researched. Tweets were checked to assess whether they:
 - Clearly referenced or supported the misinformation claim i.e. The Pfizer vaccine causes heart problems in the adolescents.
 - Spread or reacted to the misinformation, including retweets or comments that fall under the false claims.
 - Contained discussions that could reasonably be classified as related to the misinformation, even if indirect.
- 3- **Cross-Referencing with Known Misinformation:** The tweets were compared against misinformation narratives provided by fact-checking organisations, including Snopes and FactCheck.org, and health authorities, in order to confirm the false claims that were being researched. This helped to filter out tweets that might have discussed similar topics but did not actually spread misinformation.

This process was repeated for each misinformation case to ensure that only tweets containing or responding to misinformation were included in the dataset.

3.4.4 Data Analysis

3.4.4.1 Network Analysis.

To understand the structure of social networks¹⁹, each of the five instances of misinformation was analysed individually. NodeXL²⁰ was used to create graph clusters that emerged from the misinformation tweet data. The resulting graph consisted of clusters with nodes for each user, where its sizing depended on the total betweenness centrality score the user had in the network. These nodes in the network graph were linked via directed edges to other accounts based on tweet relationships (mentions or retweets). The Harel–Koren Fast Multiscale Layout Algorithm (Ahmed et al., 2020) was used to create the network graph. Influential users were analysed based on their size or their nodes, which were ranked by their betweenness centrality score. The centrality of the nodes in the graph was based on the shortest paths between two nodes. The user with the highest betweenness centrality score was referred to as the network bridge between nodes (Struweg, 2020). Therefore, Twitter accounts with high betweenness centrality scores were considered influential and the most popular in social networks (Struweg, 2020). For the Clauset–Newman–Moore clustering algorithm, groups were detected using NodeXL (Ahmed et al., 2020). Each cluster group was arranged in a box using the box laid out Treemap algorithm. A random sampling approach was applied to randomly select 200 tweets associated with each cluster to understand the user’s reactions within the networks using thematic analysis. The process was repeated for each instance of misinformation to generate a graph for each misinformation case and to understand users’ reactions. This methodology was adopted from relevant studies conducted to understand online campaigns on Twitter (Ahmed et al., 2020; Starbird et al., 2014).

3.4.4.2 Statistical Analysis.

To quantitatively understand the network’s structural properties, descriptive statistical analysis was conducted using the NodeXL Graph Metrix. The statistical analysis showed the overall metrics for each misinformation network graph. Vertex centrality metrics provided insights into a person’s position within the network, identifying influential people and unique individuals (e.g., degree, in-degree, out-degree, betweenness centrality, eigenvector centrality, closeness centrality, PageRank and clustering coefficient). The statistical analysis

¹⁹ Using Social Network Analysis (SNA), particularly through NodeXL, which has a friendly interface, to examine Twitter misinformation is justified. This technique is helpful in revealing the network’s hidden relationships and structures, identifying nodes (users/accounts), highly influential accounts and patterns of information flow. Although other approaches, such as Network Analysis using tools, including Gephi, or Python libraries, including NetworkX, might allow more flexibility, NodeXL is informed by its combination of simplicity and customization, which suits projects with limited resources and time.

results also showed network density, which systematically demonstrated the number of connected nodes and networks to understand which communities were highly connected and which were sparse.

3.4.4.3 Topic Modelling.

Latent Dirichlet Allocation (LDA) plays an important role in breaking down complex misinformation within large tweet datasets by identifying key themes and narratives underlying social media discussions (Jelodar et al., 2019). LDA has been used in several domains such as misinformation (John et al., 2022; Nguyen et al., 2023), citizen science (Mazumdar & Thakker, 2020), tourism review (Putri & Kusumaningrum, 2020) and public discourse (Xue et al., 2023). This unsupervised learning method makes it easier to analyse large datasets (Mazumdar & Thakker, 2020), making it more straightforward to identify regularities indicating misinformation. By starting with preprocessing activities, such as stop word removal and non-essential terms, adopting the LDA model can help isolate latent topics (Mazumdar & Thakker, 2020). In addition, tweets falling under the observed topics were analysed instead of using identification. As a result, this holistic analysis revealed both the main topics and provided a complete picture of the themes of misinformation reactions. LDA outshines all other models because it combines detailed themes with ease of use.

3.5 Summary

The research philosophy of pragmatism is explained in the chapter, along with the chosen mixed methods strategy and its justification. The chapter also provides an overview of the research design called 'Exploratory Sequential Design' and details the data-gathering procedures and data processing.

Chapter 4: Exploring Reactions to Misinformation - Results

4.1 Chapter Overview

This chapter presents the findings derived from the questionnaire with descriptive analysis. The descriptive analysis involved summarising data, and the topics covered included social media platform usage, level of comfort in relying on social media platforms and information sources. Before presenting the results from the descriptive analysis, some terms related to the number of participants should be clarified to avoid any misunderstandings. These terms are used frequently in the upcoming section. The terms some, many and majority are used throughout the text to indicate 1–50, 50–507 and 508–1014 participants, respectively

4.2 Summary of Questionnaire Responses

The questionnaire response summary was utilised to identify patterns in the data and summarise data points using various tools such as frequency distribution tables, pie charts, proportions and percentages. This summary enabled a better understanding of the data to generate hypotheses for further analysis.

4.2.1 Participant Demographics

According to survey findings, of 1014 participants, many belonged to the 25–34 age group, representing 38.1%, while educationally, bachelor's degree holders accounted for 47.2%, being the most frequent education level. However, on an employment basis, the majority (75.6%) were either full-time workers or freelancers. Among the participants, 95% were from the USA. Please see Appendix B (The demographics of participants) for more details.

4.2.2 Participants' Information Source Preferences

Based on the survey, the majority of participants preferred to use aggregated news sources, such as Google News and government websites, when verifying information obtained on social media, which accounted for 26% (n = 699) and 22.3% (n = 601), respectively. This is important for scholars interested in studying misinformation because these sources help correct false narratives found online. Newspapers, books and academic journals also contributed towards disseminating verified information, indicating different avenues through which social media users seek information. Please see Appendix B (Preferred information sources to verify information) for more details.

Participants provided their top five information sources regarding COVID-19. **Figure 4** shows a word cloud of all responses on preferred information sources. Survey results showed that mainstream media websites were the most preferred among participants, with CNN preferred by 48.0% (n = 485) and BBC preferred by 33.9% (n = 343). Other prominent mentions included Fox News, The New York Times, NBC and local news (18.4%), as well as official government and health organisation websites, such as CDC and WHO. Surprisingly, there was also interest in social media platforms and aggregated news sites, such as Google and Yahoo; however, academic journals, although known for their credibility, were not preferable, possibly due to accessibility or even engagement difficulties. This varied preference portrays the different levels of preferences among various sources of information during the

COVID-19 pandemic. Please see Appendix B (Preferred information sources to find information) for more details.

Figure 4 Word Cloud Analysis of Open-Ended Questions on the Preferred Information Sources of Participants



4.2.3 Social Media Consumption and Use

This study showed the diverse use of social media platforms for obtaining COVID-19 information. Facebook and Twitter accounted for 41.3 (n = 419) and 39.6% (n = 402) of this usage, respectively. Reddit, YouTube and WhatsApp were other sources of information, although to a lesser degree. Meanwhile, the least used platforms included Telegram, TikTok and WeChat (n = 5). Instead of relying on social media that may be influenced by unreliable sources, extreme political views and personal interest, some chose BBC News, CDC or even asked family members directly to obtain reliable facts concerning COVID-19. This highlights the polarised trust and usefulness perception of social media in relation to the COVID-19 pandemic. Please see Appendix B (Most social media platforms frequently used to access COVID-19 information) for more details.

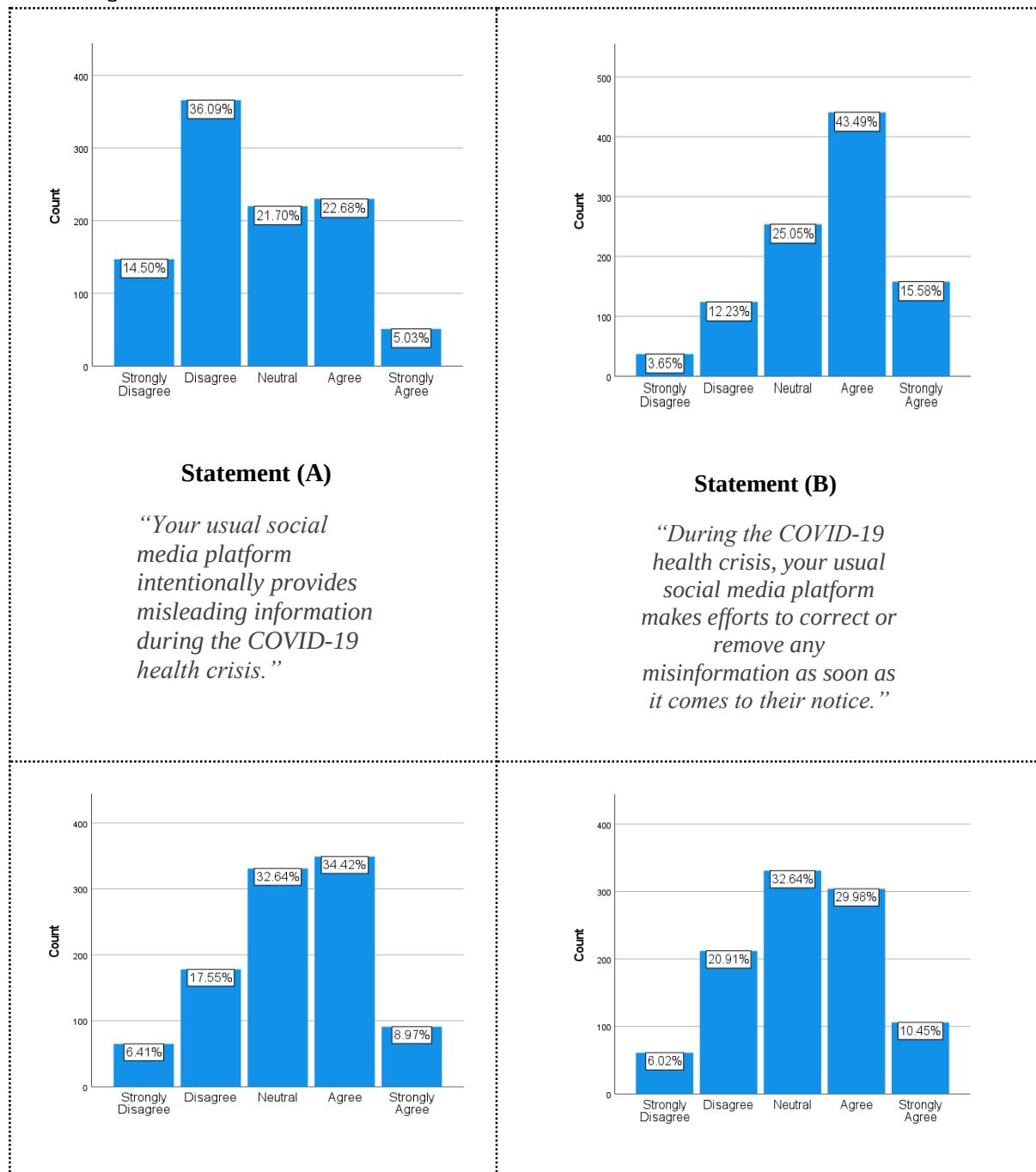
Of the participants, 45.9% were uncomfortable and 39.3% were comfortable using social media to obtain information on COVID-19. Please see Appendix B (Level of comfort in relying on Social Media) for more details.⁰

4.2.4 Participants' Attitudes and Assessment of Social Media Platforms

Most participants thought that social media was only slightly capable (28.8%) or moderately capable (32%) of providing them with the information they needed on COVID-19. Of participants, 12.6% thought it was not at all capable. Please see Appendix B (Assessment of capability of social media platforms in providing essential Covid-19 information) for more details.

The participants were asked how they rated the trustworthiness of their social media platforms during COVID-19. Trust in these platforms was even lower, with only 35.9% slightly trusting them and 28.9% mostly trusting them. A small percentage believed that these sites were very trustworthy (19.3%) or completely trustworthy (3.7%). Surprisingly, 12.1% of people believed these sites were entirely untrustworthy, which shows how opinions can vary about these platforms during a pandemic. Please see Appendix B (The Trustworthiness assessment of social media platforms) for more details.

Figure 6 Responses of Participants Asked to Rate Their Level of Agreement with the Following Statements



Statement (C)	Statement (D)
<i>“Your usual social media platform has a consequences policy for sharing misinformation on COVID-19, but they do not really enforce this for accounts that violate”</i>	<i>“Your usual social media platform has created a “hub” to feature news and information about COVID-19 from reputable sources. However, this page does not help you get the news or information about COVID-19 that you really need.”</i>

4.2.5 Frequency of Exposure to Misinformation on Social Media

Participants were asked how often they see false information on their favourite social media platform and provided the following responses: sometimes (45.7%), often (35.8%), always (10%) and rarely (8%). These figures are worrisome, considering the danger of misinformation. Please see Appendix B (The frequency of exposure to misinformation in social media) for more details.

4.2.6 Participants' Interactions with Misinformation

Participants adopted various strategies to verify information on social media, primarily using search engines for primary research (15.5%, $n = 667$) and consulting trusted experts (15.3%, $n = 657$). Other methods included assessing alignment with existing knowledge (14 %, $n = 603$) and evaluating the credibility of the source's profile (13.9%, $n = 597$). Some also relied on community feedback in replies and discussions (10.6%, $n = 456$), peer-reviewed research (8.2%, $n = 352$), and cross-referencing with other posts or platforms (7.5%, $n = 323$). Fewer participants judged credibility based on engagement metrics, such as shares (3.7%, $n = 159$) and likes (2.6%, $n = 114$), consulted trusted friends (4.3%, $n = 188$), and assessed visual quality (4.1%, $n = 177$). This highlights a comprehensive approach to discerning trustworthy information. Please see Appendix B (Approaches used for verifying information) for more details.

Participants were asked how they would react if they stumbled upon something they thought was false while scrolling through their favourite social media platform. The most common reactions were reporting it (18.2%, $n = 438$), but others would ignore it (14.2%, $n = 341$), ask the author for the information source (13.1%, $n = 315$), discuss the misinformation post with the author (9.7%, $n = 258$) or block the user (11.6%, $n = 279$). Other reactions included tagging, snoozing or sharing the post or sharing the false article elsewhere online for more people to see. Please see Appendix B (0) for more details.

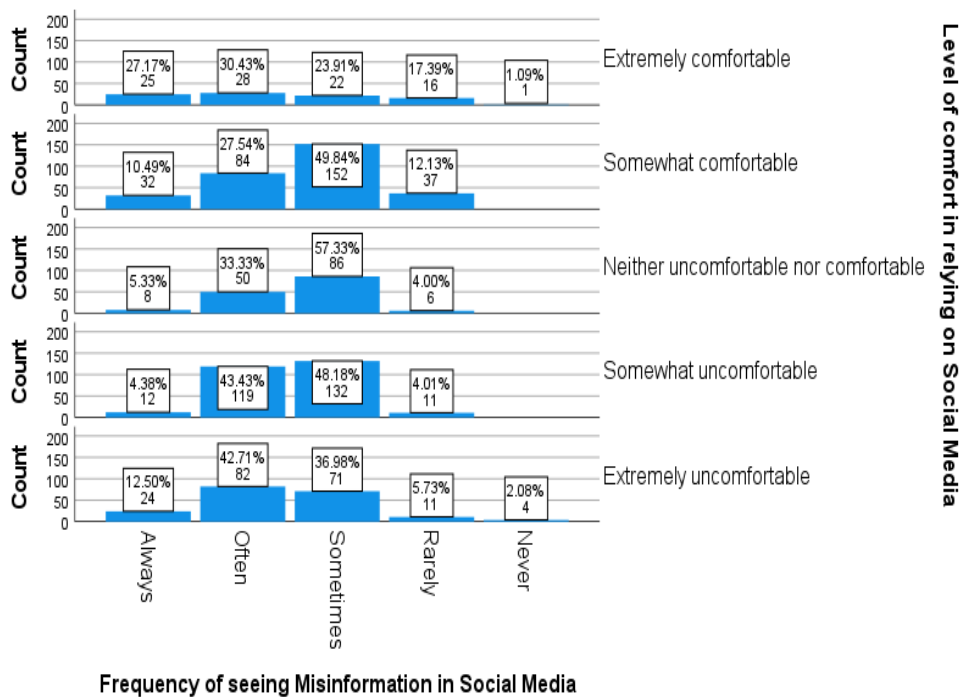
4.3 Social Media Use vs. Trust Gap

Although some people were aware that social media information regarding COVID-19 may not be trustworthy, some still preferred to use social media platforms to access such information. Among the participants, Facebook (41.3%, $n = 419$) and Twitter (39.6%, $n = 402$) were the most commonly used social media platforms for this purpose. While many participants rated social media platforms as moderately trustworthy (35.9%, $n = 364$) and moderately capable (32%, $n = 324$) of providing information about COVID-19, a significant

number considered them to be only slightly trustworthy (28.9%, $n = 293$) and slightly capable (28.8%, $n = 292$). Furthermore, the majority of participants reported seeing misinformation on social media platforms, with 45.7% ($n = 463$) sometimes and 35.8% ($n = 363$) often encountering it.

These findings revealed a significant discrepancy between people's preference for using social media to access information and their confidence in the reliability of that information. People were aware that social media information was not trustworthy, but they preferred to use social media to access information about COVID-19. **Figure 7** presents findings on how often participants came across misinformation on their social media platform, grouping responses by their level of comfort in relying on social media for COVID-19 news. Among the participants who mentioned they were extremely uncomfortable in relying on social media, 42.7% ($n = 82$) often and 37% ($n = 71$) sometimes came across misinformation on social media. However, among the participants who mentioned they were extremely comfortable in relying on social media, 27.1% ($n = 25$) always and 37% ($n = 71$) sometimes came across misinformation on social media. Despite coming across misinformation regularly, these participants were extremely comfortable relying on social media. It is believed that a significant number of participants think they can filter out misinformation despite regularly coming across it.

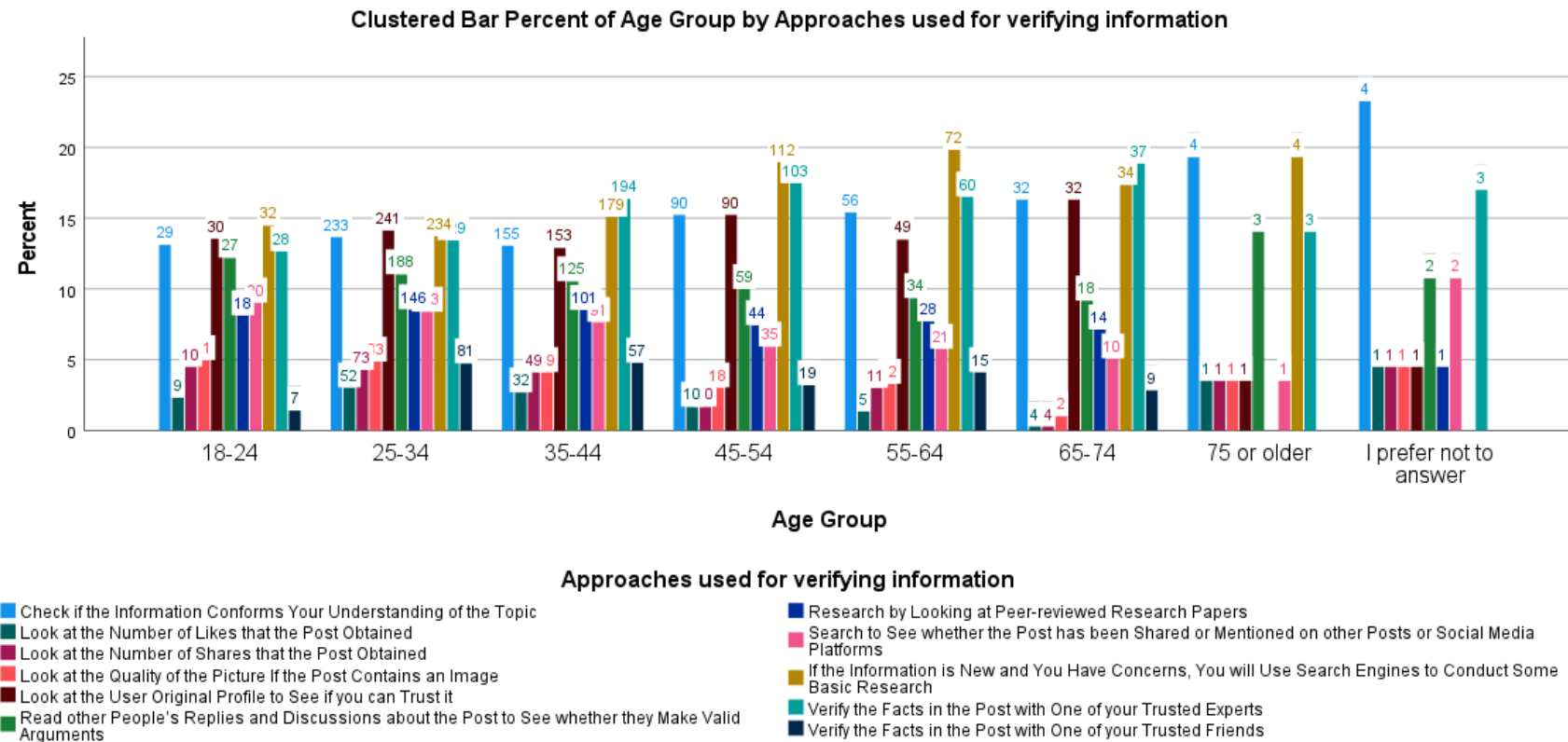
Figure 7 *How Often Participants Come Across Misinformation on Their Social Media Platform Grouped by Their Level of Comfort in Relying on Social Media for COVID-19 News.* Note: the blank spaces next to “Never” indicate a value of 0.



4.4 Factors Impacting Participants' Interactions with Misinformation

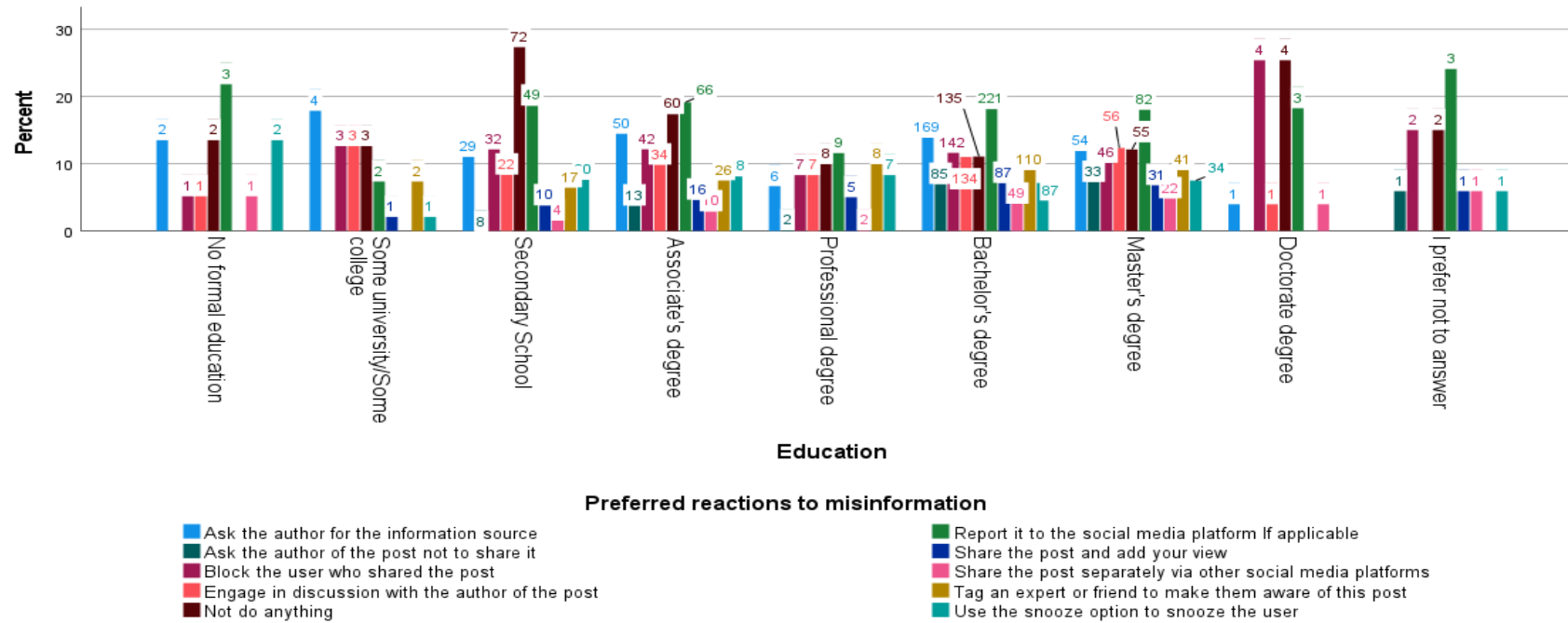
4.4.1 Impact of Age on Participant's Verification Approaches

Figure 8 shows that participants aged 25–34 and 45–74 were most likely to use search engines or check the author's profile to verify information, while participants aged 35–44 were most likely to verify information with a trusted expert. This implies that those aged 35–44 were more likely to seek the truth from experts more knowledgeable in the field without directly getting involved in searching for facts themselves, while younger people aged 25–34 and older people aged 45–74 were more likely to verify information for themselves.

Figure 8 *Impact of Age on Participant's Verification Approach*

4.4.2 Impact of Education Level on Participant's Verification Approaches

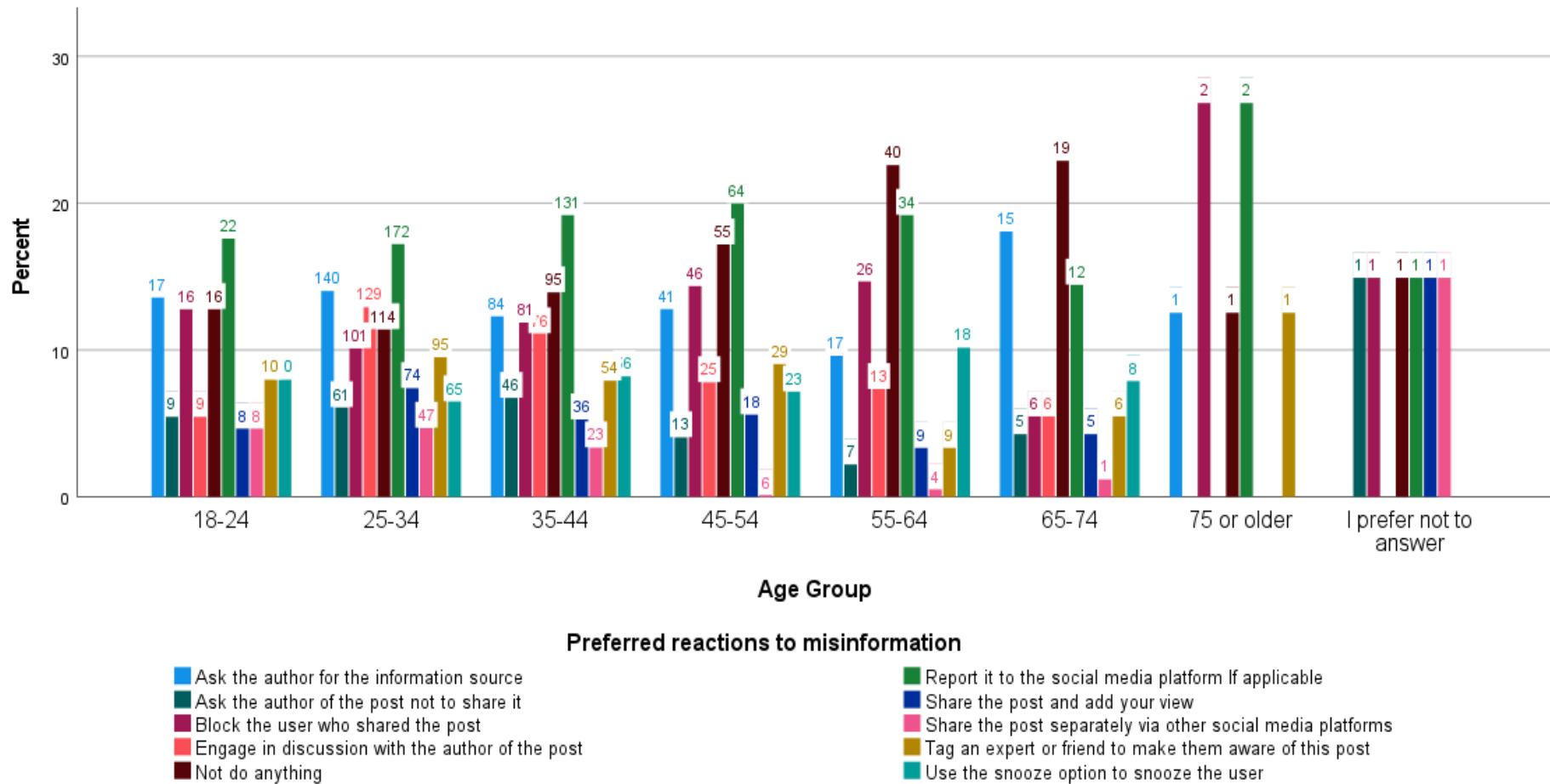
As shown in **Figure 9**, people of all educational levels were similar in the following ways of verifying information: using search engines, checking the author's profile and verifying information with an expert. Participants with bachelor's and master's degrees read people's responses to the post to verify the information. Those with a master's degree also searched for peer-reviewed studies, and those with a secondary school degree also verified the information by looking at the number of likes the post received. The typical methods of verification, such as using search engines, looking at the profile and seeking help from experts, were used by participants of all education levels. However, those with qualifications, such as a master's degree, used more difficult methods to verify information, while those with lower qualifications, such as secondary school, were influenced by the number of likes, which may not indicate the credibility of the post.

Figure 9 *Impact of Education Level on Participant's Verification Approaches*

4.4.3 Impact of Age on Participants' Reactions to Misinformation

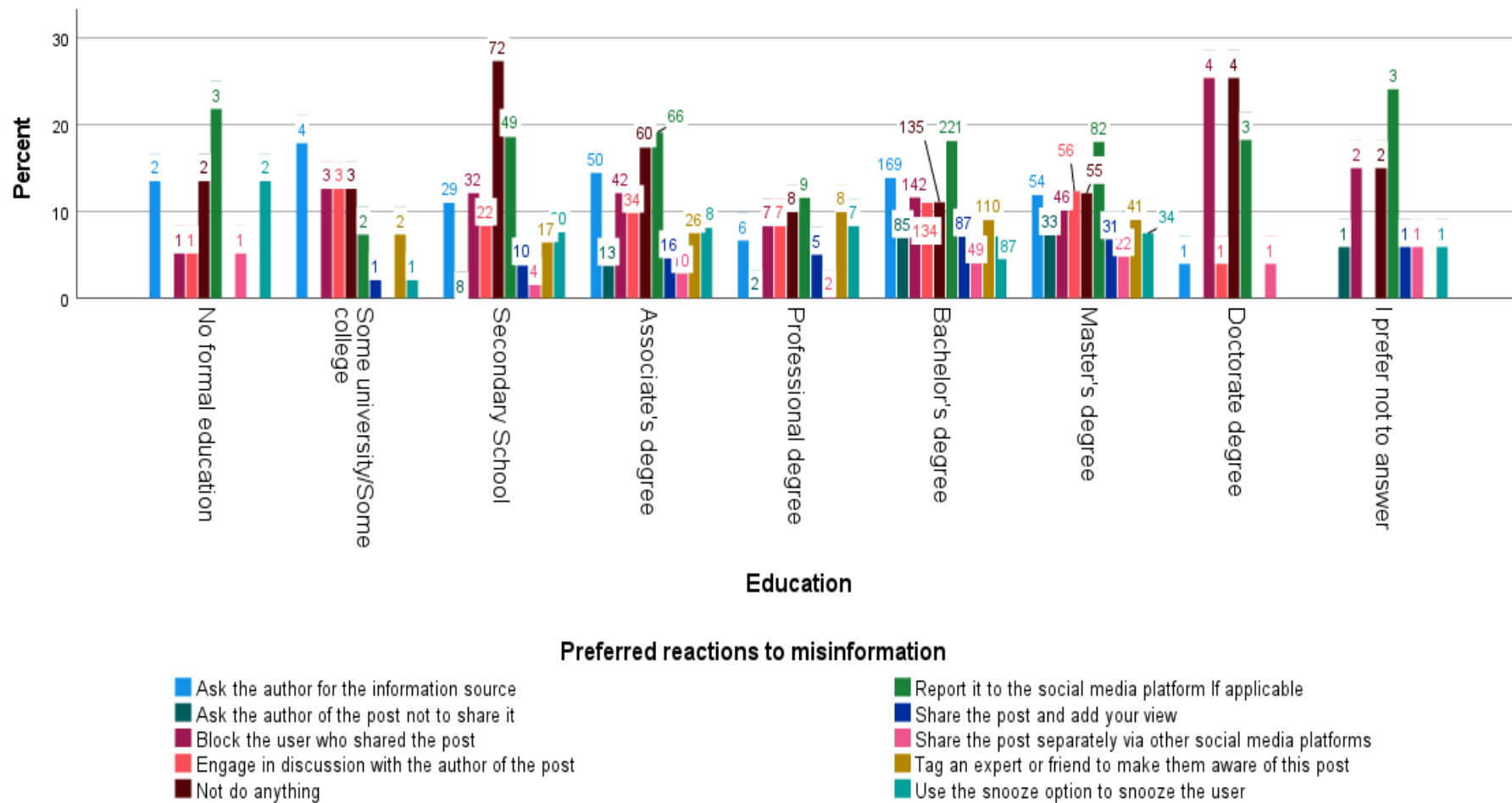
As shown in **Figure 10**, participants of different ages were similar in the following reactions: reporting the post, asking the author for the source of the information and ignoring misleading information. The difference was that those who were aged 25–34 were more likely to engage in a discussion with the author, while all other ages, whether younger or older, were less likely to engage in a discussion with the author. Those of ages ranging from 45–64 were also more likely to block the user. There was a relationship between age and engaging in discussions with those who spread misleading information, in which the younger the person, the more likely they were to engage in discussion.

Figure 10 *Impact of Age on Participants' Reactions to Misinformation*



4.4.4 Impact of Educational Level on Participants' Reactions to Misinformation

Figure 11 shows that all participants of different educational levels were similar in the following reactions: reporting the post, asking the author for the source of the information, ignoring misleading information and blocking the user. Those with secondary school and associate degrees were more likely to ignore misleading information. Those who had bachelor's or master's degrees were more likely to report misleading information or engage in a discussion with the author. In contrast, participants with secondary school and associate degrees were more likely to report misleading information but likely engage in a discussion with the author. This suggests a relationship between education and reactions, in which those with higher education were more likely to engage in a discussion with the author instead of ignoring the misinformation compared to those with secondary school and associate degrees.

Figure 11 *Impact of Educational Level on Participants' Reactions to Misinformation*

The following hypothesis was developed based on the aforementioned results: **individuals' background factors affect their reactions to misinformation (H7)**. The related sub-hypotheses are listed in the hypothesis development section (Error! Reference source not found. Hypotheses Development), and the results of hypothesis testing can be found in (0).

4.5 Understanding Reactions to Misinformation - Scenario-Based Analyses

4.5.1 Close Friends Scenario

Figure 12A contains a word cloud showing the words most frequently used by participants when asked if their friend shared misinformation. Some participants used the word 'friend', 'tell', 'privately' and 'correct'. Therefore, some participants would correct or discuss misinformation with their friends in private and not in public. For example, one participant mentioned that

"I'd first probably mention it privately, with evidence in hand, in the hopes they would remove the post, redact the info, etc. If that doesn't work, I would then publicly counter their argument, and even report it to the social media platform if necessary." P:PD2L5

4.5.2 Manager or Supervisor Scenario

As shown in **Figure 12B**, the word cloud contains the most common words participants used in their response to whether their manager or supervisor shared misinformation. Some participants used the words "ignore", "tell", "correct", "manager", "supervisor", "privately", "nothing" and "misinformation". Based on the use of the words "ignore" and "nothing", many participants ignored the misinformation shared by their manager or supervisor. For example, some participants mentioned:

"I would do my best to ignore them and remain as professional as possible in the workplace." P:QQHGC

"Depending on the severity, how certain I was it was misinformation, and how harmful that was, I would either (privately) speak with them about it, or potentially let it slide." P:Z8BAM

Participants also used the word 'privately', indicating that they would discuss misinformation privately with their manager or supervisor. This is demonstrated in the following quotes from participants:

"I would go to them privately and ask for a private meeting. I would see where they are coming from and then base my decision on that whether to report it or not." P:QP690

"I would message them privately and tell them, as to not embarrass them in public" P:OX1LK

4.5.3 Trusted Source Scenario

As shown in **Figure 12C**, the word cloud contains the words most frequently used by participants when asked whether their trusted source shared misinformation. The participants

used the words “information”, “source”, “trusted”, “research”, “contact”, “ask”, “check”, “report” and “ignore”, indicating that many reactions, such as communicating with the trusted source and correcting them, searching for the validity of the information, and ignoring it, were taken regarding a trusted source who shared misinformation. For example, some participants said:

“I would share the evidence with them that I find to validate the misinformation and discuss where they can find more data to back up what I found. If they change their information then I would no longer see them as a trusted source.” P:9GJJZ

“I would probably ignore it since there is so much misinformation out there anyway.” P:WESZX

“I would ignore the trusted source because I am capable of looking at all forms of information and making a conscious decision about it.” P:1CTJ7

4.5.4 Correcting Information Without Evidence Scenario

Figure 12D shows a word cloud containing the word most frequently used by participants when asked to correct their information and to not share misinformation without giving evidence. The participants used the word “information”, “evidence”, “share”, “ask”, “correct”, “wrong” and “ignore”. Based on the words used by the participants, the reactions varied and included asking for evidence, correcting and ignoring. For example, some participants stated that

“I would do the research and see if they are right. If they are and I shared misinformation, I would delete the original message and write an apology to my friends.” P:87FGP

“I would ask them for some evidence to back their claims up and I would doublecheck my sources to make sure I was being accurate.” P:CD3E3

“I would ignore them and hope they make a better case if it is indeed wrong.” P:VCIL0

Figure 12 Word Cloud Analysis of Open-Ended Question on How the Participants Would Generally React to Misinformation Shared by Their (A) Close Friend, (B) Manager or Supervisor, or (C) a Trusted Source and (D) How They Would React to Being Asked to

Correct Information and Not to Share Misinformation Without Giving Evidence. The Word Clouds Were Customised by Removing “nan” as a part of data cleansing.



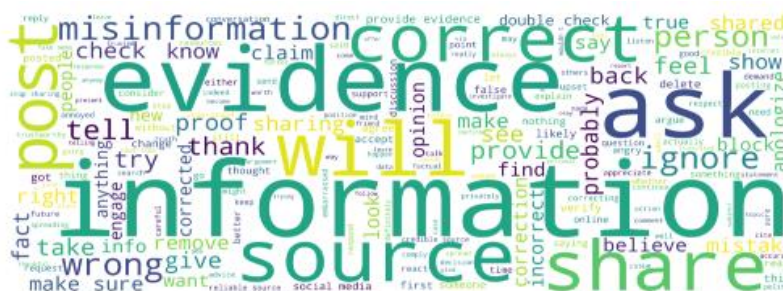
(A) Close Friends Scenario



(B) Manager or Supervisor Scenario



(C) Trusted Source Scenario



(D) Correcting Information Without Evidence Scenario

4.5 Authentication Strategies

Authentication is the process of verifying a piece of shared information on social media (Bautista et al., 2021; Tandoc et al., 2018). Tandoc et al. (2018) generated a model of news authenticity in social media that states that individuals should verify the credibility of

information based on internal and external authentication. When a user encounters news on social media, the user's first instinct is to rely on their judgment for verification (Tandoc et al., 2018). If internal authentication fails, the user turns to other sources to authenticate the credibility of a message (Tandoc et al., 2018).

In this section, participants' reactions to misinformation are explained in more detail within scenarios based on whether a 'friend', 'manager' or 'trusted source' shared misinformation. The study identified five main reactions: authentication, debating, taking action and ignoring. Each significant reaction is accompanied by different actions depending on the scenario. These actions are explained in detail when they were observed within scenarios involving a relationship, authority or trust. However, the internal acts of authentication were not explained in-depth due to data limitations, as the participants were not asked how they would authenticate internally within different situations. Instead, they were asked what makes information trustworthy. From their responses, the following themes emerged.

4.5.1 Internal Acts of Authentication

The first stage of the model proposed by Tandoc et al. (2018) is 'internal authentication', in which users determine whether what they are reading is not fake news by examining its source, message cues, and one's own intuition and experience. Appelman and Sundar (2015) suggested that this stage is comparable to evaluating credibility. References to these internal acts of authentication are shown in Table XX.

4.6.1.1 Evaluate the Source of the Message. During the internal authentication stage, users can check the author's profile or references for more authenticity to ensure that the information comes from a verified account and someone who has experience in the field.

Table 8 *Example Quotes that Relate to Evaluating the Source as an Internal Act of Authentication*

Assessment Type	Example Quote
Check the author's profile	"If it is coming from a verified user or profile." P:QRGCO
Check whether the message has a reference	"The first thing I look at is the source. Who is posting this information? Do they have a history of credibility? Are they known for being reliable? Do they work for a reputable organization? Is their account verified? I need to be very sure of these questions before accepting a piece of information as trustworthy." A3UV55HC87DO9C

These quotes suggest that it is essential to authenticate information by checking it from different angles. For instance, some participants may want to know whether a source has any history worth believing, a reputation for reliability, an affiliation with reputable organisations or a verified account.

4.6.1.1.1 Check the Author's Profile. The author's profile to ensure the information comes from a verified account and someone who has experience in the field. Users use their

experience to check certain cues in the author's profile. They might note some indicators that lead them to distrust the shared information.

4.6.1.1.2 Check Whether the Message Has a Reference. Checking whether the message has a source that can be confirmed through external authentication. It is essential to authenticate information by checking it from different angles. For instance, some participants may want to know whether a source has any history worth believing, a reputation for reliability or if it is affiliated with reputable organisations or a verified account.

4.6.1.2 Evaluate the Message. When verifying information during internal authentication, users consider various characteristics of the message. Please refer to Appendix A (Check the message) for additional related quotes.

Table 9 *Example Quotes that Relate to Evaluating the Message as an Internal Act of Authentication*

Assessment type	Example quote
Check the rationale of the message	"... if it sounds reasonable." P:I65EI
	"... if I have seen the information with my own eyes and been able to make a rational judgement on the facts." P:XGL47
	"... if it sounds reasonable." P:I65EI
Check whether the message is helpful to society	"the information give by the online sources should be fair to the society and current situation then only i consider itself trustworthy." P:PP8ED
Check the political views	"It depends on the source. If it from the left is it highly suspect." P:ZSOM9
Check whether the message is consistent with past experiences	"... if it sounds the experience I had with covid, I'll believe it ..." P:GVF0G
Check whether the message is consistent with previous knowledge	"... sometimes something just doesn't sound right based on what I know about science, and then I check on it elsewhere." P:3PEA2
Check the evidence of the message	"Backed by a source I can easily confirm.." P:R5PW2
Check the impartiality of the message	"Objective" P:DIBJM
Check the language and presentation of the message	" I tend to view information as being less credible if it is framed in more polarizing or extreme terms and/or ... a source that is known to peddle in distortions." P:ELLB0 "... when it is presented in ... organized manner" P:V1L03
Check whether the message is up to date	"It must have the following characteristics: it is current, ..." P:H9ERB
Check whether the message is strong	"Discussion of how information was obtained (rigorous study, peer review, etc.) and admissions regarding limitations of the methodology and the resulting findings." P:6LZ0Z

and has a scientific basis	
Bias and completeness of the information	"If someone posts information about something then posting the whole 'context of that article is best' so I can read the whole article instead of just a quote that could make it bias. Reading the whole article of information is most important so I can make up my own mind." P:XHIYS
Information contradicting scientific knowledge	"If it doesn't contradict the science" P:1SAA5
Made-up claims	"It depends on the specific details. No single piece of information is trustworthy or credible unless I can verify it for myself." P:CDZ71

4.6.1.2.1 Check the Rationale of the Message. The message can be verified through own's knowledge or rationale if it has an argument and logical reasoning and sufficiently addresses the problem at hand (P:O3G60, P:XGL47). The findings showed that when evaluating a message to ensure accuracy and trustworthiness, it is necessary to think rationally, using common sense and to determine whether or not the message can stand on its own merits as a fact of personal experience or judgment based on reason alone and thus contains an argument that is logically valid and adequate for enhancing confidence in the message's credibility. Moreover, an appropriate level of scepticism should be maintained about information that is 'too good to be true'.

4.6.1.2.2 Check Whether the Message Is Helpful to Society. When evaluating the credibility of a message, it is worth considering whether the message is helpful to society. Although this might not indicate accuracy in the information itself, it affects how people perceive the message (P:PP8ED, P:RQSSS). This means that organisations should highlight benefits when providing information. Health organisations should not just provide details about how to get vaccinated and the vaccine's safety, but they need to emphasise the importance of the vaccines and how they have saved millions of lives in previous health crises. Considering this approach is effective for those who prioritise society over their own interests and can help influence public health decisions.

4.6.1.2.3 Check the Political Views. Politics play a part in credibility; if an audience does not trust news sites that have a different political bias than them, then they may not believe what they read (P:393OG, P:ZSOM9). Among the many ways of dealing with this problem is making health information available to all through any news site, whether conservative, liberal or neutral. Access should be open to everybody, regardless of their political stand so that important and factual information can be given without bias.

4.6.1.2.4 Check Whether the Message is Consistent With Past Experiences. It is important for messages to be consistent with past experiences, which in most cases, does not determine credibility but rather affects how an audience perceives a message (P:L2IWA). This reveals that new material online might not be trusted unless it has been experienced first-hand (P:GVF0G); therefore, health organisations must use real-life experiences and stories in their materials for health guidelines, making them more trustworthy and effective at reaching the public. Misinformation about the pandemic can be dispelled by health organisations by including interviews and stories of people who have suffered from COVID-

19 (P:GVF0G). For some individuals, the reliability of information might only depend if it fits well with their prior beliefs (P:T17LW) and is supported by verified sources (P:LO584). This way, some people can make appropriate decisions and avoid being misguided by untrue information. The next point will consider consistency with past knowledge.

4.6.1.2.5 Check Whether the Message Is Consistent With Previous Knowledge.

Consistency with previous knowledge is very important when dealing with credibility; some participants have expressed that this aspect plays a significant role in shaping their perception of the information (P:W8SXX, P:3Q18G). This finding explained that some participants considered the information credible when they knew it previously (e.g., they had already checked it before and knew it was accurate) (P:3PEA2). Therefore, to ensure increased awareness among people, health organisations should use a simplified method of disseminating correct information through all official channels. In this way, people who lack information about the topic might find out more about it (P:W8SXX).

4.6.1.2.6 Check the Evidence of the Message. Individuals can determine whether there is any evidence accompanying the message. To determine whether or not a message may be described as factual, users should look for facts and evidence such as data, statistics and scientific evidence published by governmental organisations (P:UQA7A, P:V8LHQ, P:R5PW2).

4.6.1.2.7 Check the Impartiality of the Message. Bias or extreme language or the use of inadequate sources or media narratives to lead the audience towards believing a certain perspective without actually explaining it in detail or with facts may indicate a particular viewpoint in the message (P:U9W5R, P:1R0I4, P:4TT46). This finding shows that evaluating information requires an orderly, elaborate approach. A reader must always be able to distinguish between opinions and factual information presented in written material. For example, anti-vaccination communities might say that vaccines are dangerous, that vaccines change DNA or that vaccines are used as tools for control. Analysing information can be complicated because it often involves weighing different things such as a source's impartiality (P:DIBJM), hidden prejudice (P:L2IWA) and sometimes personal interpretation level about a given matter. However, it is prudent to evaluate such findings before taking any actions based on them.

The credibility of news sites and health organisations depends on their ability to present information unbiasedly and factually without any prejudices or hidden intentions. However, people are more likely to believe objective and fact-based information rather than one-sided arguments or extreme language that might wrongly accuse other groups without clear evidence (P:U9W5R, P:1R0I4). It is, therefore, necessary to ensure that all information being provided is accurate and fair (P:L2IWA).

4.6.1.2.8 Check the Language and Presentation of the Message. The message should be easy-to-read with good spelling and grammar (P:H9ERB) and should have pleasant wording, avoiding unnecessary provocation that could lead to hostility between groups who believe in different things (P:ELLB0, P:VPAT8). One thing to check is whether the message contains media elements or low-quality photos/clickbait (P:PGRPB, P:WW082). This finding sheds light on the fact that to evaluate a message's credibility, it is important to consider if the message contains videos, photos or screenshots (P:TWC99, P:X0NX2). These visual aids allow a reader to grasp the event more comprehensively and establish the message's

credibility. Additionally, credible sources, such as academic studies and reputable newspapers, should be used (P:VVX34). The structure is also very important in determining a message's credibility (P:V1L03, P:X8KY4). To do so, one should consider the level of detail mentioned and the accuracy of all sourced information. The quantity and quality of engagement associated with the message should also be considered (P:12LZT), and clickbait-esque content (P:WW082) should be avoided.

4.6.1.2.9 Check Whether the Message Is up to Date. The applicability and relevance of the message should also be checked (P:H9ERB, P:3R1O9). Sometimes, people do not pay attention to what they are reading or whether it even applies to them; thus, it is important to ensure that the message is current (P:H9ERB, P:3R1O9). To be deemed trustworthy, a message needs to satisfy certain criteria. It needs to be accurate and reliable while also being current and appropriate for the context in which it is being shown (P:H9ERB, P:3R1O9). Messages that do not fit this description can easily be disregarded, resulting in nobody taking the message seriously or people considering it misleading.

4.6.1.2.10 Check Whether the Message Is Strong and Has a Scientific Basis. The message should have a discussion and accepted limitations. It is essential to carefully examine what a message contains to ascertain whether it has been critically discussed (P:6LZ0Z) and whether the related limitations of the methodology employed to reach the provided facts can be accepted. This means that for a message to be considered trustworthy, there are some critical factors that need to be considered in a comprehensive evaluation. The first is whether the authors have provided a discussion of the study (P:6LZ0Z). This can provide context and clarify any ambiguities that might exist in the message. Second, the results should be verified by peer-reviewed articles (P:89D65), as this will help in determining the accuracy of the findings. Another thing to look at is the methodology, including the design of the study, sample size and data collection methods, that produced conclusions in the story (P:TKC6X). It is also important to check if limitations in methodology were accepted when conducting the study to ensure scientifically valid results (P:6LZ0Z). There are other factors that can determine credibility, such as how rough a study was (P:89D65), the presence of peer review (P:IXSI4), or support from medical experts or research scientists (P:IXSI4). It is essential to rely on sources for well-reasoned theory/argument backed by solid evidence and a balanced presentation of pros and cons (P:2MUO3). Any message that uses political/dramatic language should be avoided, as this can further damage its credibility (P:2MUO3). Reliable messages should only be supported by solid facts, with no opinions/biases to distort information (P:2MUO3).

4.6.1.2.11 Bias and Completeness of the Information. The message should be complete, providing a context, e.g., location, time, date and names (P:IM7JD). This finding explains how the credibility of information is determined in terms of biases and completeness. For the message to be credible, it should have no hidden agenda and should not suppress any facts, meaning that the reader needs to read the whole article to have an impartial opinion about it (P:XHIYS). Additionally, users should determine whether the author has included all necessary elements of a report, such as where it happened, when it happened, who did what, and even the date, as this information is instrumental in building trust for the message and increasing its credibility (P:IM7JD). Transparency plays a major role in assessing information's credibility. A good story will present both sides of an

argument or situation clearly and without any twisted information on its part (P:35J23). If the message is biased, it must be transparent about its bias (P:35J23). Neglecting relevant data can reduce a message's credibility. This approach can be perceived as dishonest if the writer 'stacks the deck' to deliver incomplete information or leaves out important details from the text. There may be contradictions with other more reliable sources when relying on such claims, as this result can lead to misleading assumptions about this issue (P:R2DTW).

4.6.1.2.12 Information Contradicting Scientific Knowledge. The message should be checked to determine whether the content contradicts science. In agreement with some quotes, a formal, authentic message has that kind of baggage, which has implications for its credibility (P:1SAA5). It means that some people have doubts because there are no logical facts that can convince them (P:T6HY0). Thus, they may choose to believe in conspiracy theories that they feel provide more obscure explanations about something, while blaming official health organisations for hiding certain things from society (P:T6HY0). It emanates from the fact that some people might lack trust in official institutions and that there is too much of a political propaganda. Therefore, agencies should provide clear and compelling explanations to win back people's trust (P:1SAA5). These explanations must be clear and devoid of any ambiguity; moreover, they should arouse confidence in the audience. Moreover, this finding explains why credible information ought to reflect a consensus view within a group or community, which refers to the credibility criterion based on the majority agreement or consensus within a group/community (P:1SAA5). This shows how this criterion helps assess the authenticity of scientific research.

4.6.1.2.13 Made-up claims. The indicators of made-up claims include suspiciousness, fabrication, no references, emotional language and contradictions. Thus, extra verification might be required. For instance, some participants stated that it is important to determine whether or not there are facts behind the words used in a message before making any decision based on this information according to one's own opinion and beliefs (P:CDZ71). Basically, it entails confirming whether the message being communicated is true or false or whether suspect information is contained therein (P:9HJLS). Conspiracy theories need to be avoided since they tend to exaggerate occurrences, misleading individuals concerned with such happenings (P:ELLB0). For the message to have credibility, it is paramount to find other sources that can confirm the information (P:97P1). These sources can include reports, press releases, posts on trusted websites or publications. Moreover, it is important to check the credibility and reputability of the information source. It is important to be cautious by verifying any information as not to fall into the trap of false or sensational stories, as informed decisions can be based on true information. This helps us personally and helps build a better, more trusting society.

In summary, the theme pointed out a number of internal acts of authentication that some users use to determine the credibility of information; such acts include checking who said the information, checking how the content was explained, what is known about the author's political affiliation and whether it aligns with the presented arguments, and checking whether the information fits in with user's prior experiences. In addition, the theme also pointed out that credible information must be supported by current information and scientific studies, devoid of biased and emotive language. This theme recommends increased scrutiny for discrepancies with science and signs of made-up content. These findings indicate that

credibility is difficult to assess accurately; therefore, solutions require more comprehensive strategies for evaluating online information. Please see Appendix A (Check the message) for the related quotes.

4.5.2 External Acts of Authentication

The second step of authentication to offer credibility in news messages is ‘external authentication’ (Tandoc et al., 2018). It can be done actively by consulting with a third party or passively through reliance on a third party for verification purposes. This method involves speaking directly with known news outlets. As such, the following sections outline the strategies for external authentication, encompassing examining a message and checking with its author.

4.6.2.1 Authenticate the Information With the Author. There are two methods that users employ to validate information with the author. The first technique involves requesting evidence from the author, and the second involves checking with the author to evaluate their attitude towards the content and determine why they believe it. Please refer to Appendix A (Authenticate with **author**) for additional related quotes.

Table 10 Example Quotes that Relate to Authenticating Information with the Author as an External Act of Authentication

Assessment type	Factors influencing the scenario	Example quote
Requesting evidence from the author	Relationship	"Definitely ask where her info came from and suggest Snopes before posting" P:7CCZX
	Authority	"I would start asking questions as to where they got their information and ask them to send it to me. I would not do anything to risk my job though, so I would avoid a fight." P:5SEPQ
	Trust	"I would try to contact someone from that institution to find out where their got their information from and tell them of the discrepancies that I found." P:6ZS7G
Check the reasoning of the author	Relationship	"I would talk to them in person and try to find out why they believe this". P:VCIL0
	Authority	"In a respectful way, I'd want to ask what makes them think it is right. Sometimes they are very adamant in the way they feel about 'truth' so you have no way to tell them it's misinformation. They get upset." P:W0VPY
	Trust	"If a trusted source shared inaccurate information, I would probably ask them why they would do that because they are respected in the community and they would be tarnishing their good name by doing so." P:N4O4C

4.6.2.1.1 Requesting Evidence From the Author. This theme discusses how users can check information from authors by requiring sources or evidence and how different factors affect this type of authentication process. When the scenario is affected by a relationship, authority or trust, some participants ask for sources or evidence from the author to authenticate it. However, a slight difference was observed when requesting evidence or sources.

In relation to the relationship factor, many participants would advise their friends on the need for providing a credible source of information before publishing it, at least through

suggesting that they use fact-checking sites, such as Snopes²¹ (P:7CCZX). This demonstrates how the participants cared about their friends. As such, they would provide them with what they perceived to be the best possible methods of authentication (P:CTXXK, P:W0VPY).

In relation to the authority factor, some participants would talk politely with their manager so as not to spoil their relationship since this may cost them their employment. They might request that their manager provide them with backup sources so that they will not fall out with each other (P:WP1PK, P:L8PQL). Such behaviour might keep stress levels down and allow managers to be corrected without being forced to discuss incomplete truths in arguments. However, some participants indicate that if they ever discovered their manager was spreading false information, they would ask them to post an apology so that people misled by that information can be corrected (P:L8PQL).

In relation to the trust factor, some participants would choose to accept higher confidence due to verification by a known trusted source. However, there might be a need to ask a trusted source what they mean by this information if it is not clear to them (P:U3RF3, P:T17LW). Moreover, some participants would evaluate the scientific methods that the source adopted to reach their conclusion (P:DW1VJ, P:6ZS7G). This means that the user would evaluate any shared information by applying critical thinking methodology. However, sometimes, critical thinking can be difficult. Thus, verifying information shared by trusted sources such as peer-reviewed papers is challenging for ordinary people because they do not pay attention to the entire message or fail to understand it properly and hence may suspect the trusted sources (P:5SEPQ). In this case, misunderstanding results from trusted sources can result in false information that contradicts what other suspicious sources have said, and misunderstandings related to suspicious sources may cause people to refute true information from a reliable source (P:5SEPQ).

4.6.2.1.2 Check the Reasoning of the Author. This theme is concerned with how users verify information with the author to determine what they think of the content and why they believe it when it comes to encountering misinformation. This reaction is triggered by relationship, authority, or trust factors.

In some instances in which the relationship factor influences the situation, some participants may try to determine if the argument given by the author is not persuasive enough or if it results from bias on the part of the author (P:VCIL0). Other participants may seek any logical fallacies contained in the author's argument or any other blemish that may come up during the discussion (P:P4FPO). Consequently, some participants may employ these and try to persuade the author so that they will realise their information is unreliable. Some participants would try to discover if the author was spreading misinformation because they want to warn or clarify it to make people aware or because their friend believed it (P:ZY5MP). Some individuals may deliberately disseminate false information to induce fear and anxiety among people or manipulate public opinion for certain purposes (P:7DO9C). Therefore, knowing why the author spread this false information might be crucial for effective correction. Without an admission from the author, it can be difficult to determine whether they intentionally spread the misinformation.

²¹ <https://www.snopes.com/>

Some participants said that they would not be harsh on such authors if they were friends since they understand them better, and some described what might happen if their friends were deceived or lied on purpose (P:7DO9C). It is unclear how easy would it be for someone who has known a friend for some time. In this regard, the participant may more easily comprehend their friend's belief system and prejudices as well as what drove them to disseminate fake news. In addition, the friends who shared the misinformation can be judged easily, whether out of ignorance or intention. This is due to the ease of determining if the user's friend is uneducated, lacks critical thinking or is unable to access official sources. A close friend with knowledge of the publisher's prior history with misinformation can challenge or refute it because the participant wants their friend to share valid information, as the participant may depend on their friends for advice and consultation. Therefore, it is crucial to determine if the data received from their friends are factual and that their faith in these pieces of information is maintained.

When authority plays a role in the scenario, some participants would start a respectful discussion to maintain the good atmosphere and understand why their manager shared the information (P:WUVC7). In a situation in which the manager was ignorant of misleading people, some participants would either challenge or discuss it depending on the manager's response and why they think their manager shared false information (P:W0VPY).

The quotes imply that the first step some participants would take is to investigate and understand why their manager published misinformation. They would then decide whether to engage in discussion with or challenge the manager, depending on whether they believe the misinformation to be true or if they think that it was shared mistakenly by the manager. The main purpose is to determine what led to the misinformation and what can be done about it. Furthermore, some participants noted that it might be difficult to convince some people as they are stubborn. However, the previous approach would differ, as their strategy involved respectful debate and the use of credible sources in making persuasive arguments.

In some instances where the trust factor influences the situation, some participants said that they would ask their trusted source for an explanation and references, while others said that they would deal with it cautiously (P:N4O4C, P:0GRBC). Some quotes implied that participants would either verify the information or inform the trusted source organisation that they noticed misinformation. Some participants may describe the implications of spreading false information about a trusted source, while others would want to know why such information was published (P:7DO9C). Additionally, these comments show that there might be participants who neither have time nor resources for further investigation but rely on logic to come up with a response concerning the purpose of the misinformation.

4.6.2.2 Check the Message. When verifying information during external authentication, users consider various characteristics of the message. Please refer to Appendix A (Check the message) for additional related quotes.

Table 11 *Example Quotes that Relate to Checking the Message as an External Act of Authentication*

Assessment type	Factors influencing the scenario	Example quote

Check the number of likes or fact ratings	N/A	"The number of reviews or likes" P:U3FYW
	N/A	"If I can verify it somewhere else on the internet from a reputable source, or if the original source in the information is a known credible source. I like when "fact checks" occur on social media and let you know right next to the article or information that twitter or facebook fact checkers deem it misinformation, false, real, etc. If I don't see a fact check and it seems like misinformation, I check other sources." P:QXZBB
Fact-checking the content	N/A	"I would jump on the Google search engine and search for the topic, then I'd read up on credible sources to determine the validity of the post." P:1UXCM
	Relationship	"I would be surprised and then fact check it give them a trusted site link that states that it is misleading." P:0846O
	Authority	"I would research for my own knowledge. I would not feel comfortable going to my supervisor unless I was certain." P:6Q8DF
	Trust	"I would search deeply to make sure that I was not the erroneous one. If I still thought their info was erroneous, I would likely send a message to their official site." P:6Z6K4
Checking multiple sources	N/A	"Can be verified through multiple varied sources. For example, information is the same on governmental, medical or university sites, and credible news sources." P:97P13
	Relationship	"If it were a close friend, I would probably send them links to multiple credible sources that contained the correct information, and point out why those sources are trustworthy." P:Q58PJ
	Trust	"I'd google it and look at multiple websites, if they don't follow up with an apology post, I will unfollow." P:SOM3D

4.6.2.2.1 Check Whether the Message Has Fact Ratings or Likes. Likes influence audience reception but do not confirm credibility (P:U3FYW). However other participants assessed only factual ratings when evaluating information's credibility. Some participant preferred fact checks given by social media platforms because they looked for facts from trusted sources; thus, they also consulted other resources once they suspected misinformation (P:QXZBB).

4.6.2.2.2 Fact-Checking the Content. This theme explores how users can fact-check information and the different situations that may impact it. It is important that a lateral search be conducted to determine a message's veracity. This entails using Google to obtain trustworthy sources that can confirm a claim (P:1UXCM, P:FKMFB), going through fact-checking websites to determine if the information has been previously verified (P:3WYKR) and obtaining third-party verification for the message upon confirmation (P:DSKK8). Furthermore, the disclaimer (P:FKMFB) or comments in the posts would be used to verify the message easily (P:NI41M). Fact-checking as a reaction was observed in all three situations when the situation affected by relationship, authority or trust factors. However, how people fact-checked differed slightly across the three situations.

When the situation was influenced by relationship factor, various methods were suggested to verify information, such as using the Google search engine, looking for facts on fact-checking websites (P:3WYKR), and even posting it on social media sites, such as Reddit, to obtain other people's views about the claim (P:8ORHP). According to some participants' quotes, individuals are faced with too much information such that they cannot easily distinguish what is true from what is false. Before confronting an author, the information needs to be verified by external sources to confirm whether it is correct or misleading. The quotes also underline the importance of supporting and empowering fact-checking organisations that track and correct disinformation campaigns. Such fact-checking organisations need to have a special unit capable of quickly identifying the most recent misinformation and correcting it accordingly.

In the scenario affected by an authority factor, some participants reported different reactions after observing that their manager had shared misinformation. Some participants would correct their manager by giving them the right information (P:D4WKD), while some would check out fact-checking websites to confirm the information (P:KJ8XL). Others preferred doing their own research but were unsure of whether they should correct or inform their manager. Some participants' quotes showed how uneasy employees are when it comes to opposing misinformation from their manager. These quotes also show that people may resort to fact-checking websites to quickly obtain the correct information without wasting time checking the information with its primary sources, indicating the importance of providing quick and accessible ways to obtain accurate information. Some participants would think critically and take positive steps to ensure that accurate information reached their manager, enabling them to make correct decisions.

In a situation in which trust played a part, some participants would search for more information and compare them against other credible sources, researching and evaluating the correctness of the information (P:MDXE9, P:X7FQ2). Some participants would check with various sources and perform in-depth research to verify the information (P:FKMFB). The findings showed some participants' interest in carrying out in-depth research to gather precise information. There may be a link between source reliability and deep research since more searches might be made if a 'trusted source' shares misinformation. When an 'unreliable' source shares misinformation, fewer searches would be done. However, verifying information from multiple sources is important, as disinformation campaigns can spread misinformation, and making sure is essential (P:HK9F2).

4.6.2.2.3 Checking Whether the Message Corresponds with Multiple Sources. The message should be corroborated by several sources or supported through different tests to ascertain that the claim is true. Even if trust and relationship factors affect the situation, it could be verified in this manner. Some participants would be influenced by information that matches across different reliable sources (P:97P13, P:Q58PJ, P:5OM3D, P:PGRPB, P:5G81E, P:T906L, P:ZIP7Y, P:CB76C). This is a significant finding since we know that information from multiple channels can persuade some people to agree with necessary health advice or believe untruths as facts; thus, healthcare organisations need to release their health guidelines and correct any misinformation while recommending at least three other credible sites.

4.6.2.3 Check the Background of the Source. When verifying information during external authentication, users consider various characteristics of the background of the source. Please refer to Appendix A (Check the background of the source) for additional related quotes.

4.6.2.3.1 Check the Original Source Type. To ensure the credibility of information, there is a need to know who wrote it/where it came from. There is also a need to find reliable sources of information, such as peer-reviewed articles or books written by experts in the field, official websites, fact-checking sites such as Snopes.com, and opinions from medical professionals, researchers, and public health officers (P:89D65, P:7CCZX, P:M0RD1). The reputation of the author/source should be checked, and the views of random people on social media should be avoided (P:1OY76). Most participants considered official sources (e.g., government and health organisation websites) more credible than any other source type (P:M0RD1). Other types of credible sites include scientific research done by professional scientists in different fields and fact-checking websites (P:ASLDS, P:IXSI4). Some participants used social media, mainstream news, books, verified accounts, TV/media outlets and affiliation with the author as credible sources (P:5XPTC, P:MBIJY).

Table 12 *Example Quotes that Relate to Checking the Background of the Source as an External Act of Authentication*

Type of Source	Example quote
Author/Source Reputation	"Who the author/source is and is it a reputable author/source" P:1OY76
Expert Opinion	"It almost always depends on who is providing the information. I don't listen to anything that comes from a random person on social media or IRL until I can verify it with a credible source, i.e., someone with a scientific/medical background..." P:5XPTC
Peer-reviewed Articles/Books	"...peer-reviewed articles or books -written by researchers for students and researchers. Original research, extensive bibliography" P:89D65
Friends	"Most of the news are shared by our friends so it will be reliable." P:MBIJY
Scientific/Medical Sites	"Did it come from a legit scientist/doctor on a legit site like the CDC or being reported on a general site like Reuters and not on a sensationalist news site like Fox or MSNBC" P:ASLDS
Research & Clinical Trials	"Information tends to be credible if it has been supplied by medical experts, research scientists, or public health professionals. If the information has been peer-reviewed in academic journals or supported in double-blind, randomized, controlled clinical trials, it probably has a good deal of credibility." P:IXSI4
Fact-checking Sites	"Snopes.com verification of info" P:7CCZX
Official Websites/Media	"If the information is from an official pronouncement or printed publication by a news/media outlet that I trust, then I tend to trust it. For example, I would generally trust information that can be traced directly to the cnn.com domain..." P:M0RD1

4.6.2.3.2 Check the Characteristics of the Original Source.

Traits of credible info sources: The original source should have traits that qualify it as an authoritative info source, for example, authority (P:M0RD1), accuracy (), trustworthiness (P:5NI6V), impartiality (P:VI46H), familiarity (P:8ORHP), originality (P:M37T1), long time of existence (P:B83RG) and coverage (P:3HY3O).

Table 13 *Example Quotes that Relate to Checking the Background of the Source as an External Act of Authentication (Traits of a Credible Info Source)*

Characteristic	Importance of credibility	Example quote
Trustworthy	Sources recognised for being trustworthy in the past	"For information to be trustworthy to me, it must come from a source that I recognize for being trustworthy in the past and it must either fit cleanly into what I have learned from reputable sources or offer something compelling that refutes those sources"... P:5NI6V
Authority	Credibility from government agencies, health authorities, recognised organizations	"If the information is from an official pronouncement or printed publication by a news/media outlet that I trust, then I tend to trust it".. P:M0RD1
Accuracy	Major factor for source credibility	"Any news have to to authenticated by BBC, CDC, and PBS or other reliable sources. I USUALLY DOUBLE CHECK CREDIBILITY BEFORE MAKING A DECISI"N. P:DSKK8
Reputability	Need for sources to be reputable	"If it is from a trustful resource, such as a reputable news source or scholarly journal. Moreover, aside from the source of the information, I also need to be able to verify that the information is cited".. P:X1APP
Impartiality	Preference for neutral and unbiased sources	"It comes from an established, well respected source known for their integrity and factual reporting. I' I'm unsure of a source, I always look up their media bias to determine their qualifications".. P:VI46H
Familiarity	Sources must be familiar or have proven credibility before	"i like using forums like Reddit so many people can fact check it and discuss. Also, places like NPR and NYT get called out on being wrong, etc. which helps their credibility." P:8ORHP
Original	Information must come directly from the primary source	"It has to come from the original source, not information which has been passed on" P:M37T1
Long Time of Existence	Credibility from sources that have existed for a long time	"Some information sources are more credible than others, because they have been in business for a very long time and have established a strong reputation for accuracy and dependable facts." P:B83RG
Coverage	Thorough coverage of news by the source	"there are many factors that make a source credible. these things include the source ... objectivity..." P:3HY3O

Traits of a less credible info source: It is important to determine whether the original source has any traits that make it a less credible info source, including bias (P:QBUD9), anonymity (P:JI7ZS), bad reputation (P:ELLB0), lack of specialisation (P:H2LIY),

opinionated (P:NQWCJ), directed writings (P:4TT46), transmitting (P:M0RD1) and mainstream media (P:B03XL).

Table 14 *Example Quotes that Relates to Checking the Background of the Source as an External Act of Authentication (Traits of a Less Credible Info Source)*

Characteristic	Importance of credibility	Example quote
Biased sources	Less credible due to bias	"If it is not too left or right-winged, if that makes sense. It should be from an unbiased news channel." P:QBUD9
Opinion sources	Less credible when relying on opinions	"That there is a source on the post and it doesn't rely only on the posters opinion or the opinion of anyone else. If there is an expert posting something about a topic on a social media platform with sources to back it up I am more apt to trust it." P:NQWCJ
Anonymous sources	Less credible due to anonymity	"Normally the source, if it's a source I've never heard of I normally ignore it or look it up" P:JI7ZS
Bad reputation sources	Considered less credible due to past distortions	"I tend to view information as being less credible ... if it comes from ... a source that is known to peddle in distortions." P:ELLB0
Unspecialized sources	Less credible when not from an expert	"That it is from an expert and not a person that has no qualifications on the topic they are sharing." P:H2LIY
Mainstream media sources	Seen as less trustworthy by some	"If it comes from a source I can trust and is not from the mainstream media." P:B03XL
Directed sources	Less credible when seeming controlled or uniform in narrative	"Information that seems too controlled by the MSM where all of the outlets use the same wording or phrases to describe issue. Seems they are being told what to say to control the narrative." P:4TT46
Transmitting sources	Less credible when paraphrasing or summarizing the original source	"...I would not fully trust a rephrasing, paraphrasing, summarization of a news item (even where it is obviously done in good faith or by a respected friend or some political pundit who I follow/admire) on a platform by Twitter, as there is always room for mistakes. In general, I am extremely cautious about things I read by "users" of social media platforms." P:M0RD1

Overall, the information source matters, and verifying the source element before accepting its information as accurate is necessary. However, determining whether a given piece of information is credible should be based on the characteristics of its source when numerous sources of information might limit our knowledge of its credibility.

In summary, this theme explains that external authentication supports news messages by checking several of its characteristics such as scrutinising the author's credibility and checking the content's reasoning. Participants use different methods depending on their familiarity with a given author while considering dynamics such as relationship, authority and trust. It is thereby possible to imagine various degrees of misinformation being countered through several tactics, which may include but are not limited to requesting evidence from authors themselves, evaluating their attitudes towards why they share the misinformation, and

conducting cross-checking across many trusted sources or performing independent research. Sources are considered credible if they include credentials, authority, accuracy, reputability, impartiality, familiarity, originality, longevity and coverage. Conversely, less legitimate sources have bias, anonymity, a bad reputation, lack of specialisation, an opinion or a connection with mainstream media. Therefore, source credibility has become a critical issue in which misinformation has become part of our daily lives.

4.6 Authentication Strategies Strategies for Debating with the Author When Misinformation is Identified

This theme shows that some participants would refute misinformation or make requests of the author to help combat misinformation spread. Please refer to Appendix A (Strategies of refuting *misinformation* and

Strategies for requesting from the author of *misinformation*) for additional related quotes.

4.6.1 Strategies for Refuting Misinformation.

Table 15 *Example Quotes that Relate to Strategies for Refuting Misinformation*

Refute	Factors influencing the scenario	Example quote
Response would depend on the relationship	Relationship	“Depending on how close we were, I might confront them, or I might ignore it.” (P:LTTCD)
	Authority	“I have a good relationship with my manager.” (P:N3ENK)
	Trust	“Depending on our relationship, I would try to tell them that I saw or read on the news that that piece of information wasn't true.” (P:Q5GMO)
Refute by private discussion	Relationship	“I'd first probably mention it privately, with evidence in hand, in the hopes they would remove the post, redact the info, etc. If that doesn't work, I would then publicly counter their argument, and even report it to the social media platform if necessary.” (P:PD2L5)
	Authority	“I would message them privately and tell them, as to not embarrass them in public” (P:OX1LK)
	Trust	“I'd consider direct messaging them, if I feel I could change their opinion on the matter by providing a factual source that showed the correct information.” (P:YY87V)
Refute and provide a source	Relationship	“I would let the friend know that the content they provided was misinformation and give them evidence of the correct information.” (P:0MNC0)
	Authority	“I would privately message them, and send them links/sources, to explain why it was wrong, and damaging to share.” (P:AAHVV)
	Trust	“I would try to verify if other reliable sources confirmed the information and notify the original source if I thought they were incorrect.” (P:ZTS00)
	Relationship	“I would tell them right away that the info is junk/trash, and not to believe it. Seriously.” (P:QBUD9)

Refute by notifying or arguing	Authority	"I would let them know but not give them any specific action to take. I have a good relationship with my manager." (P:N3ENK)
	Trust	"I would write to the source and question them on it." (P:8BIUX)

4.6.3.1.1 Response Would Depend on the Relationship. According to some participants, correcting misinformation depends on how close they are with the author, in cases with relationship and authority factors (P:LTTC, P:N3ENK, P:Q5GMO). This result indicates that some participants would be more willing to correct their family members or close friends than others who they do not consider friends because they know those whom they consider loved ones will see it as love and due to their concern for them to have correct information. Others with whom they do not have a strong tie might be ignored since correcting these other people may take too much time and effort because of research and discussions. Thus, participants would save this time and effort for the people they care about.

4.6.3.1.2 Refute by Notifying or Arguing. This theme discusses how users refute misinformation by notifying or arguing and shows how different situations influence this argument. However, all such reactions occurred under different circumstances depending on relationship, authority or trust factors. However, there were slight differences in the ways people refuted misinformation depending on the three situations.

The situation was affected by the relationship factor, as the majority of participants would refute the misinformation by notifying or arguing. The average reaction would be done with ultimate respect and concern towards that friend. Others would be more open and would tell their friends right away that they disagree with them (P:QBUD9), while some would ask questions to determine whether the information was accurate or not (P:34SXI). They would also make fun of them for sharing misinformation (P:DPN1E). The last group would seriously talk to their friends about why they must be cautious when sharing information (P:52JYC, P:WUVC7). Moreover, others may opt for a discussion with their friends, while others may argue with them about the credibility of the information if there were uncertainties on its safety (P:39W3E). Most importantly, some participants indicated the importance of using their critical thinking skills and trying to have a reasonable discussion with their friends.

In a scenario affected by an authority factor in which a manager posted misinformation, many participants reported varying reactions to refute it by notifying or arguing. For instance, many mentioned that they would politely let their managers know that they made mistakes concerning certain facts, but they would not necessarily ask them to do anything specific regarding it (P:N3ENK, P:977EH). Some preferred presenting all of the facts and arguing because they wanted to change their manager's mind through reasoning, but only if their manager was open to this (P:3KDLP). Some participants said that there are people who already have fixed opinions and cannot be engaged in discussions because they will not change their views even when they see better arguments (P:QXZBB). Participants emphasised maintaining a good relationship with their manager and would not pursue the matter further if the manager showed no interest (P:N3ENK). There are participants who would treat misinformation from their managers differently in accordance with how its seriousness. For example, they would most likely ignore it if there was not much at stake except for a situation in which this information had societal consequences (P:MDXE9,

P:WESZX). Ultimately, participants suggested that their reaction would depend on the severity of the misinformation, their relationship with their manager, and whether it would affect their employment or its quality (P:XNQK1, P:43KIH, P:VNBLG, P:DIDI7).

In a scenario affected by a trust factor, participants reacted differently in response to a trusted source who shared misinformation. Some participants would contact the source that shared misinformation and explain their views on the shared post (P:8BIUX, P:8AEGM), while others would comment on their wrong post (P:65BV3, P:BTI5W). Some participants would communicate via the official channel or communication page of the source through which they can send their notes about the misinformation and ask for evidence in case their argument is unreasonable. If the source cannot provide a response, then they may consider it unreliable (P:QXZBB). Finally, some participants would be content to just question the source professionally (P:R6X1H). These actions can prevent the further spread of fake news and make even reputable sources accountable for what they post. The quotes suggest that some individuals often check the accuracy of information by reading other individuals' replies and counter-arguments within the comments section and then informing the source about any errors (P:M0RD1, P:04YR7). In case of a complaint, as some individuals explained, trusted sources are expected to take appropriate measures, such as correcting or removing false information. However, some individuals indicate that it is essential to correct the misinformation themselves when it comes to matters such as security, politics and health. The quotes additionally imply that people judge a source's credibility not from just one erroneous mistake but from its past track record, which may put its trustworthiness at risk if it continues the spread of fake news.

Many participants would doubt its credibility, but if it only happens once, they would consider it an error. They might also verify the latest posts of the source and contact them to obtain more details. By stressing this issue, the quotes say how critical it is for trustworthy sources to avoid spreading incorrect information, thus maintaining people's trust. This can make the source questionable and completely lose credibility among people. Sources are advised to delete the post and apologise to their readers in cases in which they are involved in posting false information. It is important for authors to ensure that the content they provide is credible and accurate.

4.6.3.1.3 Refute and Provide a Source. This theme looks at how users can refute misinformation through providing sources as well as how different situations affect this process. Relationship, authority and trust factors also trigger reactions in each situation. However, there was a difference in how they would refute the misinformation depending on each situation.

In a scenario affected by a relationship factor, many participants would refute it and provide a source, but they would react differently to a friend who shared misinformation. Some participants would investigate the information before alerting their friends (P:D4WKD, P:HNW2J), while others would engage in an informal conversation to correct the misinformation (P:Q58PJ, P:HW9AG). Some participants would offer evidence against their friends' claims and even expect them to delete the misinformation post they shared (P:0MNC0, P:PD2L5), while others would politely provide a friend with alternative viewpoints and an appropriate link (P:L2IWA, P:HK9F2, P:CD3E3). In all cases, they would remain friends and not take any actions that will increase the flow of misinformation. In

summary, refuting misinformation depended on why the friend made the post and the strength of the relationship.

According to the quote, some people may be afraid to correct their friends when giving false information because they do not want to lose the friendship. To correct misinformation properly, participants mentioned that they would first verify the information and then point out the logical mistakes, question facts, provide opposing information or sources, and try to understand the motivation behind the misinformation (P:TY8VH, P:X1APP, P:VI46H, P:1N5LA, P:M45E2, P:NA9UM). This way may be more successful in conveying the truth to the friend without expressing any condemnation. However, it is easier to correct close friends who could be open for deep talks and might be ready to accept corrections. Upon analysis, the following associations were identified: verifying and correcting misinformation, insisting on one's opinion and having deep discussions (P:R2DTW, P:TY8VH).

In a scenario affected by an authority factor, some would be confident enough to send the manager trusted links with correct information (P:AAHV, P:CLZWT, P:V1S39), while others would feel uncomfortable correcting their managers, may not trust their judgment, or might correct those who the manager misled instead of confronting the manager (P:MZODB, P:YY87V). Some people would choose their words carefully, present their point of view with fact-checked information, or politely correct the manager without questioning what the manager posted as wrong (P:XJQF6, P:3KDLP, P:HK9F2, P:9GJJZ).

Some participants would challenge the manager's misinformation, but only if it was necessary or dangerous, to avoid creating an uncomfortable working environment with the manager (P:XJQF6, P:3ADYX). Some participants viewed transparency and trust as important values at work and thus felt obligated to ensure that what their manager said was correct, and they could escalate this to upper management if the manager disagreed with the accurate information (P:3ADYX).

Several associations were identified, including correcting the manager when the misinformation was dangerous. Several reactions were also associated with managerial authority, including ignoring misinformation, politely correcting the manager by choosing words very carefully and correcting via private messages (P:HK9F2, P:YY87V). The quotes highlight that open communication and trust within a company can prevent adverse outcomes due to incorrect information. Some participants would lose confidence in their managers' abilities once they shared false information, while others would lose trust in them completely. This shows how sharing misinformation could lead participants to no longer trust their manager and be more cautious of the things they say. This can affect how much faith participants have in their managers' skills.

When the situation was affected by the trust factor, many participants refuted it by providing a source. Some participants suggested that they would check whether shared information was accurate via other sources before sharing evidence with the source who shared it incorrectly (P:ZTS00, P:L2IWA, P:9GJJZ, P:HW9AG, P:U69RU, P:VV2NP). Furthermore, most of the participants stressed that only reliable sources could be trusted to provide accurate information. Thus, the first action here is to look for other reliable sources, search for facts and share evidence with the source for clarification purposes. Some participants would also tell the source who shared the information where they could find

reliable evidence showing that the information is wrong (P:9GJJZ, P:HW9AG). Otherwise, if no responses were received from the source concerning the misleading content, it would make them consider that source unreliable (P:9GJJZ, P:S2WS4).

Some participants were concerned with ensuring the accuracy and correctness of the information they receive. They would choose to verify the information from other reliable sources to ensure they have not been given incorrect or biased information (P:ZTS00, P:L2IWA). Some other individuals trust the source of such information, even if it includes misinformation since they do not think that the source intentionally published wrong information (P:L2IWA). Some other participants would also challenge the source to ensure the shared misinformation is corrected and would not consider it a trusted source if they were not willing to correct their shared misinformation (P:9GJJZ, P:HW9AG, P:S2WS4). Some participants would verify the shared information and then share the correct information with their friends on social media platforms (P:VV2NP).

4.6.3.1.4 Refute by a Private Discussion. This theme explores users' methods of refuting misinformation through private discussions as well as how various situational factors, namely relationship, authority and trust, affect this. Refuting misinformation through private discussions slightly differed among the three situations, as shown in the quotes.

In the case where the relationship factor impacted the situation, many participants agreed that they would approach the friend who had shared misinformation through direct messages or phone calls to correct them by providing evidence and would request that their friend remove or correct the shared misleading post (P:PD2L5, P:9O460, AG2YM9OWQP690, P:6VE6Y, P:YB3HO, P:YY87V, P:T81HL, P:QIFWA, A2O486OILASFYG, P:U42D8, P:KTUSE). If the friend refuses to remove or correct it even when provided with proof pointing out its errors, some participants would publicly argue against their friend and alert others about the misleading content shared by their friend (P:PD2L5). Some participants thought that it was possible to have a private conversation with a friend, as it is a direct and confidential dialogue. This would lead to more respect in the discussion and less embarrassment for the friend. Some participants mentioned that when they feel that talking to their friends is insignificant, they may not do so.

This result is significant because the debate in private allows for a direct and confidential approach, making the dialogue more respectful between the two parties. Confidential conversations through private messages may cause the friend to be more open to hearing the facts. In contrast, discussion in public may make the friend more adherent to their opinion even if it is incorrect because requesting evidence in front of others will make the requester play the role of the 'attacker' and make the friend who spread the misinformation feel that they are being challenged and adopt the role of 'defender'.

In a situation affected by an authority, some participants had diverse reactions to their manager posting misinformation. Some participants believed that privately correcting mistakes could be more impactful than doing it publicly. This includes contacting the manager privately, discussing the information with them and asking them to remove the post, and providing them with links to articles to correct the misinformation (P:AHHV, P:OX1LK, P:SZGP0, P:6ZS7G). The approach taken here is intended to provide a better understanding of what happened and to prevent wrong information from spreading without embarrassing the manager, thereby maintaining a good relationship with them. Depending on

the severity of the misinformation, some participants would speak privately with their manager, while others would question it openly (P:Z8BAM, P:PD2L5). Another participant suggested dealing with a manager as if they were handling a loved one by notifying them privately first before taking any measures in public (P:PD2L5).

When a situation is affected by the trust factor, some participants would react differently. Some would directly comment on the post publicly, whereas other participants would try sending the right information to a trusted source via private message or email to change their minds (P:YY87V, P:FG71P, P:87FGP, P:OX1LK). Some quotes indicate that it is important that this issue is approached with sensitivity and respect, and users should consider whether it is more appropriate to do so privately or publicly. If trusted sources share the misinformation, reaching them via their email might be better than leaving comments on public pages, which may not even be considered serious or may get lost among other comments (P:B3U07).

Overall, participants reacted differently based on each scenario. Some participants would discuss and correct misinformation privately via sending direct messages to halt the further spread of misinformation. In cases where the misinformation is dangerous, some people correct the misinformation publicly. The participants emphasised the importance of having respectful and sensitive communication with the authors.

4.6.2 Strategies for Requesting from the Author of Misinformation.

Table 16 *Example Quotes that Relates to Strategies for Requesting from the Author of Misinformation*

Strategies	Factors influencing the scenario	Example quote
Request a correction	Authority	"I will most likely approach him/her respectfully and inform them about the fact that I can confirm the information shared is wrong hence should be edited or pulled down." (P:ILYX1)
Request to not reshare	Relationship	"I would advise my friend to not share such misinformation" (P:QZX1X)
	Authority	"i just advice that manager or supervisor and requested for don't share misinformation" (P:6CBLD)
Request post removal	Relationship	"I would tell them to take it down and that I was pretty sure what they posted was misinformation." (P:KMCC4)
	Authority	"I would probably tell them to take it down as well but do it a bit more diplomatically." (P:KMCC4)
	Trust	"I would privately let them know and ask them to remove it" (P:FLOEM)

4.6.3.2.1 Request a Correction. This theme shows how some participants would ask an author to correct misinformation that they shared. This reaction was not present in all situations and was only triggered by the authority factor. Some participants would approach the author and politely plead with them to correct their misinformation (P:ILYX1, P:KWB4S, P:QRGCO). This implies that some participants find it more efficient to request correction from the original authors rather than to take responsibility themselves. Some participants would be content with merely notifying the source, provided that the source admitted to

making mistakes and apologised to all misled audiences. Some participants would use this approach due to the notion that correcting misinformation is not an easy process, as it requires a lot of time and effort. This might explain why spreading misinformation happens more readily than its correction.

4.6.3.2.2 Request to Not Reshare. This theme examines how users request that the author of misinformation not share it. This was not observed in all situations, only occurring when relationship and authority factors were present.

Participants had different reactions when a friend shared misinformation in a scenario where there was a relationship factor. Some advised their friends to be cautious about what they share and recommended checking information before sharing it (P:BWUXO). Others chose to directly advise their friend not to share misinformation (P:QZX1X, P:5QMII).

The quotes explain that there is an emphasis on double-checking information before it is passed from one person to another to be proactive against the spread of false information. By doing so, we can help our friends avoid spreading misinformation because it is important to check all the details before posting something on social media. Although some participants trusted their friends, they acknowledged that their friends may be wrong at times. In such cases, correcting our friends and asking them not to repeat the mistake is crucial since sharing misleading information with others can damage relationships or mislead people. Through self-education and being mindful of this problem, we can reduce the spread of misleading data.

In a scenario affected by an authority factor, some participants reacted differently if a manager shared misinformation. Some participants faced a dilemma when their managers shared misinformation. Others wanted to prevent the spread of misinformation but did not want to lose their job. Some participants stated that they would tell their managers not to spread misinformation, but they would do so in a way that would not affect their job security (P:P4FPO). Others would explain why the information was incorrect and then ask their managers not to share it further (P:K5GUC).

The quotes explain that it is essential to consider the power dynamics between subordinates and managers and understand the manager's personality before engaging in a discussion. Some managers might perceive correction as an intrusion into private affairs.

4.6.3.2.3 Request Post Removal. This theme explores the reaction of requesting that the author remove the misinformation, which can be triggered by relationship, authority and trust factors.

In a situation affected by a relationship factor, some participants reacted differently when a friend shared misinformation. Some said they would make a crazy comment, so their friend would delete the post (P:W39BO). Others said that they would politely point out the error and strongly advise them to remove it (P:QXZBB, P:KMCC4, P:52JYC, P:XYAYB, P:L8PQL, P:51J89). If it were dangerous, though, most said that they would demand that the friend delete it (P:52JYC). They would first check who posted it, then verify with reliable sources, if possible, to avoid confusion, before asking for it to be deleted using polite, respectful language (P:51J89).

In a scenario affected by an authority factor, different approaches were suggested, such as politely requesting the manager remove the post (P:KMCC4, P:ILYX1, P:GPOWD), having a polite conversation and requesting removal of the post, and requesting an apology, if

necessary, because sharing misinformation a sensitive issue and might easily mislead people (P:KMCC4, P:GPOWD). Others recommended verifying the information by themselves before requesting removal of the post so that they could confidently make the request (P:GPOWD). Some participants would fight against misinformation that could potentially harm society, even if it meant going against their manager (P:GPOWD).

Different approaches were suggested in a scenario affected by the trust factor. Some participants suggested that they would openly challenge the source in public (P:EJQZ1). They believed that this would prevent others from spreading the misinformation and help correct those who were misled (P:EJQZ1). Others preferred to privately contact the source to verify by themselves and then ask them to remove the post if it is misleading (P:KUZGS, P:FLOEM). Both approaches are used to combat misinformation. It is important that media embrace these actions to protect society from the dangers of misinformation.

Overall, participants' reactions to misinformation posted differed depending on the relationship, authority or trust factors implicated in such situations. The majority suggested asking the person nicely to remove the post or verify it before requesting that the author take down the misinformation. However, participants were more likely to notify their friends about misinformation than their managers or trusted sources, which could also lead them to feel more obliged to correct them privately. Consequently, when friends spread misinformation over social media, users may command that they 'delete the post'. From these findings, it is evident that friendships play a role, as friends will guide and correct each other to establish facts. The data show that people do not tend to contradict a source that spreads misinformation unless the shared misinformation post is dangerous enough to influence state policies. Arguing, notifying, correcting and discussing misinformation privately was consistent across different conditions.

In summary, this theme shows the complex methods for combating misinformation by engaging authors and considering relationship dynamics, authority, and trust. The approach used to combat misinformation with authors differed, having its own significance depending on how close they were to the source. Different approaches, including direct confrontation or private conversations, may result in the user easily obtaining answers from their relatives without insults or fights. These decisions often lead to evidence-based arguments; some individuals would refute false information immediately if it was dangerous, whereas others would rather have a respectful private conversation before refuting the false information. Many participants preferred politeness when addressing authors, especially if an authority was involved. Consequently, the problem of misinformation calls for critical thinking and accountability among the users, who should rely on trusted sources to correct it promptly. Moreover, respectful communication is important for correcting misinformation. Private discussions are recommended so that relationships will not be damaged and people can remain factually accurate while fighting against false information.

4.7 Actions to Take When Misinformation is Identified

Participants generally took different actions against misinformation depending on whether the authors was a friend, manager or trusted source. The data showed that users were more willing to take action against a trusted source than a friend or manager. They were more willing to forgive friends for posting incorrect information, but they questioned trusted sources more often than usual. Furthermore, only a small number of participants mentioned using the "mention" option in any of these scenarios. Please refer to Appendix A (Actions on

the misinformation posts and Actions on the users who post the misinformation) for additional related quotes.

4.7.1 Actions on the Misinformation Posts.

Table 17 *Example Quotes that Relate to Actions Taken Against Misinformation Posts*

Actions	Factors influencing the scenario	Example quote
Hiding the misinformation post	Authority	“i would ignore it completely and simply hide the post” (P:51J89)
	Trust	“hide it” (P:VHW6T)
Disliking the misinformation post	Trust	“I would probably dislike it and unfollow.” (P:833FE)
Resharing the misinformation post	Relationship	“yes, I want to share with my friends with feelings sad.” (P:V6NV8)
	Authority	“I would gossip about him sharing misinformation to other co-workers” (P:YV7EF)
	Trust	“I would share it adding my opinion about the topic” (P:6SRO7)
Tagging the misinformation post	Authority	“I would tag it on the platform and then move on.” (P:AM00C)

4.6.4.1.1 Hide the Misinformation Post. Hiding misinformation posts was observed when there were authority and trust factors that influenced the situation (P:51J89, P:VHW6T). The quotes indicate that individuals who hide misleading posts on social media behave this way because they do not want to be influenced by them. Some people may hide these posts so that they do not see them again, but this approach may not effectively eliminate misinformation as a whole, which is why health authorities need to address this through education and awareness campaigns.

4.6.4.1.2 Disliking the Misinformation Post. Disliking a misinformation post (P:833FE) occurred only when a trust factor influenced the scenario. Disliking the post may occur because it would reduce the importance of the misinformation post (P:6734Q). It could also be an attempt to warn other users about misinformation without discussing it. Disliking a post containing misinformation can reduce its chances of going viral and appearing on the trend list. This could be an essential reaction since this might help to identify misinformation on social media platforms. For example, when many dislikes are found in a post concerning a significant health topic, it may contain false information. Therefore, a post with many dislikes may be flagged as suspicious.

4.6.4.1.3 Resharing the Misinformation Post. Resharing misinformation posts was observed in situations with relationship, authority and trust factors. In any case, people can react by forwarding or sharing the misinformation; however, this reaction differed across the three scenarios. For instance, in a close friend scenario, people would share because they want their families or friends to know what is happening (P:V6NV8). In the manager situation, individuals may forward or share information with their colleagues to be backbiting or gossip about the manager (P:YV7EF). In a trusted source scenario, some participants

would share the misinformation post on other social media platforms to add their views on the subject matter (P:6SRO7).

4.6.4.1.4 Tagging the Misinformation Post. Tagging a post as misinformation was observed with authority and trust factors. In a situation where an authority factor had a role, some participants said that they would tag the post and move on (P:AM00C). This suggests that the participant might want to use it as evidence of a mistake in the workplace against their manager or verify it later on to correct their manager. In situations influenced by trust, tags may be used by some participants so that they can correct their source when they have more time (P:026JE, P:026JE). Such behaviour implies that there are people who mark misinformation posts to refer back to them or comment on them in the future (P:WMRBL). Overall, some users would tag posts containing misinformation when authority or trust factors were involved in a situation. Some participants tagged posts for later evidence in authority scenarios or as a reference to correct the trusted source later when they have more time.

4.7.2 Actions Against Users Who Post Misinformation.

Table 18 *Example Quotes that Relate to Actions Taken Against Users Who Post the Misinformation*

Actions	Factors influencing the scenario	Example Quote
Snoozing the user	Relationship	"I will give them a few passes, then mute for 30 days, if it keeps happening then a block is next" (P:3WFW2)
	Authority	"I would snooze their posts for 30 days and try to avoid discussing COVID with them in person at work since we disagree and getting into an argument could hurt me at work." (P:ZX1N6)
	Trust	"I put them on ignore. I don't unfriend them, but I put them on ignore so I don't have to see their posts. I would also ask them for their source(s)" (P:O1F23)
Unfollowing the user	Relationship	"If deliberately sharing misinformation then I unfriend/block but if it's an accident I try to bring to their attention" (P:977EH)
	Authority	"Unfollow them" (P:AGJ4G)
	Trust	"I would have to reevaluate my opinion on the trustworthiness of the source, and I might discontinue using it as a source of information." (P:AUNON)
Reporting the user	Relationship	"I would report the post and possible make a comment on the post about why the information is misinformation." (P:3ON0J)
	Authority	"I would make an anonymous complaint with HR so as not to put my job in jeopardy." (P:OY2RG)
	Trust	"I would report it as it's probably an error" (P:YR0H3)
Blocking the user	Relationship	"Block them if it becomes too egregious..." (P:6PA5Y)

	Authority	“roll my eyes and block him/her” (P:XDQI7)
	Trust	“I would fact check their information and try to understand if what they are saying is factual. If it was indeed misinformation, I would have to consider blocking them.” (P:6JA08)
Mentioning the user	Relationship	“I mention it to someone else but would try not to be rude.” (P:T1SG9)
	Authority	“I would mention it to them, and let them know it may not be accurate and they need to look into it further” (P:65BV3)

4.6.4.2.1 Snoozing the User. This theme examines why users snooze people who post misinformation. This reaction was present in situations with relationship, authority and trust factors.

In situations where a relationship is involved, Some participants said that they would use the social media’s snooze button or even unfriend/block close friends if they shared misinformation to prevent them from continuing to share misinformation with them (P:3WFW2, P:338OL, P:MDXE9). However, dangerous misinformation could spoil a friendship; thus, a user uses an action such as snoozing to prevent the friend for some time and to allow their friends to obtain accurate details and arrive at their own understanding.

When an authority was involved in the situation, some participants chose to manage the situation by snoozing a manager who repeatedly shared misinformation posts (P:ZX1N6, P:HJEDA, P:N65UM). Some participants thought that snoozing the manager would make them feel like they took action and would provide relief from built up anger over their manager sharing posts not backed up with facts (P:N65UM). Some participants would avoid talking with their manager about it face to face to prevent any conflict that could harm their relationship (P:ZX1N6). This implies that participants fear disagreeing with a manager because of the potential consequences.

In a scenario affected by trust, some participants would snooze the person, while others would report the post and then snooze the source if they continued sharing false information (P:O1F23, P:HJEDA). Some participants confirmed that they would not unfriend the source but would snooze them to avoid seeing their posts and to prevent similar posts from appearing (P:O1F23).

Overall, some participants used the snooze option on social media to protect themselves from false information. Some would unfriend or block users for persistently sharing misinformation. In situations in which an authority was involved, some chose to snooze to avoid conflict with supervisors. When trust was a factor, participants tended to snooze or report the source instead of unfollowing them.

4.6.4.2.2 Unfollowing the User. Some participants would unfollow users who share misinformation posts in situations affected by relationship, authority and trust factors.

In a situation affected by a relationship, some participants said that if their close friend intentionally shared misinformation on social media, they would unfollow or block them altogether because spreading misinformation intentionally is unacceptable behaviour and threatens society (P:977EH, P:6LT0I, P:55E8X). Regarding how they can know whether

their friend posted intentionally, some participants indicated that they know their close friends very well and would be able to determine if their friend intentionally posted something factually incorrect. If their friend shared false information, especially about conspiracy theories, some participants would distance themselves from their friend. Some people also said that if their friend repeatedly shared false information, they would talk to them about it. If the friend did not stop sharing misinformation after their conversation, they might end the friendship (P:PLV69).

In a scenario affected by an authority factor, some participants would unfollow their manager when they shared misinformation due to conflict (P:AGJ4G). Some quotes also indicate that the receiver's reaction would be hard to predict. The dissemination of misinformation is a social problem that cannot be tolerated.

In a situation involving trust, some may stop following a source that spreads misinformation, and others may verify the information using multiple sources before they eventually unfollow the user or express doubt about their legitimacy as a trusted source, which may lead them to unfollow that source in the future (P:AUNON, P:VI46H, P:5OM3D). Consequently, trust affects whether followers continue with or stop following a source.

Overall, some participants would stop following or block those who disseminate false information due to a loss of trust. Even close friends can end their friendship if misinformation is being spread repetitively. Trust plays an important role in whether followers will continue or cease to follow a source. Some followers can no longer have trust in a source when it is confirmed that they are sharing information that is not true; they may unfollow that source in the future.

4.6.4.2.3 Reporting the user. Some participants would report authors who shared misinformation posts. This reaction was present in all situations, whether triggered by relationship, authority or trust.

In situations involving a relationship factor, some participants would report the post and comment on it (P:3ONON), while others would quietly report it without commenting on it (P:F8R5N). Others preferred privately explaining the facts to their friend before reporting them (P:PD2L5). Some participants said that they would speak with their friends if they repeatedly spread misinformation. If the friend continued to share misinformation despite the conversation, they would end the friendship. This behaviour showed that some participants were severe when their friends spread misinformation, which might indicate that they care about their close friends.

In a scenario affected by authority, some participants would report their manager when they shared misinformation (P:OY2RG, P:3ONON, P:PYMTU). This suggests that some participants, for the protection of society, would not tolerate their managers spreading false information. Some participants also said they would anonymously speak to human resources if their manager shared misinformation to avoid risking their jobs (P:OY2RG). Others, however, would report it but not directly inform their manager or comment on the post because they would fear revenge (P:3ONON). This illustrates that some individuals might be unwilling to report their manager and that a construct must guarantee their identity is hidden. A few participants said they would report the manager because they are an authority figure (P:PYMTU). Managers and other influential people should be cautious and verify information before posting it. Some other participants would discuss it privately with

their managers before deciding whether to report them (P:PD2L5, P:QP690). In such a case, some participants might seek another job or resign if their manager persistently shared misinformation. Such rumours at work can lead to job losses and require laws that prevent employees from exchanging misinformation among themselves. Some participants suggested escalating the case to the board of directors, while others preferred discussing it with human resources (P:OY2RG, P:3ONJO, P:PYMTU, P:PD2L5, P:QP690).

When the trust factor affected the scenario, some participants would report and alert the source (P:YR0H3, P:HPSDX, P:3ONJO), while some went ahead and verified information through other sources before taking action (P:QP690, P:XNQK1). The source's reputation influenced how participants would deal with the shared misinformation.

Overall, participants' actions toward users who shared misinformation differed when the scenario was affected by relationship, trust and authority factors. They either reported the site before posting comments or ignored them. Thus, reporting anonymously and checking facts with different sources were common responses. The objectives ranged from helping social media platforms remove false information or warning the sources to making the source correct the post.

4.6.4.2.4 Blocking the User. Users would block accounts that post misinformation in situations with relationships, authority and trust factors.

When a relationship affected the situation, some participants indicated that they might choose to ignore, unfollow or block their friends; however, they might do so if they had already tried to explain the correct information to them and they were still convinced by the misinformation (P:6CY9L, P:PWHPR). They would block their friend if that were the only alternative left but only if things reach the extreme end or when someone loses their patience.

The quotes imply that it is often better to ignore the situation for some time as a means of solving the issue. Unfollowing is generally considered less harsh than blocking. There are instances in which blocking might be a better option to avoid wasting time debating with the author and to be patient when reading their misinformation (P:6PA5Y). False information can make people lose their patience and lead to them ignoring or blocking the person spreading it. Therefore, how patient people are may determine how they would react to untrue information.

In a situation with an authority factor, some participants would just block the manager directly (P:XDQI7). Another participant would only communicate whenever necessary after blocking their manager (P:PLV69), while yet another would consider asking questions to get the manager's opinion before potentially blocking them (P:RL4HJ).

The quotes imply that blocking the manager could have negative consequences as it might ruin work relations and disturb production within an organisation. It is advisable to act rationally and with a sense of diplomacy when dealing with a manager who has control over an individual's income.

When trust played a role in the situation, some participants said they would fact-check the information and decide whether to block the source (P:6JA08), while others would simply ignore or block the account sharing the misinformation (P:T6OSJ).

The quotes imply that validation is important in decision-making and the reaction to misinformation; it also illustrates how some people block others without determining whether information is accurate and prefer faster options, such as ignoring or blocking, instead of

something that would require more effort, such as validation and correction. Overall, depending on the relationship, authority, or trust factors, users may choose to ignore, unfollow or block individuals who share misinformation. In such cases, blocking may not be an easy step, especially when a manager is involved. Verifying the information is important, and users may opt to crosscheck it before determining whether to block the author.

4.6.4.2.5 Mentioning the User. Mentioning others in a post that contains misinformation was not a reaction presented in all situations, except those directly linked with authority and relationship factors. In the relationship context, some participants pointed out that they would approach this respectfully due to friendship and suggested tagging their friend to ensure that it gets noticed (P:T1SG9). In case of an authority figure, some members proposed that they would bring the error to the attention of their manager and ask them to look into it more carefully (P:65BV3). Overall, some people used the “mention” option when combating misinformation by politely raising the matter, tagging friends or even prompting their manager for further investigation.

In summary, this theme explained that reactions to misinformation depend on their relationship with the author, authority dynamics and trust. Notably, the theme shows that actions were more likely taken against trusted sources than friends or managers; thus, there is less forgiveness when dealing with trusted sources than friends and extra careful consideration when dealing with managers. These actions range from hiding, disliking, resharing, tagging, snoozing, unfollowing, reporting and blocking users that post misinformation depending on relationship, authority and trust factors. This theme stresses polite communication and verification of information, which fosters trust and ensures that relationships do not break when combating fake news.

4.8 Ignoring the Misinformation

Avoiding or ignoring misinformation was highly observed in the data whether the scenario was affected by relationship, authority or trust factors. Ignoring misinformation was a significant response among participants. In this context, most participants would ignore their manager more than their friend or a trusted source. Participants pointed out various ways and reasons why they would ignore misinformation. Please refer to Appendix A (Ignoring Misinformation) for additional related quotes.

Table 19 *Example Quotes that Relate to Ignoring Misinformation*

Subtheme	Factors influencing the scenario	Example quote
Ignoring	Relationship	"I wouldn't do anything. That is not my concern." P:438E7
	Authority	"I would do my best to ignore them and remain as professional as possible in the workplace." P:QQHGC
	Trust	"I would ignore the misinformation and not trust that source anymore." P:7DPZG

In situations in which a relationship is involved, many participants would ignore friends who share misinformation for various reasons, such as believing in their friend's right to their own opinions, hearing different interpretations, avoiding conflict and protecting the friendship, lack of time, or not wanting to insult their friend (P:438E7, P:1DRFO, P:UX6XS, P:GE2UW, P:M0RD1, P:3DQ3G, P:2ZCR0, P:G0CYR, P:MC5NV). Additionally, some participants would not engage with the person spreading misinformation, while others would only respond to dangerous information that could easily be proven wrong or correct (P:DU10C, P:33333, P:YOM8Y, P:SK3ZZ, P:QGYB7, P:G7HDE, P:O24TN).

The quotes indicate that some people prefer not to address misinformation shared by their friends because they respect their opinions even when they are wrong. This makes it hard to fight misinformation. Therefore, awareness of the significance of working against misinformation should be enhanced to encourage people to process and report it, even if it means uncomfortable conversations. The quotes also indicate some reasons for ignoring false information from friends: thinking that this is something friends can do for themselves, not feeling like a good enough friend and doubting that they can control what their friends think. This raises a flag for an important issue—people might be less proactive to counter misinformation. To counteract this problem, there need to be solutions that respect individual perspectives, such as developing a social media feature in which users can flag a post as inaccurate without arguing with its author.

In cases affected by authority, many would ignore managers when they share misinformation to avoid damaging their professional relationships or risking their jobs (P:QQHGC, P:ELLB0, P:0525D, P:UV141, P:SK3ZZ, P:3DQ3G). Others would confront the manager if the misinformation affected their work quality, suggesting ways managers can ignore misinformation, such as not taking any action, ignoring the misinformation but changing their opinion about the manager personally, or nodding their heads and changing the topic to avoid unproductive conversations (P:M0RD1, P:8OVGN, P:DSKMA, P:4IUUN, P:DUC5V, P:977EH, P:GE2UW, P:HIXXL, P:QBUD9, P:WESZX, P:B0NS4, P:6NA18, P:X1APP, P:55E8X).

The quotes emphasise that managers should avoid sharing misinformation with employees to maintain their trust and respect. False information may cause fear among employees, job security issues or destroyed relationships; therefore, employees need to be trained to disagree and respectfully correct false information spread in the workplace. There should be clear human resource rules to prevent employees from spreading misinformation. Additionally, users should know where to obtain reliable, correct information. Freedom of speech should not be used as an excuse for spreading misinformation that can hurt others.

In a scenario influenced by a trust factor, many participants would ignore the misinformation. Some participants provided reasons why they would ignore trusted sources when they encountered misinformation, including that the source had the right to believe whatever they wanted (P:XGL47), misinformation is spread at a significant level anyway (P:WESZX), and it would be hard to contact the sources (P:FKK3Z). They would also ignore the misinformation if it was not dangerous (P:O06EG).

The quotes show that some participants trust the source, and even when they post misinformation, they ignore it and continue to follow the source (P:FKK3Z). Some others assume that other users will report it and that there is no need to do anything about it

(P:JSLQW). However, some participants' attitudes towards sources sharing misinformation were positive but might be changed when there were no quick responses to correct the posted misinformation (P:TG1NX). Trusted sources need to be cautious about sharing unverified facts, especially for life-threatening or dangerous misinformation. Therefore, sources need to take steps against such misinformation and deal with it immediately (P:7DPZG).

In summary, this theme shows that ignoring misinformation is driven by relationship, authority and trust factors. Typically, a friend would be ignored to keep the peace and maintain the relationship and because participants valued the views of their friends. Similarly, it is common to ignore misinformation propagated by a manager at the workplace to maintain job security and other employment benefits. In addition, participants might consider misinformation to be a mistake from a trusted source and assume that it will be corrected. Therefore, confrontation issues, lack of time for verification and plenty of sources that are untrustworthy cause misinformation to be overlooked. Strategies need to be put in place to address this while considering peoples' diverse opinions and relationships.

4.9 Summary

This study found that even though the majority of participants were aware of the unreliability of COVID-19 information on social media, they still tended to access it from these platforms. Participants relied on trusted sources, such as CNN, government websites, CDC, BBC, Fox News and New York Times. Credible information must have a credible source, be compatible with several sources, be sufficiently detailed, have logical arguments, be objective and consistent with previous knowledge. It must also be free from fiction, exaggeration and emotions and must not contain hateful or extremist words. There was an association between individuals' background factors and their reactions to misinformation and between encountering misinformation on social media and individuals' attitudes towards social media platforms, which will be tested to determine whether the associations are significant.

In different situations, participants' reactions to posted misinformation are contingent upon relationship, authority and trust factors. Participants' reactions to misinformation usually involve a refined mixture of internal and external methods of authentication, which are used to assess the credibility of the information. The former investigates content reasonableness, political bias and conformity with past experiences; thus, it highlights the importance of logical reasoning, societal relevance and impartiality. The external methods generally assess the source's credibility and question the author, with strategies shaped by relationships, authority and trust levels. In most instances, many participants, either privately or publicly, use respectful communication when providing arguments without necessarily providing a source. Providing a source that fact-checks the information was another correction strategy. Operationalising this approach ranges from engaging in nuanced discussions involving users themselves to taking action against misinformation, such as reporting/blocking. The approach to misinformation also varies, with some choosing to ignore it due to concerns about confrontation or the overwhelming presence of unreliable sources. Trust in the information source plays an essential role in these reactions, emphasising the importance of credible sources and respectful communication.

Chapter 5: Participants' Reactions to Misinformation: Insights from Different Types of Misinformation - Results

5.1 Chapter Overview

This chapter presents the findings of an investigation into participants' reactions to different types of misinformation (difficult, moderate and easy to spot) in scenarios provided for them. Participants were asked to evaluate three synthetic tweets containing misinformation. The participants had three minutes to investigate (by researching the topic) the posts shared on Twitter and were asked to agree/disagree. The study also included a question to assess how participants might respond to the tweets, with a list of typical reactions and an "other" category for additional responses. More information about the scenario-based behavioural tasks can be found in Section 7 of the Questionnaire design (0). The misinformation tasks were developed to capture how participants respond to misinformation at different levels of difficult, moderate or easy. For instance, these levels were chose to evaluate certain traits associated with age, education and employment, which underpin the verification strategies used to identify falsehoods. Consequently, this study sought to determine whether overreliance on information sources, demographic factors or verification methods impacted people's reactions to fake news, such as sharing it among friends, reporting or ignoring it, and taking action against it.

5.2 Difficult to Spot Misinformation (Behavioural Task 1)

The nature of this post was purely medical, as it was found that COVID-19 was not controlled and the use of annual vaccinations was adopted.

5.2.1 Level of Agreement

The pie chart in **Figure 13** presents the distribution of the levels of agreement that participants had with the difficult behavioural task, which suggested that COVID-19 would require a yearly vaccine. Overall, 435 (42.9%) participants agreed with this statement, and 373 (36.8%) disagreed with this statement. An additional 206 (20.3%) found it difficult to disagree or agree. One of the problems when it comes to misinformation is when a statement is made that contains both correct and incorrect information thereby making verification difficult. Referring to the tweet focusing on COVID-19 vaccinations, there are two claims that can be distinguished: (1) the claim that it is necessary to vaccinate against COVID-19 every year from now on, and (2) the assertion that the World Health Organization of the United Nations (WHO) said this. It is evident that it was not stated by WHO, but the idea of having to keep getting vaccinated against COVID-19 every year is still something that could be entertained. There have been also views that perhaps, to sustain immunity, some form of regular booster may be required, and, therefore, this part of the message is somewhat believable. This creates some sort of a bind for the people who have been cross-verifying the tweet. it is possible that one part of the message corresponds to scientific evaluation, the verifiers may beleve the conceivable element (the need for yearly vaccination) and and fail to verify the untruth (the attribution of the claim to WHO). Therefore, the inconsistency of evidence does not allow corroborating the absolute certainty of cause-and-effect relationships

Figure 16 Participants responses to Behavioural Task 1

Figure 13 Top - Pie chart presenting to what extent participants agreed with the post (Behavioural Task 1) **Error! Reference source not found.** **Figure 14** Top - Bar chart showing participants reactions to the misinformation (Behavioural Task 1). **Figure 15**, Bottom - Word cloud analysis of open-ended questions on what sources they used to answer (Behavioural Task 1)

6.2.2 Reactions to Misinformation

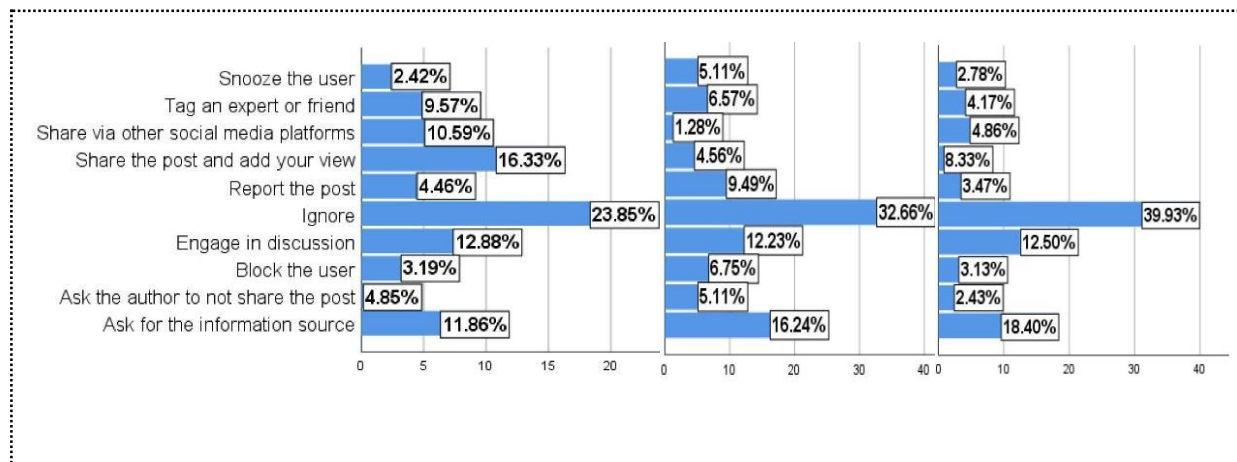
Figure 14 Bar chart showing **participants' reactions to the misinformation** (Behavioural Task 1) on social media (Behavioural Task 1). Many participants would ignore the post (n = 481; 29.7%), ask the author of the post for the information source (n = 235; 14.5%), engage in discussion with the author of the post (n = 204; 12.6%), or share the post and add their own view (n = 104; 10.9%).

6.2.3 Participants Reactions Grouped by Level of Agreement or Hesitation

Figure 17 presents how participants reacted to the difficult behavioural task, grouped by their level of agreement or hesitation. Overall, most people across the different levels of agreement would ignore the post. Among the participants who agreed with the misinformation, a considerable number would share the post and add their own views, while a few would ask for the information source. Among participants who disagreed with the post, several would ask for the information source, while a few would engage in discussion. For the participants who found it difficult to say, many said they would ask for the information source, while only a few would engage in discussion. Participants seemed more likely to ignore the post when they were hesitant or disagreed with the post and would consequently choose to ask the author for the information source. Participants who agreed with the post were more likely to share and add their own view than those who hesitated or disagreed with the post.

Figure 17 Bar Charts Presenting How Participants Would React to a Difficult Behavioural Task (the Pfizer Vaccine Being a Yearly Vaccine). Distribution of Behaviours for

Participants Who Selected: A - “I Definitely Agree” or “Somewhat Agree”; B - “Definitely Disagree” or “I Somewhat Disagree”; C - “Difficult to Say”



5.3.2 Moderately Difficult to Spot Misinformation (Behavioural Task 2)

The nature of this post was conspiratorial, indicating that some people are working to create a world-threatening virus in a laboratory. This task was related to initial news about the origins of COVID-19 linked to bats and stated that the virus was accidentally released from a lab. At the time of writing, the origin of the virus was not confirmed, making it misinformation. At the time, there was much discussion around how the pandemic might be stopped, with less official investigations on the origin.

5.3.1 Level of Agreement

Figure 18 presents the distribution of the participants' level of agreement to a moderately difficult to spot behavioural task (origin of COVID-19 as a lab accident). Overall, 486 (47.9%) participants disagreed with the statement, 246 (24.2%) agreed, and 282 (27.8%) were hesitant to agree/disagree. Some participants mentioned:

“It's possible someone knows where it originated and how, but those people aren't the ones posting it on social media. It also doesn't really matter how it originated to laymen all that matters is trying to stop it.”. P: IN5LA

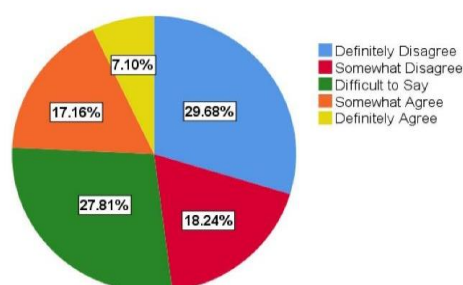


Figure 18 A simple pie chart presenting to what extent participants agreed with the post (Moderate Behavioural Task)

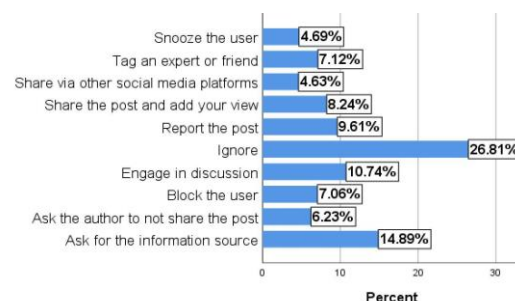


Figure 19 A simple bar showing participants' reactions to combating misinformation (Moderate Behavioural Task)



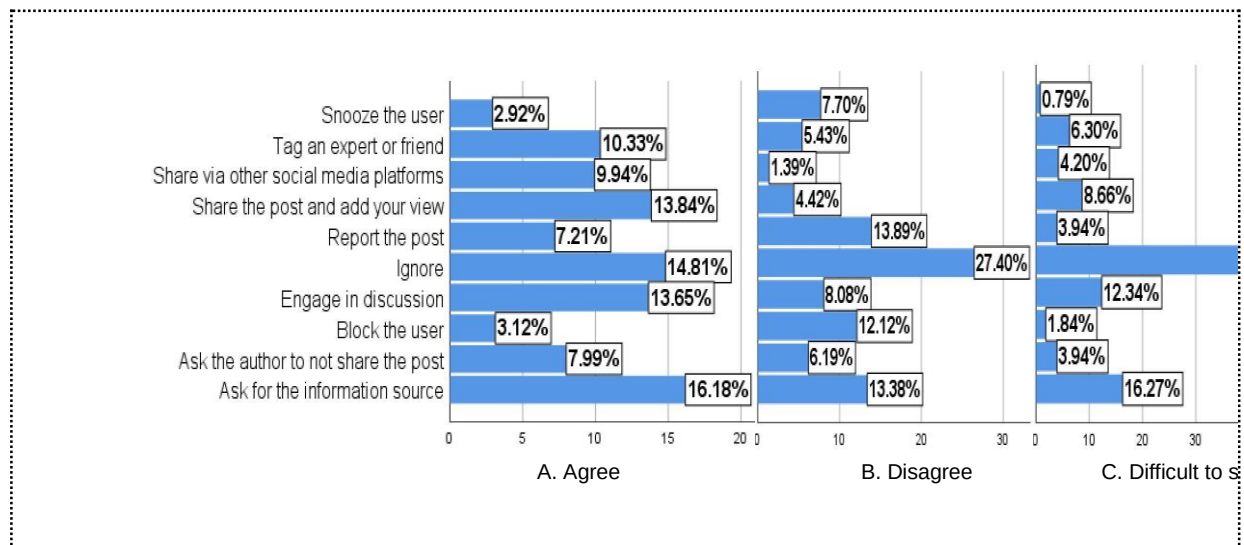
Figure 21 Participants responses to the Moderate Behavioural Task

5.3.2 Reactions to Misinformation

5.3.3 Participants Reactions Grouped by Level of Agreement or Hesitation

Figure 22 Bar Chart Presenting How Participants Would React to the Moderate Behavioural Task (the Origin of COVID-19 as a Lab Accident). Distribution of Behaviours for

Participants Who Selected: A - “I Definitely Agree” or “Somewhat Agree”; B - “Definitely Disagree” or “I Somewhat Disagree”; C - “Difficult to Say”



5.4 Easy to Spot Misinformation (Behavioural Task 3)

The nature of this post is conspiratorial, stating that the names of viruses are released on a scheduled basis.

5.4.1 Level of Agreement

shows how participants reacted to the easy behavioural task (COVID-19 variants are planned). Overall, 704 (79.4%) participants disagreed with the statement, 176 (17.3%) agreed, and 134 (13.2%) were hesitant to agree or disagree.

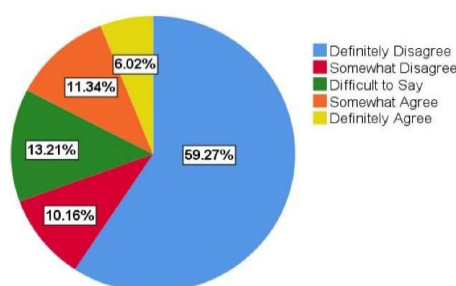


Figure 23 A simple pie chart presenting the extent to which participants agreed with the post (Easy Behavioural Task)

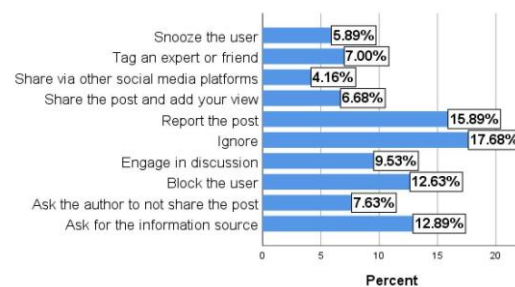


Figure 24 A simple bar chart showing participants' reactions to combating the misinformation (Easy Behavioural Task)



Participants would also ask for the information source, while several would tag an expert or friend. Among the participants who would disagree with the post, most would report the post, ignore it or block the user who posted the information. Among participants who were hesitant, many would ignore the post, ask for the information source or engage in discussion.

5.5 Cross-task Analysis: List of Other Reactions that the Participants Would Express

As shown in **Table 12**, some participants had other reactions that they would likely show towards behavioural tasks 1, 2 and 3 that were not covered in other categories.

Table 20 List of Other Reactions that the Participants Would Express Towards Behavioural Tasks

Reactions to misinformation, Agreements and Difficulty levels	Agreed			Hesitant			Disagreed		
	Difficult Task	Moderate Task	Easy Task	Difficult Task	Moderate Task	Easy Task	Difficult Task	Moderate Task	Easy Task
Verify the post	X	X	X	X	X	X	X	X	X
Like the post	X								
Share the post	X								X
Engage in discussion with author					X				X
Engage in discussion with others	X	X							
Would not share the post	X				X				X
Would not engage in discussion					X				
Reply to the post with an opinion	X							X	X
Reply to the post with a reference	X				X		X	X	X
Ask the user to take down the post							X		X
Sigh									X
Laugh									X
Wait for more info				X		X			
Keep up to date on the topic					X				
Remove the post from the feed								X	X
Block the author								X	X
Disregard		X			X		X		X

Overall, some participants made sure that the information they read were true by verifying it through trustworthy websites, such as journals, or looking it up on Google. Other participants would ‘like’ or share the post with more people. If they agreed with the post, they would share it; if not, they might still talk about it with their friends. However, some participants decided not to share the post at all, even if they thought it was true, because they were worried about spreading misinformation.

When some participants wanted to express their opinions by replying, whether they agreed with it or not, they often added their thoughts and sometimes even brought up facts to back up their arguments with references. Participants who were initially hesitant engaged in discussions to ask others what they thought or questioned the person who made the post. Hesitant participants preferred to double-check the information on their own instead of sharing it online.

There were also some participants who just ignored posts they did not like or thought were fake to avoid getting upset or spreading misinformation. Some even asked for these posts to be taken down or just blocked the person who posted them. Lastly, some participants had different reactions, such as just sighing and hoping things would get better, laughing off something silly, or waiting to see more information before they took action. Please see Appendix B (**Error! Reference source not found.**) for more details.

Overall, the results indicate three key findings. According to the results of the three behavioural tasks, people tended to ignore and inquire about the source of information. For instance, many participants agreed with the misinformation that the COVID-19 vaccine would need to be taken annually. In response to this post, most reactions were to either ignore it or ask for the source. In contrast, when presented with the second misinformation post, which claimed that the COVID-19 virus originated from a laboratory accident, most participants disagreed with it and mostly ignored it. Similarly, in the third misinformation task, most participants disagreed with the post claiming that COVID-19 variants were planned. In response, most reactions were either to ignore, report or block it.

This study found that participants’ responses to different types of COVID-19 misinformation on social media varied based on their level of agreement. In Task 1, 42.9% of participants agreed with the misinformation about COVID-19 being a yearly vaccine. However, most participants would either ignore the post or ask for the information source. In Task 2, a smaller percentage (24.2%) agreed with the idea that COVID-19 was created in a lab. Those who agreed with the post were more likely to ask for information sources or share it on other platforms. In Task 3, participants generally disagreed with the statement about planned COVID-19 variants and would ignore or report it.

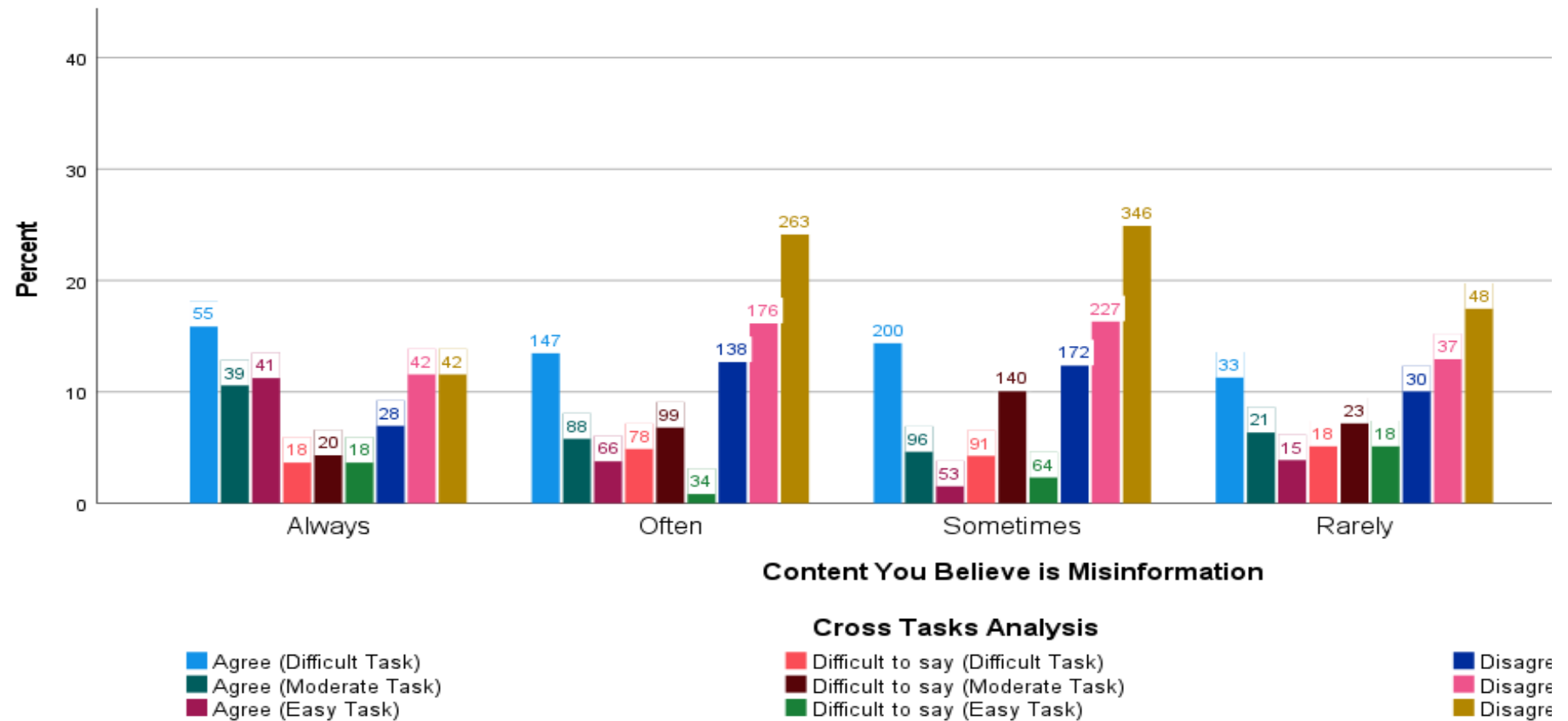
The presence of clear markers or cues in the post, such as a “This fact is disputed” mark or poor image quality, aided participants in identifying the nature of the misinformation. For instance, in Task 1, in which participants were presented with misinformation about COVID-19 being a yearly vaccine (The post has NO “This fact is disputed” mark), 42.9% of participants generally agreed with the misinformation. In Task 2, participants were asked about their agreement with the idea that COVID-19 was created in a lab (The post has “This fact is disputed” mark), and a smaller percentage (24.2%) agreed with this idea compared to Task 1. In Task 3, which involved a post about planned COVID-19 variants (The post has “This fact is disputed” mark and poor screenshot image), and participants generally disagreed

with the statement. The presence of a “This fact is disputed” mark in the post, along with a poor screenshot image, made it easier for participants to identify the nature of the post as misinformation compared to the previous tasks.

5.6 Cross-task Analysis: Identifying Misinformation Across Difficulty Levels

5.6.1 The Impact of Frequently Encountering Misinformation on the Ability to Identify It

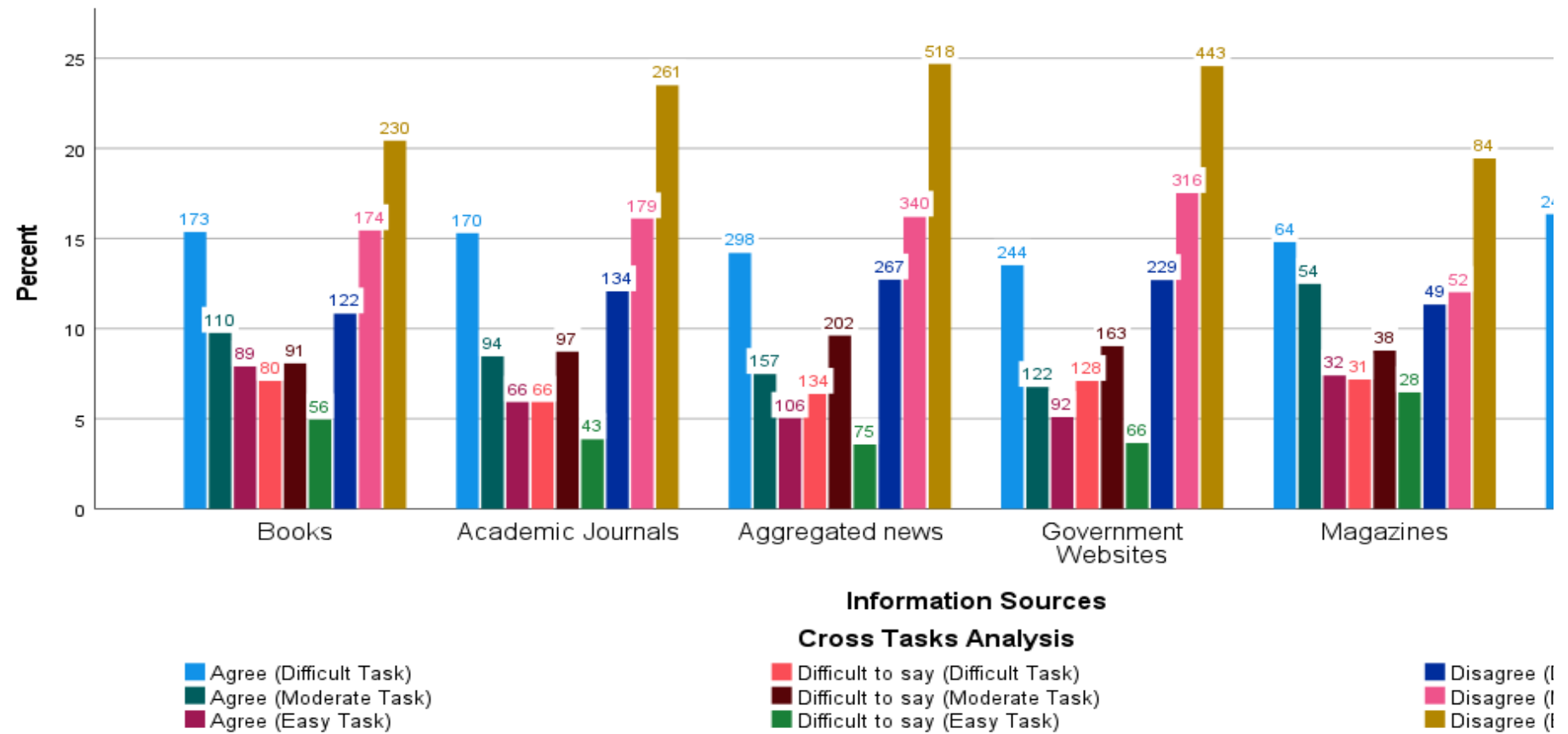
Participants who encountered misinformation always or often were able to identify misinformation in the easier tasks than in the moderately difficult and difficult tasks. Participants who encountered misinformation always and often demonstrated a possible relationship between task difficulty and their agreement with misinformation, agreeing more often with the difficult task and disagreeing with the easy task. The hesitation was greater among those who encountered misinformation always and often in the moderately difficult task compared to the easy and difficult tasks. However, there was no apparent difference in identifying misinformation among the group that rarely or always encountered misinformation.

Figure 28 *Impact of Frequently Encountering Misinformation on the Ability to Identify It*

5.6.2 The Impact of Preference in Information Source Type to Verify Information on the Ability to Identify Misinformation

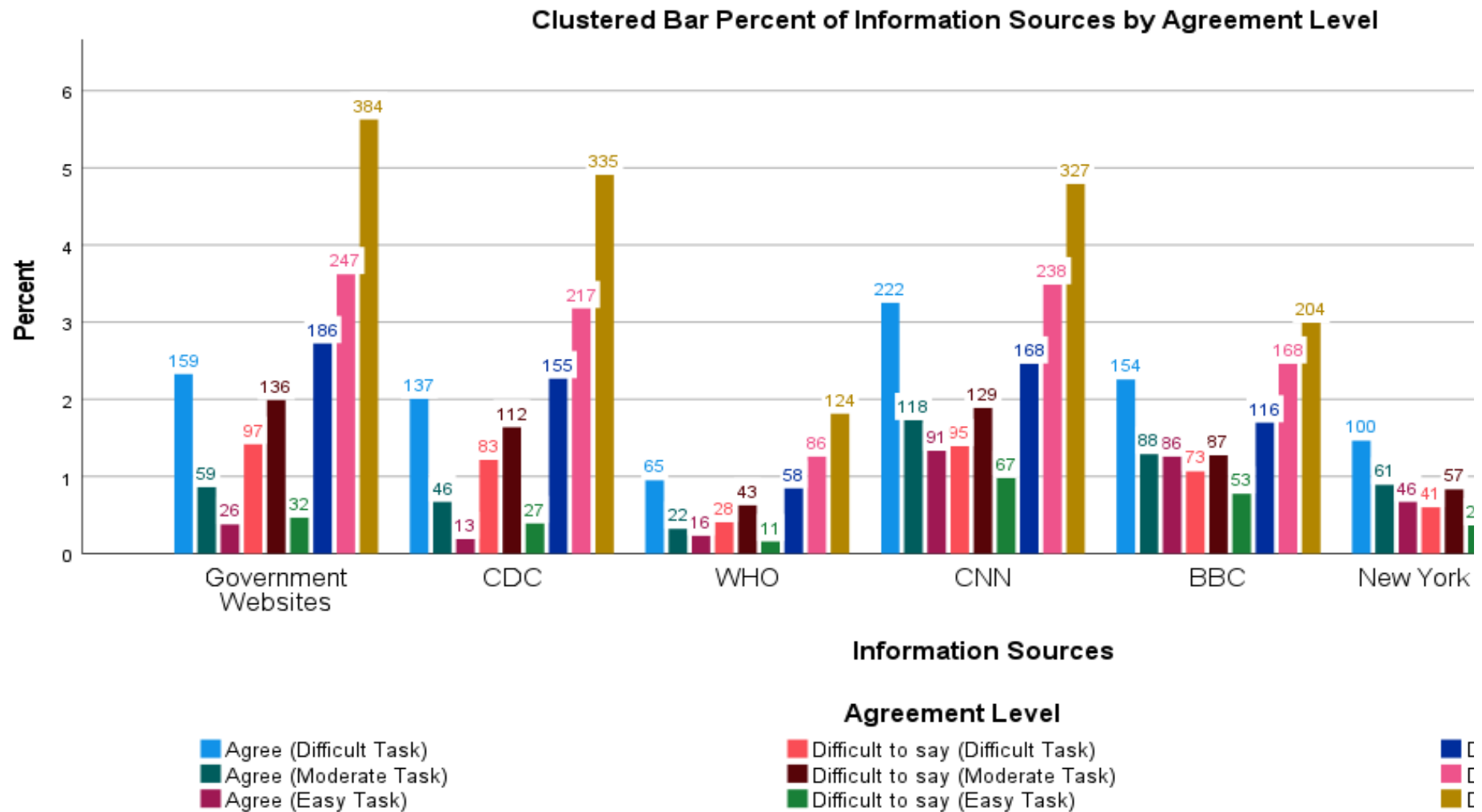
Participants who relied on aggregated news and government websites were more successful in identifying misinformation in easier tasks than in moderately difficult and difficult tasks. The hesitation was greater among participants who relied on aggregated news and government websites in the moderate task compared to the easy and difficult tasks. Participants who relied on aggregated news and government websites in the difficult task agreed with the misinformation, and in the easy task, they disagreed with the misinformation, showing a possible correlation between misinformation difficulty and the ability to identify it. Participants who relied on aggregated news and government websites were more hesitant in the moderately difficult task. However, participants who relied on newspapers and academic journals were fewer in number but were also able to identify misinformation on the easier tasks more than the moderate and difficult tasks. The hesitation was also greater among participants in the moderate task compared to the easy and difficult tasks. There was no apparent difference in identifying misinformation among the groups that relied on books and magazines. The following hypothesis was developed based on the aforementioned results:

H2: The level of agreement of individuals with misinformation posts is dependent on the sources of information they rely on to verify the information seen on social media platforms. The related sub-hypotheses are listed in the hypothesis development as shown in section (Error! Reference source not found.Hypotheses Development), and the results of hypothesis testing can be found in (0).

Figure 29 *The Impact of Preference for Information Source Type to Verify the Information on the Ability to Identify Misinformation*

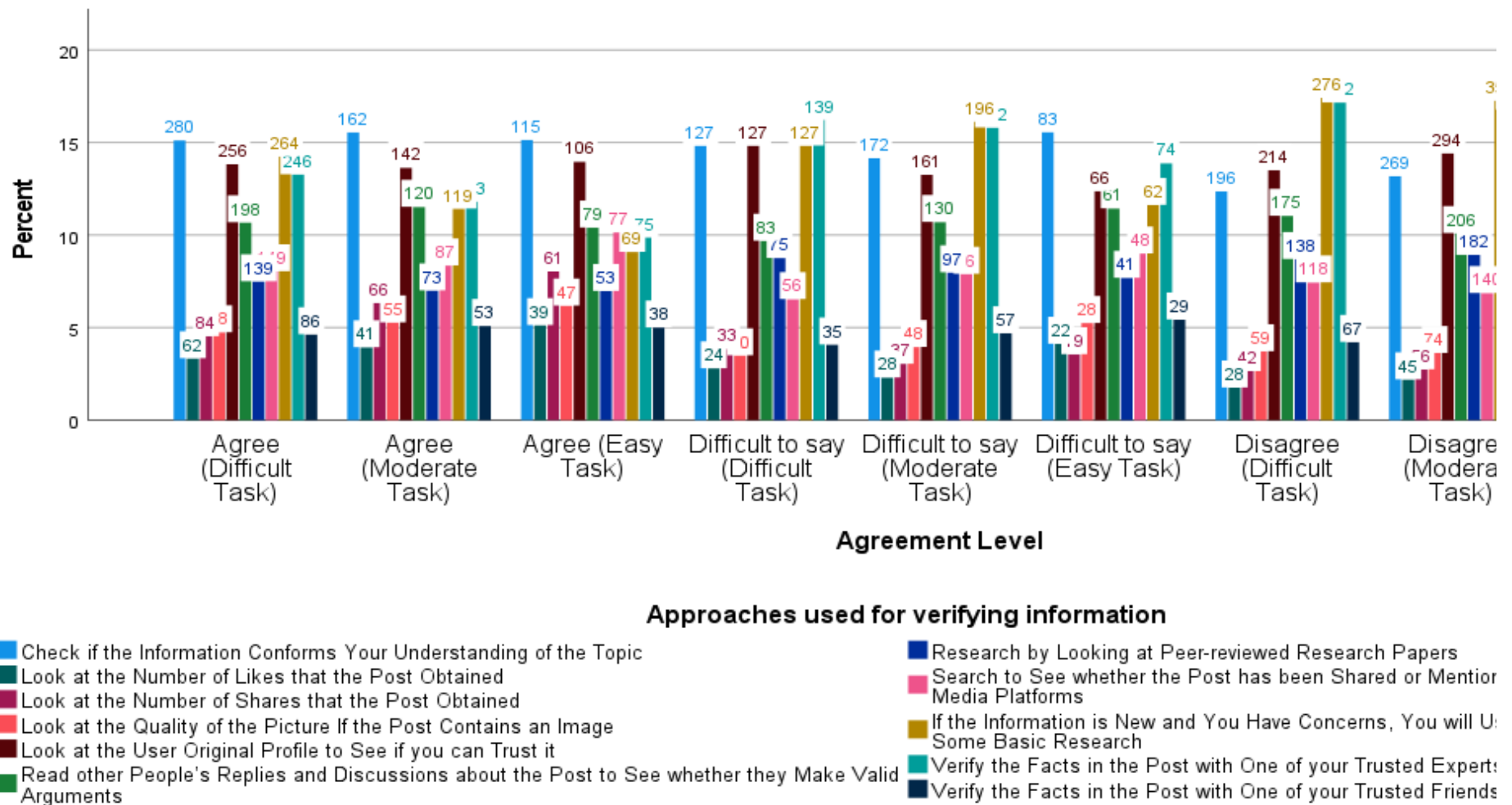
5.6.3 The Impact of Information Source Preference to Find Information on the Ability to Identify Misinformation

Participants who preferred government websites, CDC, CNN and BBC were able to identify misleading information in the easier tasks more than in the moderate and difficult tasks. Those who preferred government websites and CDC were similar in their ability to identify misinformation across all tasks, while those who preferred CNN and BBC were more likely to agree with all misinformation compared to those who preferred government websites and CDC. Participants who relied on Fox News and the New York Times were fewer, but those who preferred the New York Times were able to identify misleading information in the easier tasks more than in the moderate and difficult tasks. However, those who preferred Fox News were less able to identify misleading information, except for the easiest task, and showed a higher rate of agreement on all tasks. Hesitation was observed more frequently among participants in the moderate task compared to the easy and difficult tasks. The following hypothesis was developed based on these results: **H3: Individuals' reactions to misinformation depends on their level of agreement with the misinformation.** The related sub-hypotheses are listed in the hypothesis development as shown in section (Error! Reference source not found.Hypotheses Development), and the results of hypothesis testing can be found in (0).

Figure 30 *The Impact of Information Source Preference to Find Information on the Ability to Identify Misinformation*

5.6.4 The Impact of the Verification Approaches Used on the Ability to Identify Misinformation

Participants used the following methods to verify information: using search engines, reading other people's responses to the post, verifying the information through an expert, verifying the author's profile, and verifying whether the information is consistent with the reader's understanding of the topic. The differences between these methods of verification were small. Those who read other people's responses to the post to verify the information were less able to identify the information compared to those who preferred to use the other methods, especially with difficult misinformation. Those who verified information by examining the author's profile or searching for peer-reviewed studies were the most able to identify misinformation, as shown by the curve that was a straight line that increased from difficult misinformation to easy misinformation compared to other methods of verification. The following hypothesis was developed based on these results: **H8: The way individuals verify information affects their ability to identify misinformation.** The related sub-hypotheses are listed in the hypothesis development as shown in section (Error! Reference source not found. Hypotheses Development), and the results of hypothesis testing can be found in (0)

Figure 31 *The Impact of the Verification Approaches Used on the Ability to Identify Misinformation*

5.6.5 Cross-task Analysis: Effect of Preference for Information Source Type on Reactions to Misinformation

5.6.5.1 Ignoring the Misinformation Post.

As shown in **Figure 32**, participants' responses differed across all tasks. Ignoring difficult misinformation increased when participants agreed or disagreed with the misinformation. In the moderately difficult to spot misinformation task, ignoring the misinformation increased more when participants were hesitant and increased more when they disagreed with the misinformation. In the case of moderately difficult to spot misinformation, ignoring misinformation was at its lowest level among participants who were hesitant and increased significantly when they did not agree with it. In the easy to spot misinformation task, ignoring occurred least when participants agreed or were hesitant about misinformation and increased substantially when they did not agree with it. Across all tasks, misinformation was largely ignored when participants disagreed with it.

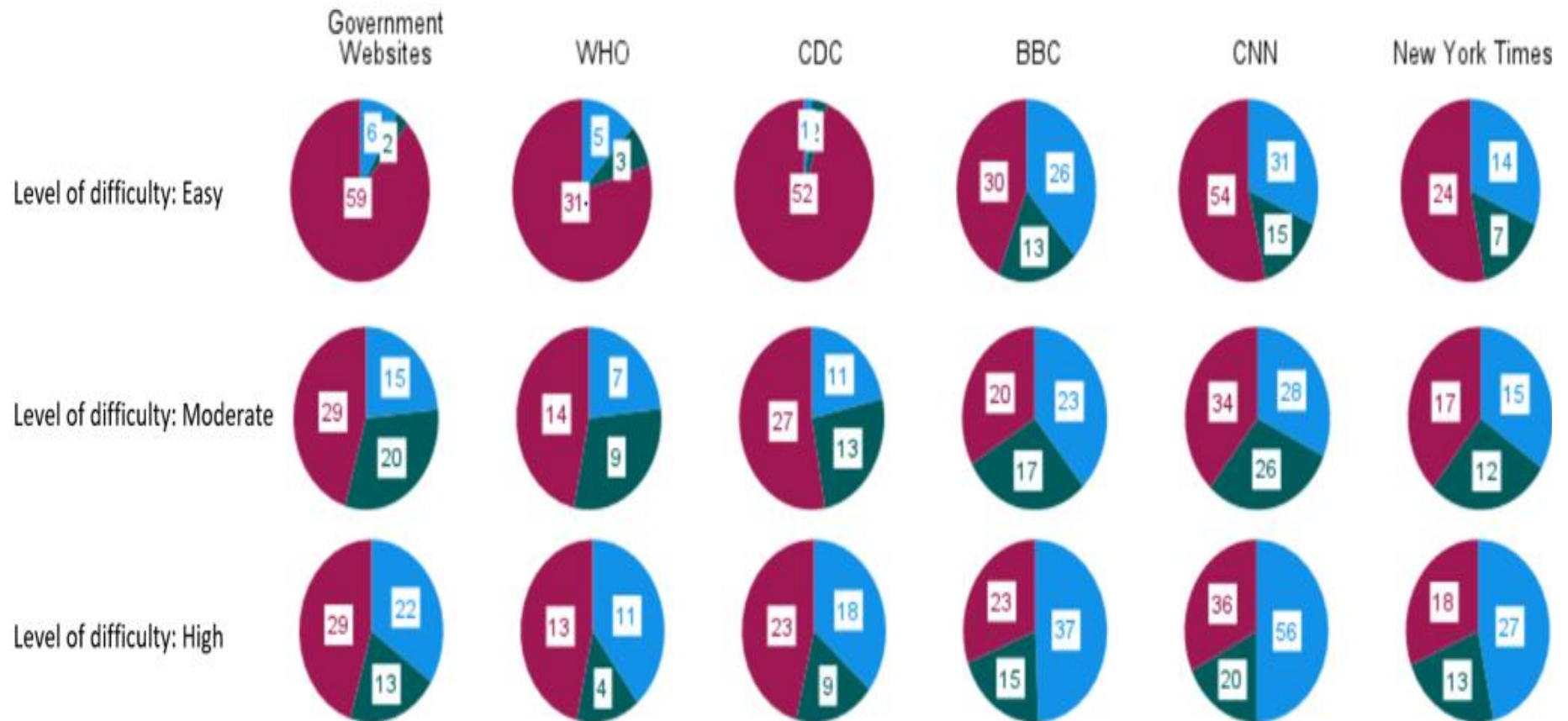
As shown in **Figure 32**, across all six information source preferences, misinformation was frequently ignored when participants agreed or disagreed with the difficult to spot misinformation. In the easy to spot misinformation task, misinformation was largely ignored when participants disagreed it and used CNN, government website, CDC, New York Times and BBC as information sources. However, those who preferred Fox News had low and converging ignoring in all types of misinformation, in the case of moderate and easy misinformation. Those who preferred CNN, New York Times and BBC were least likely to ignore moderately difficult to spot misinformation gradually, but ignoring it increased significantly among those who disagreed with the misinformation. Those who preferred government websites and CDC were similar in their practice of ignoring moderately difficult to spot misinformation, and ignoring it was high when they hesitated or disagreed. Hesitation was low among all those who preferred Fox News, CNN, New York Times and BBC, but those who preferred government websites and CDC frequently ignored moderately difficult to spot misinformation when they hesitated to agree with it. Therefore, ignoring misinformation tended to occur more often when people disagreed with it and increased with the difficulty of ignoring when the information becomes easier. This depended on the source, such Fox News viewers were best at not ignoring false information.

Figure 32 *Effect of Preference for Information Sources on Ignoring Misinformation Across Difficulty Levels of Misinformation*

5.6.5.2 Interact with the Author of the Misinformation Post. As shown in **Figure 33**, showed that in the case of difficult to spot misinformation, the level of discussion with the author was higher among participants who either agreed or disagreed with the misinformation. However, for moderately difficult and difficult to spot misinformation, there was less discussion with the author, with no significant difference in the case of agreement, hesitation or disagreement with the misinformation. In contrast, for the easy to spot misinformation, discussion with the author was high among participants when they disagreed with the misinformation.

As shown in **Figure 33**, among all six information source preferences, entering into a discussion with the author occurred frequently when the participants agreed with the difficult to spot misinformation, with those who preferred CNN the most willing and those who preferred CDC and government websites the least willing to discuss the misinformation with the author. Entering into a discussion with the author as a reaction was not frequently chosen as a reaction when the participants disagreed with the difficult to spot misinformation, but those who preferred CNN were the most willing. In the case of moderately difficult to spot misinformation, entering into a discussion with the author occurred infrequently among all six information source preferences, whether in the case of agreement, hesitation or disagreement with the misinformation. Those who preferred Fox News, BBC and CNN had more desire to enter into a discussion with the author when they agreed with the easy to spot misinformation, while those who preferred government websites, CDC and New York Times were less willing to discuss the author when they agreed with the misinformation. Among all six information source preferences, entering into a discussion with the author occurred frequently when the participants disagreed with the misinformation, but those who preferred CNN, CDC and government websites were the most willing when they disagreed with the misinformation. Therefore, the difficulty of spotting misinformation and source preference influenced author engagement, especially with difficult to spot misinformation among CNN viewers.

Figure 33 *Effect of Preference for Information Sources on Interacting with Author of the Misinformation Across Difficulty Levels of Misinformation*

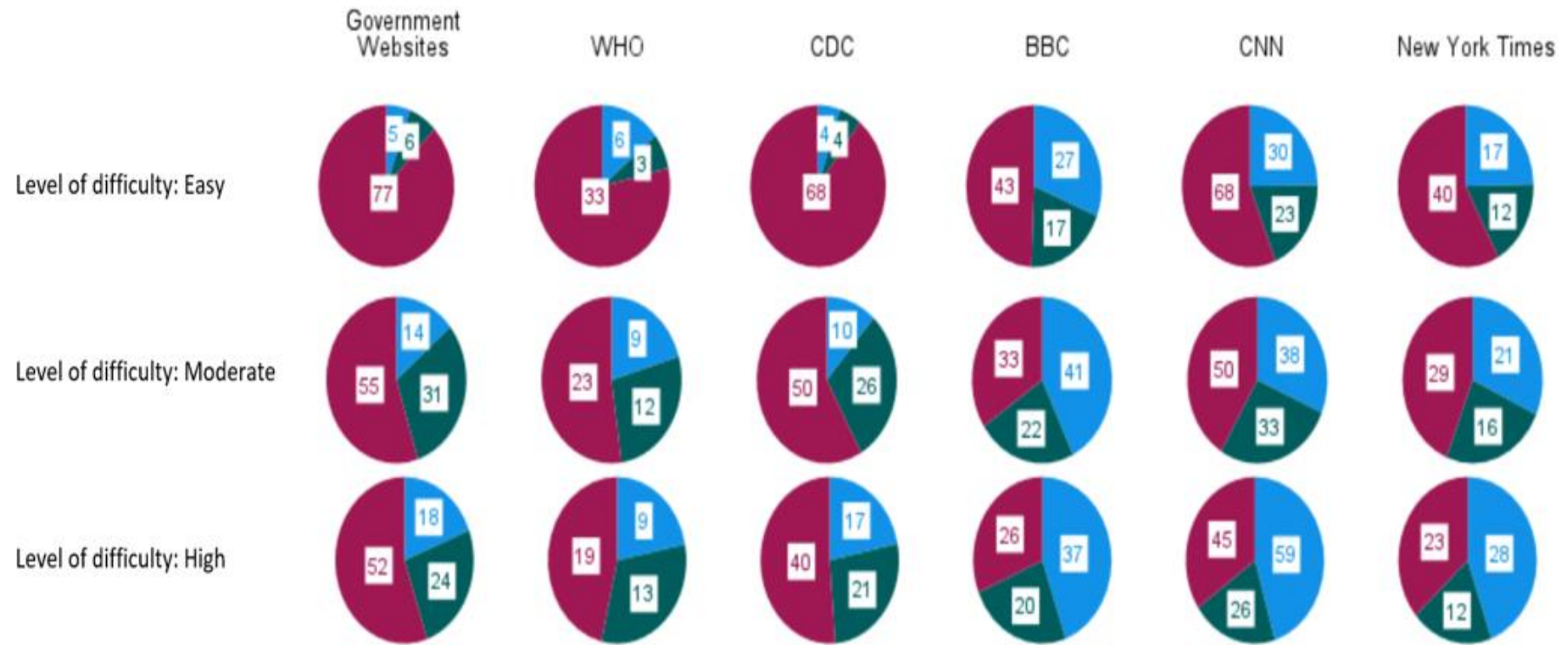


5.6.5.3 Requesting the Information Source.

As shown in **Figure 34**, requesting the information source was selected as a reaction when the participants disagreed with the misinformation. In the case of difficult misinformation, requesting the information source occurred as a reaction between all information source preferences, but those who preferred CNN were the most likely to request the source, regardless of whether they agreed or disagreed with it. Those who preferred Fox News and BBC would request the source of the information when they agreed with the difficult to spot misinformation more than when they disagreed with it. Those who preferred government websites would request the information source when they disagreed with the difficult to spot misinformation more than when they agreed with it.

In the case of moderately difficult to spot misinformation, requesting the misinformation source was selected as a reaction among those who preferred CNN, BBC, New York Times and Fox News, regardless of whether they agreed or disagreed with the misinformation. However, those who preferred government websites and CDC would ask the author for the information source when they disagreed much more than when they agreed with the moderately difficult to spot misinformation.

In the case of easy to spot misinformation, requesting the source of the misinformation occurred more among participants who disagreed than among those who agreed with it, but occurred less with participants who preferred CNN, BBC, New York Times and Fox News than those who preferred government websites and CDC. Thus, the request for the source differed according to how difficult to spot misinformation was, with CNN viewers the most active when they did not agree with the misinformation.

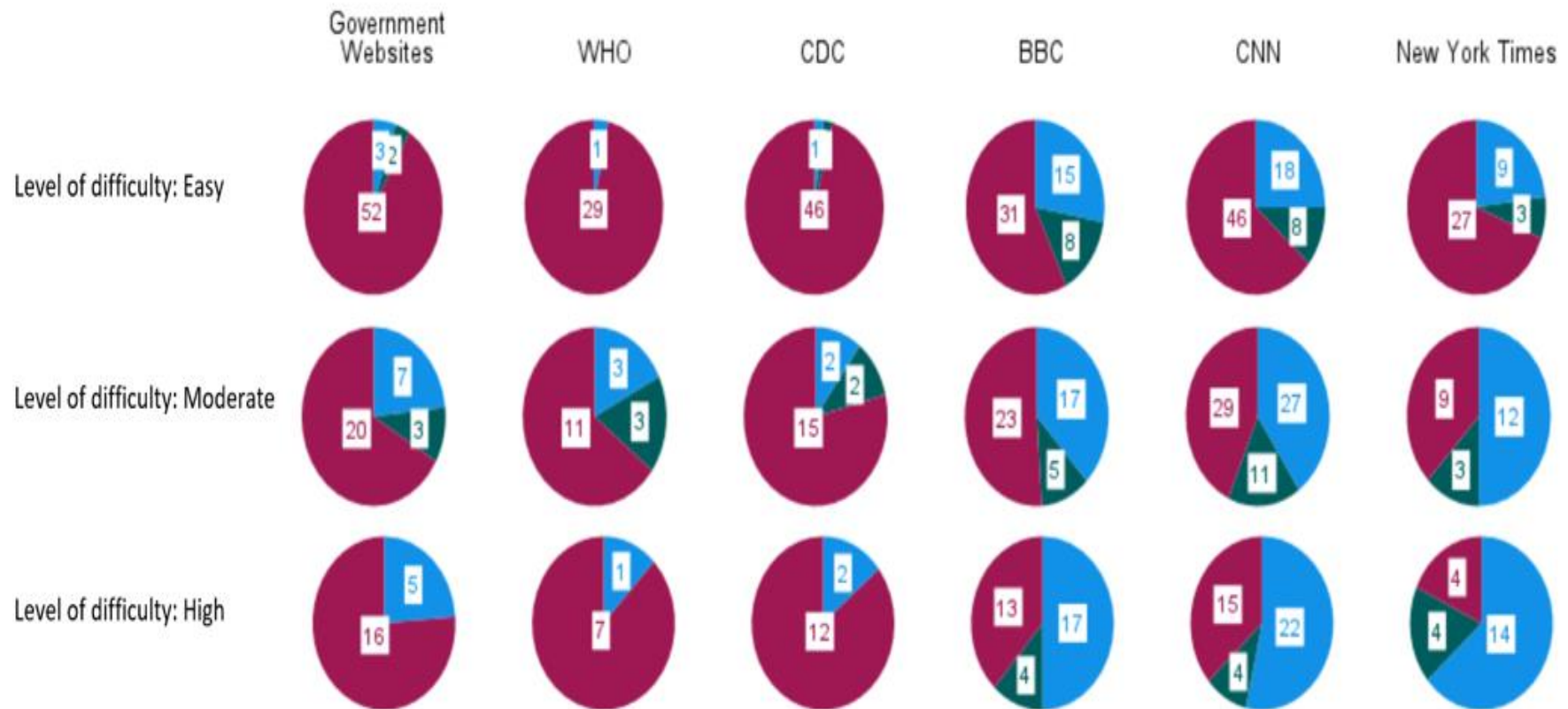
Figure 34 *Effect of Preference for Information Sources on Requesting the Information Source Across Difficulty Levels of Misinformation*

5.6.5.4 Asking the Author Not to Share.

Figure 35 shows that participants were more likely to ask the author not to share the misinformation if they disagreed with it, but there was no clear difference among the types of the difficulty of spotting the misinformation. In the case of difficult to spot misinformation, those who preferred government websites, CDC and CNN were the most likely to request that the author not share the misinformation when they disagreed with it. In contrast, those who preferred Fox News, New York Times and BBC were less likely to request that the author not share misinformation. Interestingly Those who preferred Fox News, New York Times and BBC, in addition to their desire to ask that the author not share misinformation when they disagreed with it, they also wanted to request this when they agreed with it.

In the case of moderately difficult to spot misinformation, those who preferred government websites, BBC, CDC and CNN were the most likely to request that the author not share the misinformation when they disagreed with it. In contrast, those who preferred Fox News, New York Times and BBC were less likely to request that the author not share the misinformation. Interestingly, those who preferred government websites, CDC, CNN, Fox News and New York Times would request that the author not share the misinformation, regardless of whether they disagreed or agreed with it.

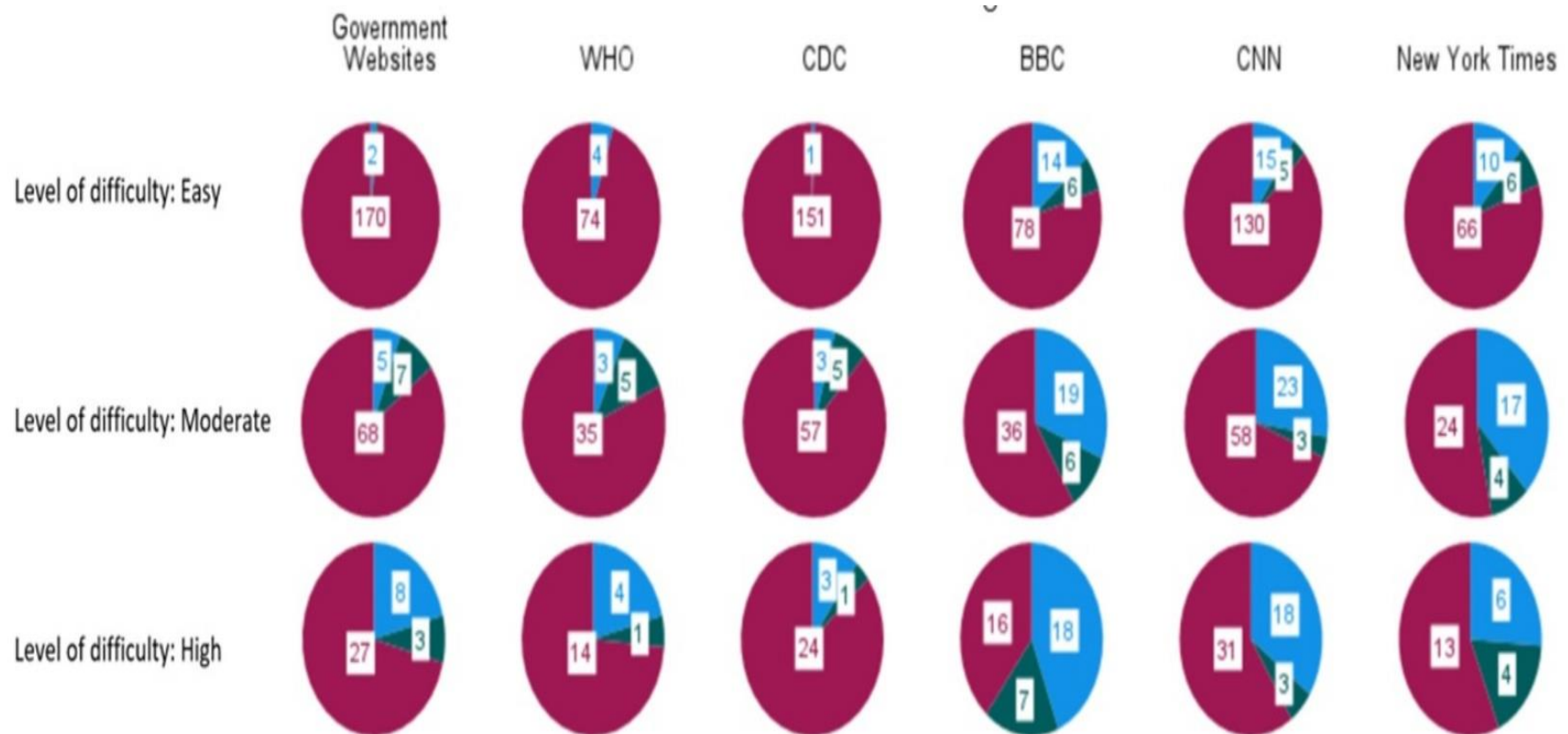
In the case of easy to spot misinformation, regardless of their information source preference, participants would request that the author not share misinformation when they disagreed with it. However, those who preferred Fox News were the least likely to request this.

Figure 35 *Effect of Preference for Information Sources on Asking that the Author Not Share the Post Across Difficulty Levels of Misinformation*

5.6.5.5 Report the Misinformation Post to the Social Media Platform. As shown **Figure 36** in, reporting misinformation as an action increased proportionally when the misinformation was easy to spot. Reporting was least selected as a reaction when the misinformation was difficult to spot, increased slightly in the case of moderately difficult to spot misinformation, and increased further when the misinformation was easy. Moreover, there was a significant difference in the level of agreement or hesitation across all types of misinformation.

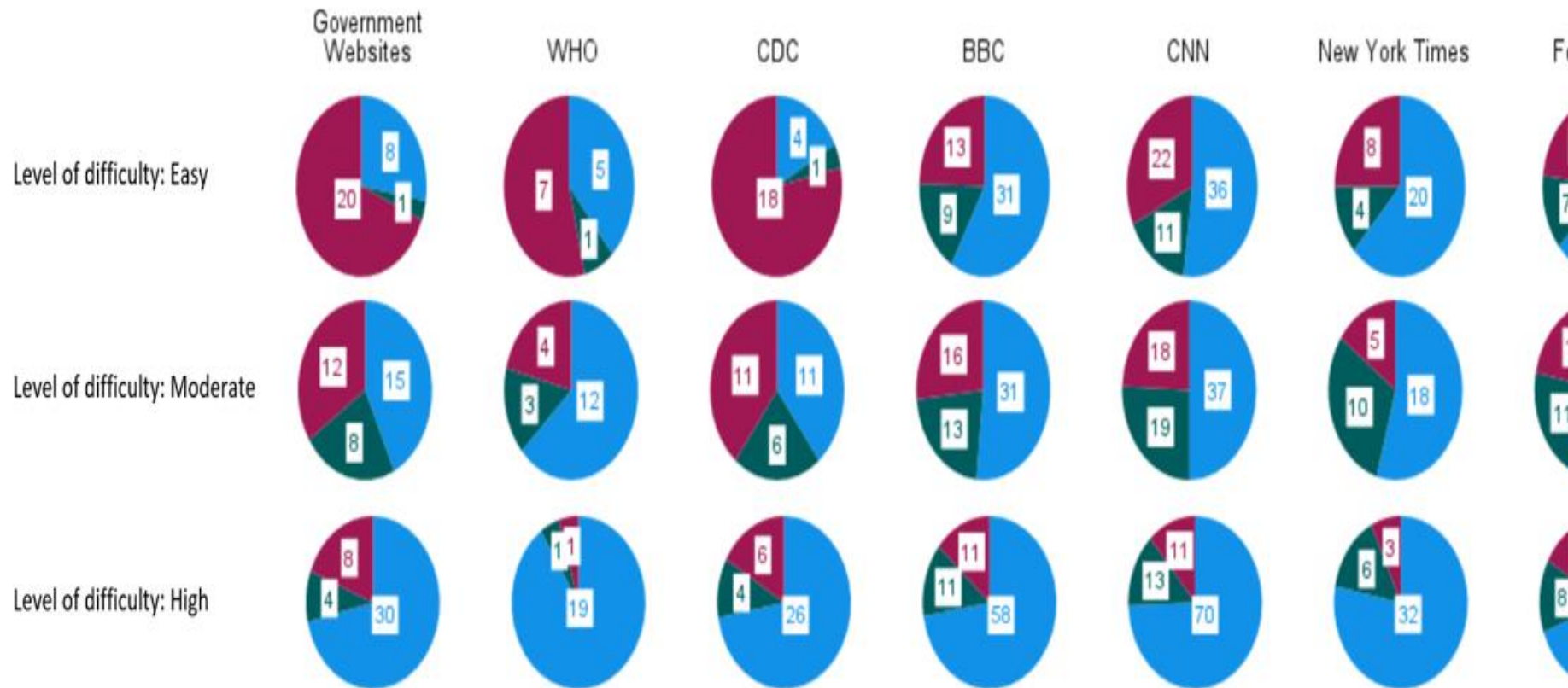
Regardless of information source preference, the participants would report the misinformation when they disagreed with it, but those who preferred CNN, government websites, CDC and BBC were the most likely to report difficult, moderately difficult and easy to spot misinformation when they disagreed with it. Participants would also report the misinformation despite agreeing with it regardless of their information source preference, but those who preferred government websites and CDC were the least likely to do so in the case of moderately difficult and easy to spot misinformation. Therefore, reporting misinformation increased with the easy of spotting misinformation, participant preferred government and health websites being the most willing to report misinformation.

Figure 36 *Effect of Preference for Information Sources on Reporting the Misinformation to the Social Media Platform Across Difficulty Levels of Misinformation*



5.6.5.6 Share the Post and Add Your Views. As shown in **Figure 37**, participants were more likely to share misinformation when they agreed with it. Interestingly, the likelihood of sharing misinformation increased proportionally with the difficulty to spot misinformation. The lowest level of sharing occurred with easy to spot misinformation.

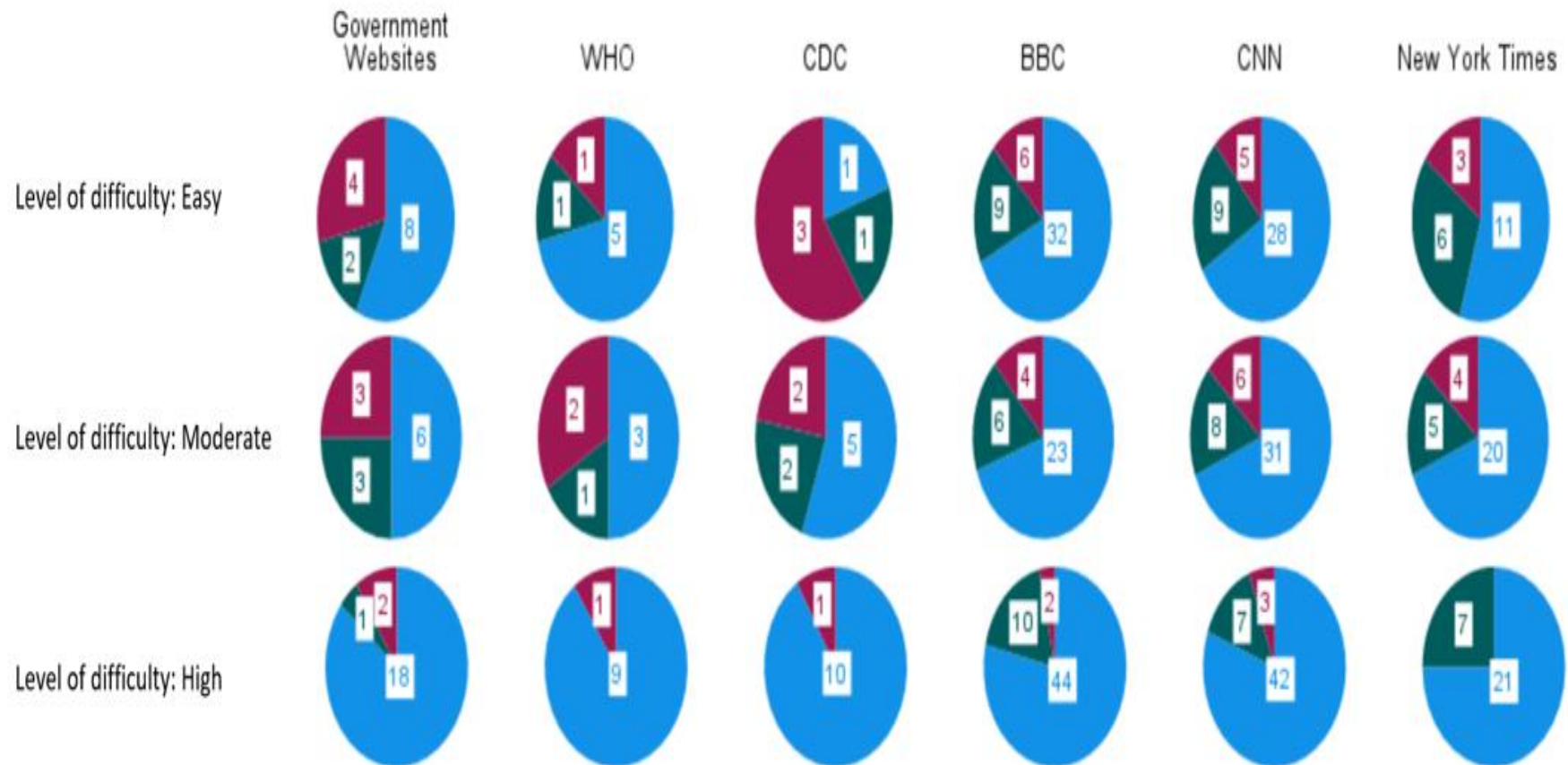
Sharing the post and adding a perspective occurred frequently when the participants agreed with the difficult to spot misinformation, regardless of their information source preference. In the case of moderately difficult to spot misinformation, sharing the post and adding a perspective occurred frequently among participants who preferred Fox News, New York Times, CNN and BBC and agreed with the misinformation. Those who preferred government websites and CDC were less interested in sharing the post and adding their perspective to moderately difficult to spot misinformation. In the case of easy to spot misinformation, participants who preferred Fox News, CNN and BBC wanted to share the post and add their perspective when they agreed with it. Those who preferred government websites, CDC and New York Times did not want to share the post or add their perspective to easy to spot misinformation when they agreed with it, but they wanted to do so when they disagreed with it. This may be why agreement with difficult to spot misinformation had a bearing on whether it was shared based on the source preference. More sharing occurred among those following Fox News, CNN and BBC and less occurred among government website and CDC viewers depending on the difficulty of spotting the misinformation.

Figure 37 *Effect of Preference for Information Sources on Sharing the Post and Adding a View Across Difficulty Levels of Misinformation*

5.6.5.7 Share the Post Separately via Other Social Media Platforms. As shown in Figure XX, sharing misinformation via other social media platforms occurred frequently among participants who agreed with the difficult to spot misinformation and occurred infrequently among those who disagreed with it. In the case of moderate and easy to spot misinformation, sharing increased when participants agreed with it but to a lesser extent compared to the difficult to spot misinformation.

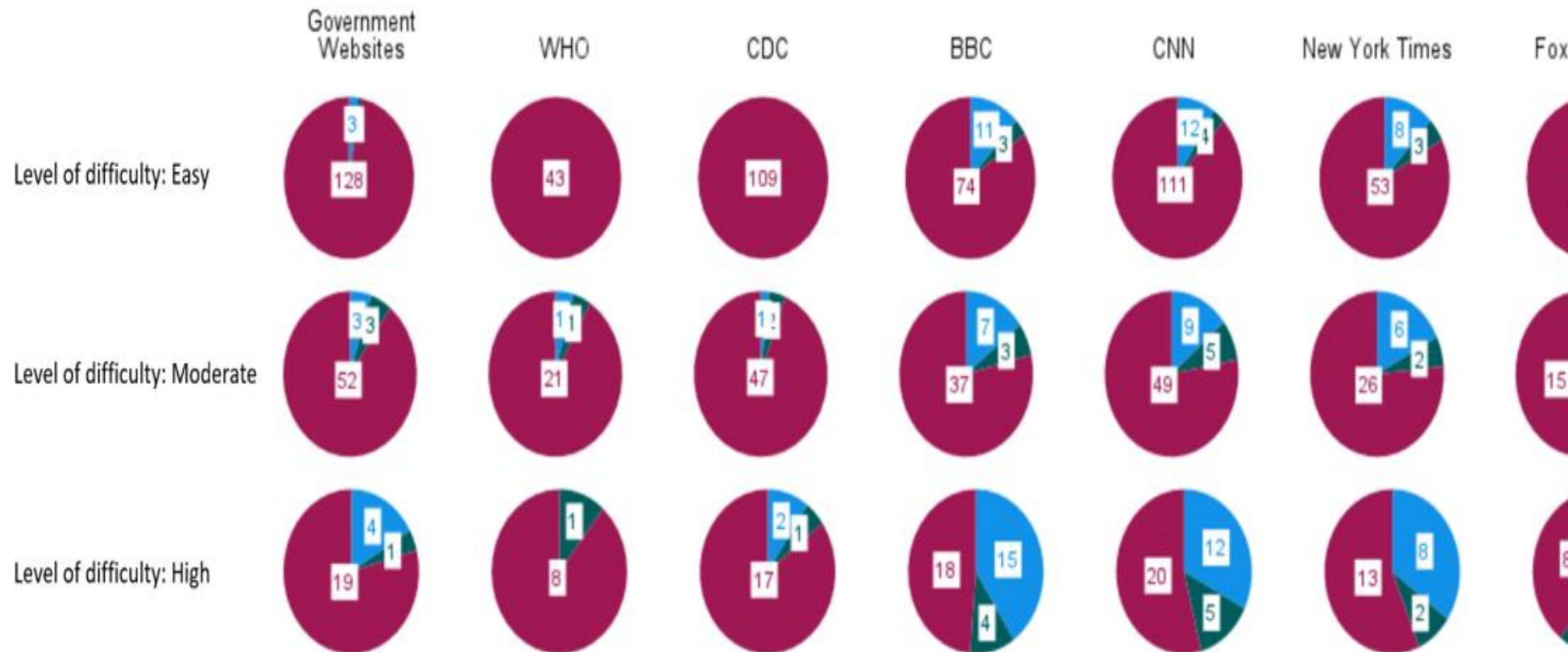
In the case of difficult to spot misinformation, sharing misinformation to other social media platforms occurred frequently among those who agreed with the misinformation and preferred BBC and CNN and less frequently among those who preferred Fox News, government websites, CDC and New York Times. In the case of moderately difficult to spot misinformation, sharing misinformation to other social media platforms occurred frequently when participants agreed with the misinformation and preferred BBC, CNN, Fox News and New York Times and was almost non-existent among those who preferred government websites and CDC. In the case of easy to spot misinformation, sharing misinformation to other social media platforms occurred frequently among those who agreed with the misinformation and preferred BBC and CNN and less frequently among those who preferred Fox News and New York Times and was almost non-existent for those who preferred government websites and CDC. No increase in the sharing of misinformation across other social media platforms was observed in the case of hesitation or disagreement with the misinformation regardless of the participant's information source preference or the difficulty of spotting the misinformation. Therefore, sharing misinformation increased based on agreement, especially when it is difficult to spot, but depended on information source preferences. BBC and CNN viewers were generally more likely to share misinformation across all categories.

Figure 38 *Effect of Preference for Information Sources on Sharing the Post Separately via Other Social Media Platforms Across Difficulty Levels of Misinformation*

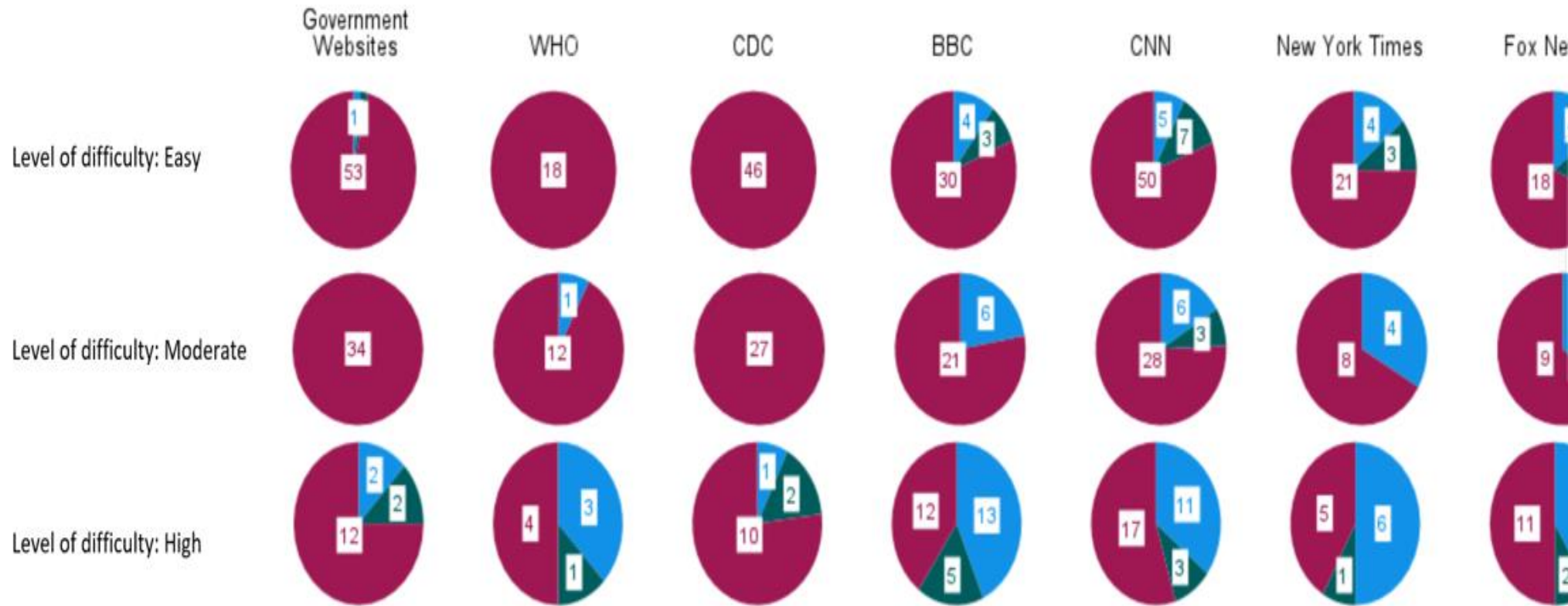


5.6.5.8 Blocking the User. Figure 39 shows that participants were more likely to block the user when they disagreed with the misinformation. The level of blocking increased as the misinformation became easier to spot.

Regardless of information source preference, in the case of difficult to spot misinformation, blocking increased when the participant disagreed with it in compare to other type of misinformation. In the case of moderately difficult and easy to spot misinformation, blocking occurred frequently when the participant disagreed with it, regardless of their information source preference. However, those who preferred Fox News were the least likely to block when they disagreed with the misinformation. Thus, participants were most likely to block misleading content that they opposed, particularly if it was obvious; this was moderately influenced by their information source preference, making Fox News viewers less likely to block the user regardless of the difficulty of spotting the misinformation.

Figure 39 *Effect of Preference for Information Sources on Blocking the User of the Post Across Different Difficulty Levels of Misinformation*

5.6.5.9 Snoozing. As shown in **Figure 40** showed that participants were more likely to snooze when they disagreed with the misinformation. Snoozing as a reaction increased proportionally as the misinformation became easier to spot. Therefore, snoozing misinformation commonly occurred when participants disagreed with the misinformation.

Figure 40 *Effect of Preference for Information Sources on Snoozing Across Difficulty Levels of Misinformation*

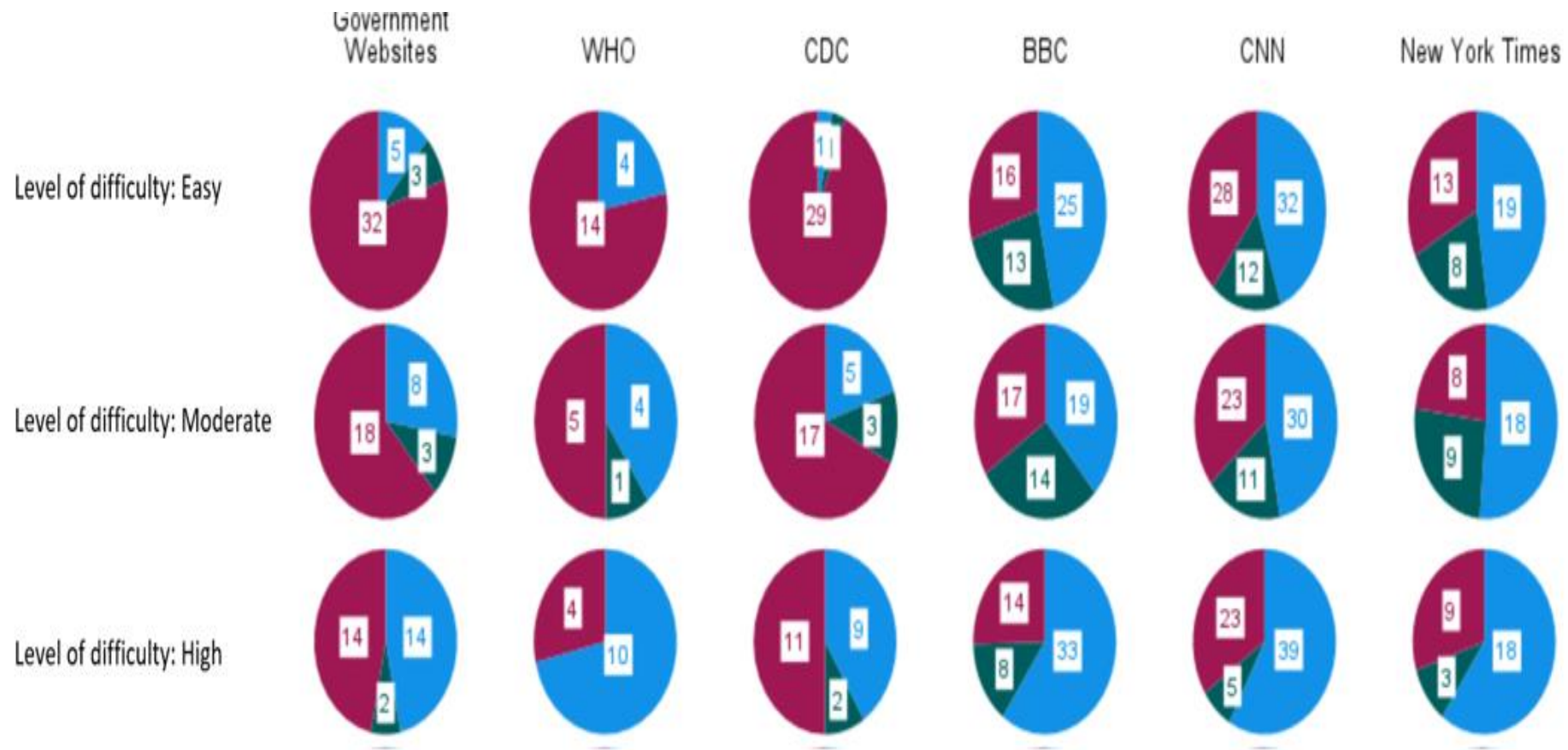
5.6.5.10 Tagging a Friend or Expert to Make Them Aware.

As shown in **Figure 41**, tagging occurred frequently when participants agreed with difficult to spot misinformation and low when they disagreed with it. In the case of moderately difficult and easy to spot misinformation, tagging occurred frequently when participants agreed or disagreed with it.

Tagging was frequently selected as a reaction, regardless of information source preference. Participants were more likely to tag a friend or expert to make them aware when they agreed with the moderately difficult or difficult to spot misinformation, but those who preferred CDC and government websites were less likely. Those who agreed with the moderately difficult or easy to spot misinformation would tag a friend or expert to make them aware when they preferred BBC, New York Times, CNN, CDC or government websites. Thus, the likelihood of tagging as a reaction increased with the level of agreement, especially for moderately difficult and difficult to spot misinformation but varying with source preference, with CDC and government website viewers showing less engagement.

The following hypothesis was developed based on these results: **H1: Individuals' reactions to misinformation depends on their preferred sources for news and information, like Government sources, Public Health Agencies (e.g., CDC), conservative/lean republican (e.g., Fox News), and democrats/lean liberal (e.g., CNN, BBC, and New York).** This hypothesis was later tested to determine whether the association was significant. The related sub-hypotheses are listed in the hypothesis development as shown in section (Error! Reference source not found.Hypotheses Development), and the results of hypothesis testing can be found in (0).

Figure 41 *Effect of Preference for Information Sources on Tagging a Friend or Expert to Make Them Aware Across Difficulty Levels of Misinformation*



In summary, when participants encountered misinformation, many either ignored the posts or requested more information sources, only reporting it if they highly disagreed with the misinformation. Interestingly, the study also found that clear markers or cues in the post, such as a "This fact is disputed" mark or poor image quality, helped participants identify the nature of the misinformation. Those who preferred trusted public health sources, such as WHO or CDC, were more likely to report misinformation posts on social media. An individual's perception of social media platforms' trustworthiness and their ability to handle COVID-19 plays a crucial role in identifying misinformation. Verification methods, such as checking the number of shares, using trusted experts or search engines can be helpful in identifying misinformation.

People react to misinformation in various ways depending on their preferred information source. For example, those who preferred government websites and CDC were more likely to ignore misinformation, while those who preferred Fox News were more likely to share it. Additionally, people who preferred CNN were more likely to enter into a discussion with the author of the misinformation, while those who preferred government websites and CDC were more likely to ask the author not to post it. Additionally, people who agreed with misinformation were more likely to share it on social media, regardless of the difficulty of spotting the misinformation. Additionally, people were more likely to tag a friend or expert to make them aware of misinformation when they agreed with it. This study's findings suggest that people who agree with misinformation are more likely to spread it and that they may also be more likely to try to convince others to agree with it. These results suggest that people's reactions to misinformation are complex and vary depending on a number of factors, including their preferred information source and level of agreement with the misinformation. The following section presents the Inferential Analysis, and the hypotheses in section (Error! Reference source not found.Hypotheses Development) are tested, explored and interpreted.

5.7 Factors Influencing Reactions to Misinformation (Hypothesis Results)

5.7.1 Information Sources' Impact on Reactions to Misinformation

5.7.1.1 Hypothesis 1: The Type of Interaction Individuals Exhibit Towards Misinformation Depends on their Preferred Sources of Information.

5.7.1.1.1 Government Information Sources.

The association results in Appendix C (**Table 52**) explain that users who preferred government websites responded differently to misinformation across various tasks. Users were less likely to share or post misinformation on social media platforms, particularly in the case of the moderate task; the relationship was statistically significant. Users were also likely to report when they came across misinformation, and this relationship was statistically significant for both moderate and easy tasks. Moreover, people who preferred government sources were more likely to ignore misinformation, particularly in the easy task. The likelihood of blocking users who posted misinformation was not uniform across various tasks, as this was statistically significant in the moderate task. No direct link could be established between user preference for government information sources and their response to requests for information sources from authors. Finally, government-oriented individuals were prone to discouraging authors from sharing misinformation, with statistical significance observed for difficult and moderate tasks.

5.7.1.1.2 Public Health Agencies. The association results in Appendix C (**Table 53**) explain that users who preferred CDC would be less likely to share misinformation and add their personal comments, especially in the moderate task. They were also less likely to share misinformation on other social media platforms during moderate and easy tasks. They showed an increased likelihood of reporting encountered misinformation and blocking users posting misinformation, while they were more inclined to ignore misinformation on the platform, especially during the easy task. In contrast, users who preferred WHO were most likely to report, ignore and block misinformation across all difficulty levels. Both groups showed no consistent pattern in asking the source of information or demanding that the authors refrain from sharing misinformation. Overall, health organisations' preferences determined how people reacted towards misinformation on social media.

5.7.1.1.3 Conservative/Lean Republican. The association results in Appendix C (**Table 54**) explain that individuals who preferred Fox News reacted differently to misinformation on social media. They were more likely to request the information source since the relationship was statistically significant for the moderate and easy tasks. They were more likely to block users posting misinformation, and the relationship was significant for the easy task. Individuals preferring Fox News were more likely to ignore misinformation on the platform, particularly for moderate and easy tasks; however, they were more likely to share the misinformation post and add their views across all difficulty levels. Individuals preferring Fox News also showed statistical significance regarding their unwillingness to allow authors to publish misinformation observed across all tasks. Moreover, they were more likely to report encountered misinformation, especially during the easy task.

5.7.1.1.4 Democrats/Lean Liberal. The association results in Appendix C (**Table 55**) explains that individuals' choice of news sources affects how they respond to misinformation on social media platforms. Individuals who preferred BBC were more likely to ask for information sources and block the user, with statistical significance in difficult and moderate

tasks. They also mostly tended to ignore misinformation in difficult and easy tasks. Individuals who preferred BBC would disseminate misinformation and add their views, showing significance for difficult and moderate tasks. Individuals who preferred BBC would discuss and report misinformation, with statistical significance across all tasks. Individuals who preferred BBC would ask for sources, block and ignore misinformation, with statistical significance in most cases. These findings indicate that different types of user preferences influence how misinformation is handled.

Overall, users' response to misinformation depended on their different preferences for information sources. Those favouring government sources were less prone to spread misinformation, more inclined to report and ignore it, and may request that authors not share misinformation. Those who preferred public health agencies, such as CDC and WHO, showed contrasting patterns, with CDC viewers less likely to spread misinformation but more likely to report and block the author, while those who preferred the WHO were inclined to report, ignore and block misinformation. Conservative/lean republican, such as those who preferred Fox News, tended to ask for sources of information, block or ignore/share misinformation but were highly likely to share the misinformation. Conversely, democrats who preferred BBC, CNN and New York Times had varying responses that involved requesting sources, blocking, ignoring, reporting and sharing misinformation. The overall findings demonstrate how the complexities of people's choices in response to misinformation are influenced by their preferred information sources and political affiliation.

5.7.1.2 Hypothesis 2: Individuals' Agreement with Misinformation Posts Depends on the Type of Information Source They Rely On. The association results in Appendix C (Table 56) explain that individuals relying on various information sources to verify content on social media platforms possessed different abilities to identify misinformation. Those depending on newspapers, academic journals, books, aggregated news websites (e.g., Google News) and government websites had an increased ability to identify misinformation across all difficulty levels. This relationship was statistically significant for all tasks, indicating the effectiveness of these sources in helping individuals separate facts from misinformation. However, those who relied on magazines could only identify misinformation under moderate and easy conditions. Thus, source selection plays a crucial role in enhancing verification efficacy among individuals using social media sites.

5.7.1.3 Hypothesis 3: Individuals' Reactions to Misinformation Depends on Their Level of Agreement with Misinformation. The association results in Appendix C (Table 57) show that individuals demonstrated distinct behavioural patterns based on their agreement or disagreement with social media posts. Those who agreed were more likely to engage in discussions, share the posts and express their views, tag friends or experts, or even share the misinformation on other platforms. This was true regardless of task level. Those who disagreed with a post were more likely to request evidence to suggest not sharing the misinformation, blocking the user, using the snooze option and ignoring the post; the relationships were statistically significant across all difficulty levels. The findings suggest that agreement calls for more interactive and sharing behaviours, while disagreement is focused on clarification seeking, reporting or disengaging from the content.

5.7.2 Impact of Attitudes on Identifying and Reacting to Misinformation

5.7.2.1 Hypothesis 4: Individuals' Personal Attitudes Towards Social Media Can Affect How They Respond to Misinformation. The association results in Appendix C (Table 58) show that the trustworthiness of social media during the COVID-19 pandemic might have affected people's behaviours, although the analysis was difficult due to violations in several tests. Individuals' opinions about social media during this time were related to certain actions; however, there were methodological limitations that made the associations uncertain. The only association found was that the perception of social media's trustworthiness during COVID-19 influenced their likelihood of ignoring misinformation. This association was statistically significant under the moderate task.

5.7.2.2 Hypothesis 5: Individuals' Personal Attitudes Towards Social Media Can Affect Their Ability to Identify Misinformation. The association results in Appendix C (Table 59) states that individuals' perceptions during the COVID-19 pandemic significantly influenced their ability to identify misinformation on social media. Trust in social media, belief in its effectiveness in providing needed information, and confidence in its capability to handle the pandemic were associated with improved identification of misinformation at all difficulty levels. However, persons who believed that social media platforms intentionally provided misinformation struggled to recognise misinformation. Similarly, people who trusted that the platform was trying to correct or remove fake news had an increased ability to detect misinformation. In sum, these findings emphasise how users' attitudes towards social media shape their capacity to identify misinformation during a pandemic and highlight the role played by trust and confidence in platform capabilities for effective information evaluation.

5.7.3 Impact of Background Factors on the Reaction to Misinformation and the Ability to Identify It

5.7.3.1 Hypothesis 6: Individuals' Background Affects their Ability to Identify Misinformation. The association results in Appendix C (Table Error! Unknown switch argument.) explain that age, education level and employment status significantly impacted individuals' ability to identify misinformation across different difficult tasks. A statistically significant relationship was observed for all three tasks. This highlights the importance of considering demographic factors, such as age, education and employment status, when assessing individuals' effectiveness at determining misinformation.

5.7.3.2 H7: Individuals' Background Affects their Reactions to Misinformation.

The association results in Appendix C (Error! Unknown switch argument.) show no evidence for an association between individuals' age, education level, employment status and their willingness to engage with misinformation on social media because several test violations existed for all tasks. There were less than five expected counts for some cells, which violated the tests, thus precluding definitive conclusions regarding the association between these demographic factors and users' behaviours related to sharing, reporting, discussing, asking for information sources, blocking and ignoring misinformation.

5.7.4 Impact of the Verification Approaches Used on the Ability to Identify Misinformation

Hypothesis 8 states that the way individuals verify information affects their ability to identify misinformation. The association results in Appendix C (Error! Unknown switch argument.) show that different verification strategies significantly affected people's ability to

detect misinformation on social media at various difficulty levels. For example, those who verified the information by checking its conformity with their understanding of the topic, looking into other platforms' mentions, looking at the picture quality and using search engines demonstrated enhanced effectiveness in spotting misinformation. Moreover, relying on likes, expert sources and research papers as verification methods enhanced the identification of misinformation. However, only in moderate and easy cases did looking at other people's or trusted friends' replies and discussions enhance the identification of misinformation. Misinformation was identified by looking at a user's original profile, which was effective only when the task was easy. However, the effects of these tactics varied with difficulty level, indicating the subtle association between verification methods and users' discernment of misinformation on social media in different difficulty levels.

5.7.5 Impact of Encountering Misinformation on Attitude Towards Social Media

Hypothesis 9 states that encountering misinformation on social media affects individuals' attitudes towards the platforms. The association results in Appendix C (Table 63) explain how encountering false information on social media platforms could cause increased uneasiness about the trustworthiness and capability of social media amid COVID-19, while multiple violations in tests made it hard to be sure about these links. The only observed association was that individuals were more likely to agree with the notion that social media platforms do not enforce their policy for sharing misinformation with violators when they encounter misinformation on social media. This relationship was significant; thus, the null hypothesis was rejected.

5.8 Summary

Government sources play an important role in reducing the sharing and spread of misinformation via social media channels by individuals themselves. Individuals who relied on government sources for information were less likely to share or spread misinformation on social media channels, and they were more likely to report instances of encountering misinformation and tended to ignore it. These users were more active, i.e., requesting authors and users to refrain from further dissemination of misinformation. Through their accounts, they were also willing to block users who shared misinformation, which changed based on the tasks performed. Various demographic factors, such as age, education level and employment status, considerably influenced individuals' capacity to identify misinformation. Therefore, the null hypotheses were rejected for all three factors, indicating a statistically significant relationship between all three factors and the ability to identify misinformation across all tasks. Hence, these factors should be considered when evaluating an individual's ability to spot misinformation. Verification strategies are crucial in identifying misinformation on social media platforms. Checking conformity with their understanding of the topic, checking picture quality and using search engines increased the effectiveness of identifying misinformation. Identification could also be made possible by relying on likes, expert sources and research papers. However, using other people's replies or trusted friends for verification only increased the identification of misinformation in moderate and easy tasks. The impact varied depending on the difficulty level, thus showing that verification methods have a nuanced relationship with identifying misinformation on social media.

Chapter 6: Understanding Social Networks’ Characteristics of Misinformation – Results

6.1 Chapter Overview

This chapter reports the results that answered research questions RQ3 and RQ4. Three pieces of misinformation were analysed individually to understand the structure of social networks for misinformation. This chapter showed descriptive statistical results demonstrating the network’s structural properties and the overall metrics for each misinformation network graph to address research question RQ3. This chapter also shows the results of the themes, which explain the reactions within the networks to address research question RQ4.

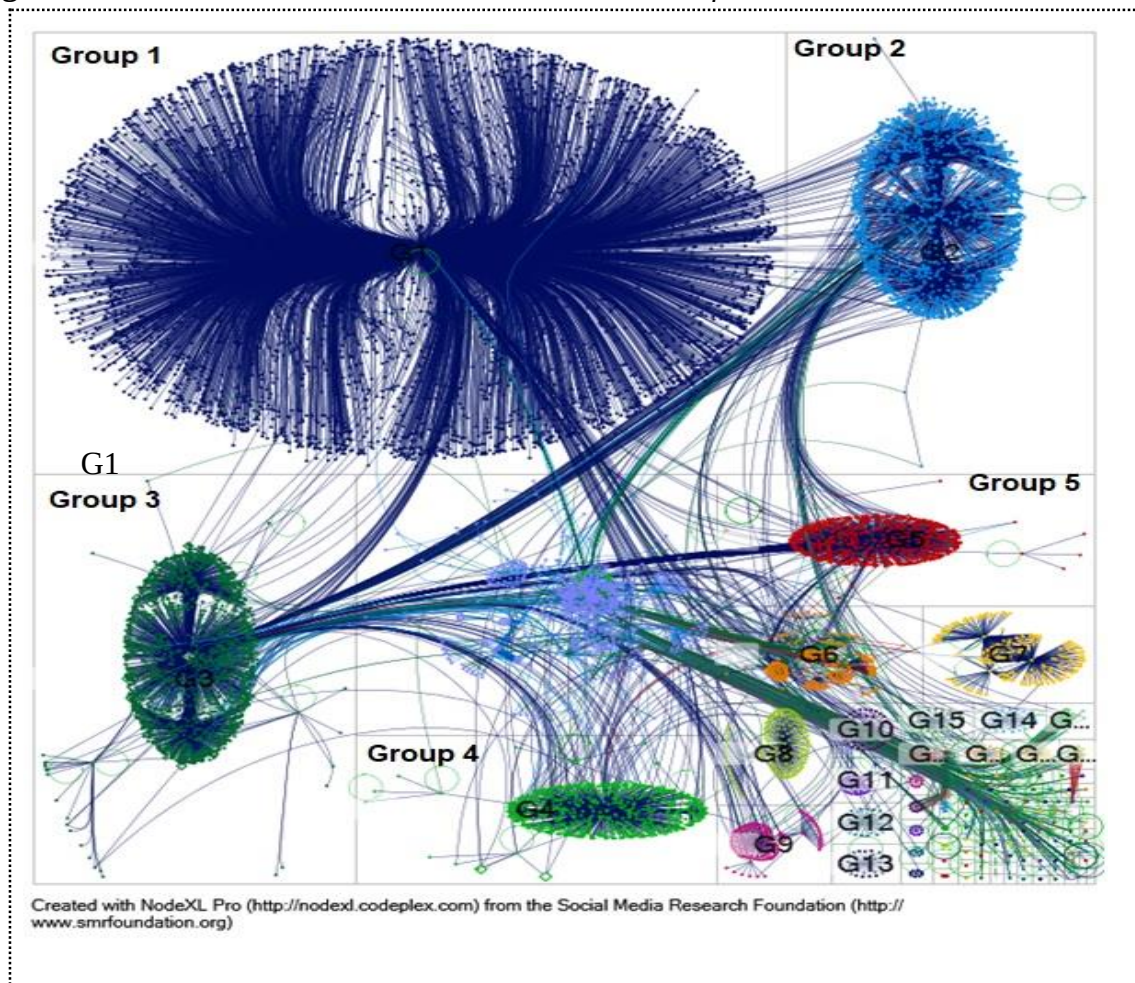
6.2 Difficult to Spot Misinformation (Linking 2nd Pfizer Vaccine with Heart Problems)

The difficult to spot misinformation claimed that a link surfaced recently between the second Pfizer vaccine and heart problems in adolescents, posing a risk of fuelling vaccine hesitancy. The claims were inaccurate and could undermine public confidence in vaccines, making prompt responses from medical professionals and fact-checking organisations crucial. Emphasising vaccine safety and relying on reputable sources for accurate health information is essential²².

6.2.1 Overall Network Structure

The network consisted of 13,255 tweets, which were composed of 6.4% (n = 848) mentions, 85.1% (n = 11291) retweets, 0.7% (n = 105) mentions in retweets, 5.7% (n = 754) replies and 1.9% (n = 257) individual tweets in the sample dataset. These interactions involved 11,950 unique users, with a network density of 0.0000896137734604986 and an average betweenness centrality of 27,889.023. The most influential users in the network were identified based on their betweenness centrality scores.

²² <https://www.reuters.com/article/idUSL1N2ZT2B5/>

Figure 42 *The Overall Social Media Network Structure of Twitter Users***Overall Contents:****Table 21** *Top Words, Words Pairs and Hashtags in Tweets in the Entire Graph*

Top Words	Count	Top Word Pairs	Count	Top Hashtags	Count
heart	11,688	heart,stop	4579	pfizer	385
pfizer	11,475	name,pfizer	4577	vaccinedeaths	94
study	7960	made,heart	4571	vaccineinjuries	91
thailand	6110	hey,girl	4563	vaccinesideeffects	69
new	5361	girl,name	4562	vaccine	49
one	4896	pfizer,made	4560	clotshot	44
stop	4677	line,hey	4551	pfizerlied	42
name	4585	new,favorite	4549	myocarditis	40
made	4581	favorite,picku	4549	mnakwethu	37
hey	4572	p	4549	thembabroly©artist	37
		pickup,line	4549		

one tweet was frequently shared in the dataset. For example, the majority of users shared the following tweets:

“Hey, Lady Pfizer, Your name caused my heart to stop.”

“A recent study found that Pfizer vaccine caused adverse cardiovascular effects in one-third of teenagers and heart inflammation in one in every 43 individuals. These findings have raised concerns regarding the potential risks associated with vaccinating young people.”

“Contrary to social media claims, a study in Thailand found that only one in six teenagers experienced mild and temporary heart rhythm changes after receiving the second dose of the Pfizer COVID-19 vaccine.”

Table 22 Influential Web Sources from the Tweets in the Graph

Rank	Domains	Type	Website title	Count
1	hartgroup.org	Antivaccine website	“(Yet) more worrying data on myocarditis in children”	2660
2	reuters.com	Fact checking website	“Fact Check-Study of Thai teenagers did not find one third experienced heart effects after COVID vaccination”	1961
3	preprints.org	Preprint service for early versions of research outputs	“Cardiovascular Effects of the BNT162b2 mRNA COVID-19 Vaccine in Adolescents”	745
4	lifesitenews.com	Canadian <u>conservative</u> website that has published misleading information and <u>conspiracy theories</u>	“New study finds 29 percent of young people had heart problems after second Pfizer dose”	154
5	twitter.com	Reuters fact check Twitter account	“Reuters Fact Check Tweet”	153
6	thehighwire.com	Mainstream media on COVID-19	“NEW STUDY ADDS TO COVID SHOT HEART CONCERNS IN YOUTH.MP4”	120
7	himalayaaustralia.com.au	Website has published misleading information and <u>conspiracy theories</u>	“29% OF TEENS WITH SECOND DOZE OF PFIZER’S CCP VIRUS VACCINE HAVE HEART PROBLEMS”	59
8	theepochtimes.com	Website promotes far-right politicians	“29 Percent of Young Pfizer COVID Vaccine Recipients Suffered Heart Effects: Study”	40
10	dailysceptic.org	Website has published misleading information and conspiracy theories	“One in Three Vaccinated Teenagers Suffer Cardiovascular Side-Effects, One in 43 Suffer Heart Inflammation – Study”	36
10	youtube.com	YouTube Chanel promotes misinformation and conspiracy theories	YouTube about the vaccine and heart complications	16

Table 23 Influential Users

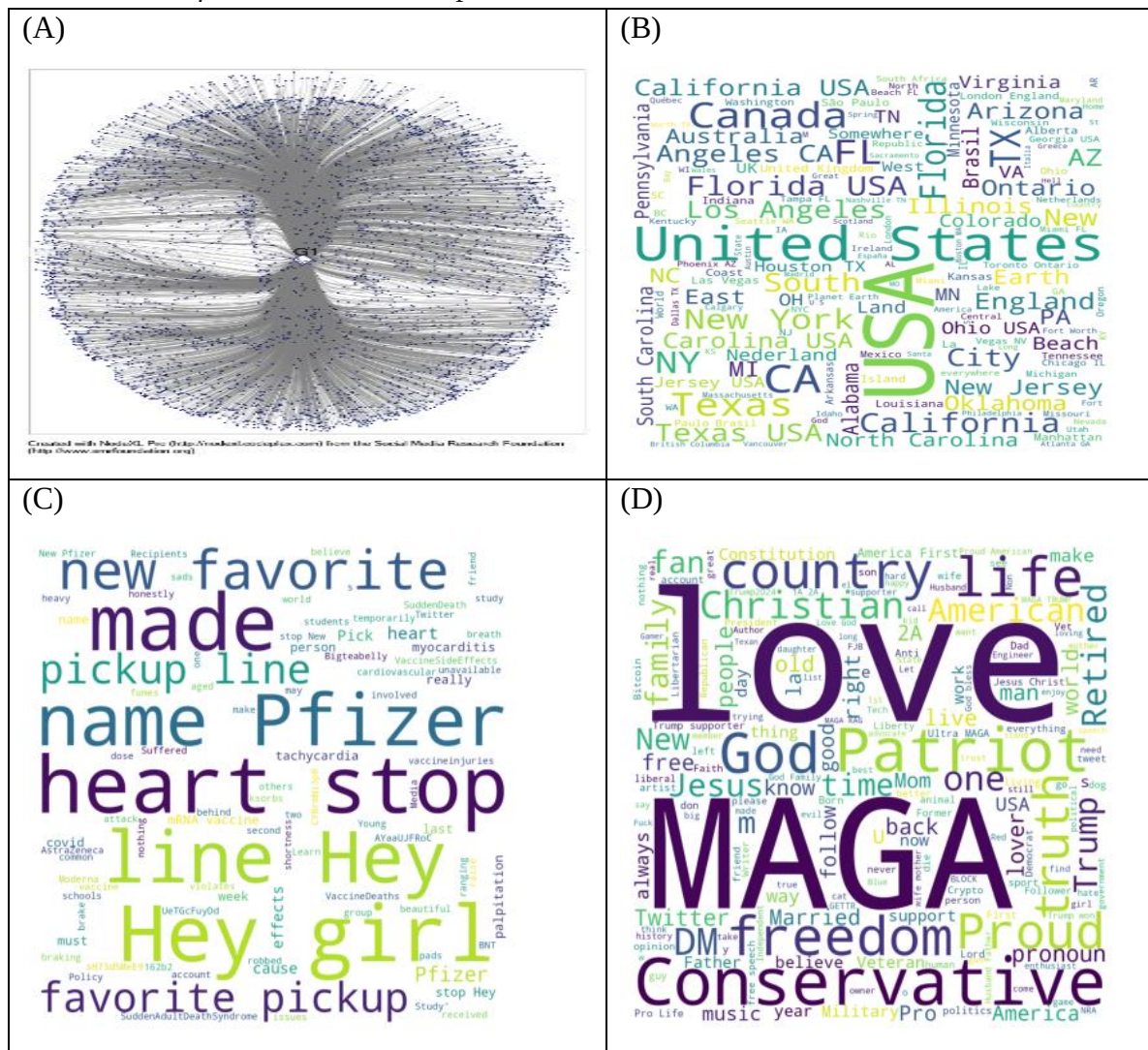
Rank	Betweenness centrality score	Followers, n	Account description	Network group, as in Figure 1
1	79,684,291.567	1,181,831	Actor and a film director	1

2	41,656,068.884	149,530	Co-chair of a group that is spreading conspiracy theories	3
3	38,128,294.432	35,405	Fact-checking account belonging to a well-known news company	2
4	15,731,427.447	501,917	Account belonging to a president and founder of a right-wing political organisation	4
5	13,007,065.539	51,488	Account belonging to a group involved in spreading many conspiracy theories and anti-vaccination messages about COVID-19	5
6	4,285,493.149	3361	Suspended account in violation of Twitter rules	7
7	1,848,536.730	25,521,886	Account belonging to a well-known news company	3
8	1,718,415.688	152	This account does not exist.	4
9	1,578,900.018	143,009	Account belonging to a news site involved in spreading many conspiracy theories and anti-vaccination messages about COVID-19	4
10	1,502,773.573	544	Account spreading many conspiracy theories and anti-vaccination messages about COVID-19	9

6.2.2 The Largest Groups

There were 121 groups formed around vaccine misinformation, among them, five large groups formed within the network structure. The largest of these groups, Group 1 (G1) had 4403 users and 4412 edges with a density of 0.000. Based on the group, an influencer was associated with almost all nodes within the group with a retweeting relationship. This account had the highest betweenness centrality degree in the network (79,684,291.567). Based on the profile of this influencer, they were an actor and film director. Through review of the influencer's previous tweets, they were a promoter of conspiracy theories related to vaccination and health and had reservations about the government, criticising any belief showing that the government is providing facts. This account had a high follower count of 1.6 million, and many tweets hinted at vaccination conspiracy theories and indirect government accusations. The influencer's posts contained insinuations linking the 2nd Pfizer vaccine with heart problems. This behaviour may be interpreted as fraudulent so that the account, which had a high number of followers, will not be banned by the moderators of the Twitter platform.

Figure 46 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 1



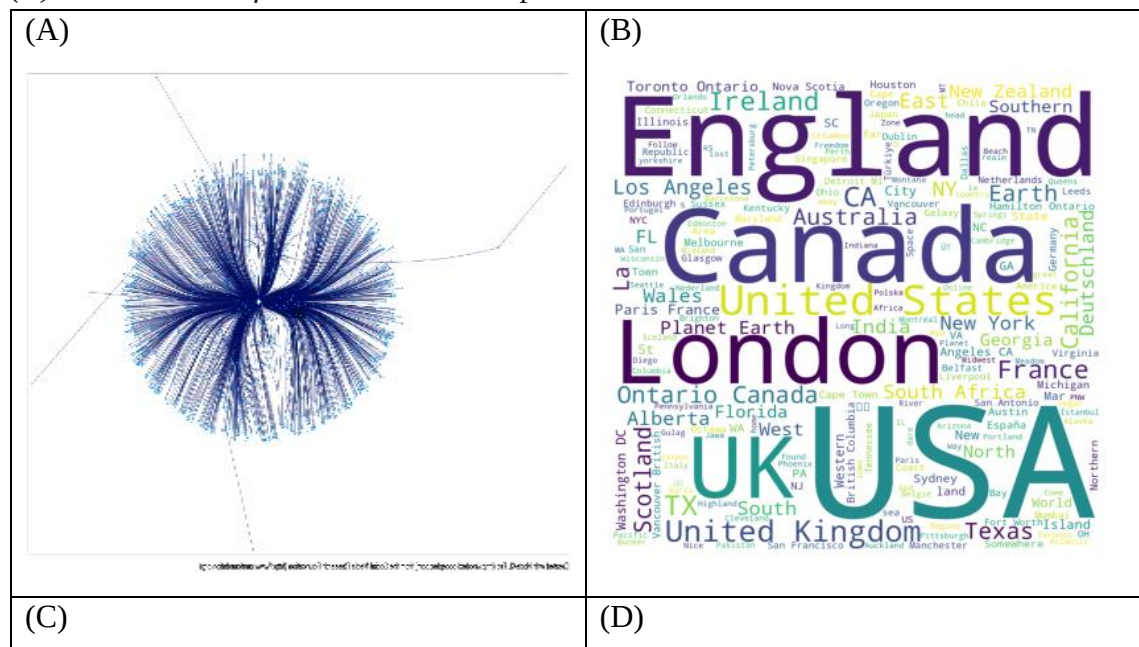
As shown in **Figure 38C**, commonly used words included “Pfizer”, “made”, “Name”, “Made”, “Heart”, “Stop”, “Hey” and “Girl”. Based on content analysis using these keywords, the following tweet was frequently shared in G1:

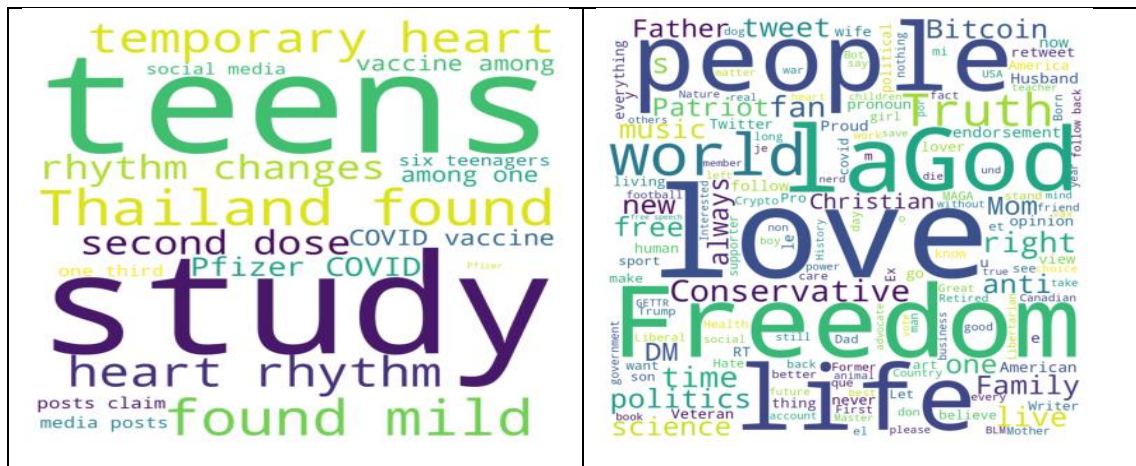
“Hey, Lady Pfizer, Your name caused my heart to stop.”

As shown in **Figure 38D**, the most used words in the profiles of users who retweeted a G1 influencer were “Love”, “MAGA”, “conservative”, “Patriot” and “Proud”. Some users mentioned the following:

“Jesus First, SoCial Conservative, Ultra MAGA, USA”

“I am a patriot American dad who upholds conservative values and believes in the Second Amendment. I love my country and will always support it.”





Based on the findings presented in **Figure XX**, the most frequently used words in this group were “Freedom”, “Love”, “People”, “Life” and “Truth”. Based on content analysis using these keywords, one tweet was frequently shared in this group. The majority of users shared the following tweets:

*An expert in misinformation | A journalist running a fact-checking website |
Previously worked as a social media correspondent.*

Love Life time is short. survivor of the winter spring summer and fall of death.

Furthermore, analysis of the word cloud showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “teens”, “study”, “Thailand”, “found” and “temporary”. Some users included the following statement in their profiles:

One in six teenagers in Thailand experienced mild heart rhythm changes after the second dose of Pfizer COVID-19 vaccine, which is contrary to claims on social media stating that one-third of teenagers experienced such changes. (Including reference for tweet and website that fact checked the claim).

Overall, a fact-checking account with few followers from a reputable news organisation corrected Pfizer vaccine misinformation, despite low interconnectivity. This highlights the challenge of misinformation spreading faster than corrections due to the influence of popular accounts with many followers.

Group 3 (G3) had 1743 users and 1772 edges with a density of 0.001. The most influential user of the network was an account co-chair of a group spreading conspiracy theories, as shown by a betweenness centrality of 41,656,068.884.

Figure 48 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 3

“The Thailand study on myocarditis should serve as a wake-up call. Troponin is released when irreplaceable heart cells die. The FDA requested Pfizer to complete the study, but Thailand conducted it in the end” (attaching reference for Anti-vaccine Website that ranked number 1 in the Influential web sources table).

Furthermore, after word cloud analysis, the most commonly used terms in the profiles of users who retweeted this group influencer were “freedom”, “love”, “anti”, “people”, “Retired” and “truth”. Some users included the following statements in their profiles:

“Lockdowns and masks contaminated with germs did little to stop the epidemic and did great harm to our children, economy, mental health, and immune systems”.

“I retired from the NHS and RMS and am a human rights advocate. opinions are mine”.

“Doctorate in Cellular and Molecular Biology; dedicated to educating the public about the science behind regaining health”.

Anti-science and anti-vaccine groups supported the misinformation tweets. Retirees had a role in spreading and supporting the misinformation. The employment factor ‘retired’ has not previously been evaluated, but age has. Guess et al. (2019) studied the use of misinformation during the 2016 U.S. election and found that older Americans, over 65, were more likely to share “fake news.”

Interestingly, after checking users’ profiles, the word retweet was used in two contexts, as some users indicated that they retweeted but did not necessarily support the information. In contrast, others mentioned that retweeting meant endorsing a tweet. This suggests that some users explain what they mean by their actions in their social media profiles.

Overall, some users retweeted misinformation without endorsing it, while others actively spread anti-vaccine and anti-science conspiracy theories. Retirees played a notable role in disseminating misinformation, with older users being more likely to share such false news, as observed in a network.

Group 4 (G4) comprised 709 users and 716 edges with a density of 0.001. The user who held the most influence within this group had a betweenness centrality of 157,314,27,447. Interestingly, the account belonged to the president and founder of a right-wing political organisation established in mid-2020. The organisation consistently promotes medical misinformation about the COVID-19 pandemic and vaccines. Interestingly, the account owner supported President Trump and participated in the 2021 storming of the United States Capitol.

“Conservative”, “Mom” and “truth”. Some users included the following statements in their profiles:

"I'm a proud conservative wife and mother. 'My love for the United States is unwavering."

"I oppose the New World Order and World Economic Forum's agenda and support Donald Trump. I am again't socialism, the European Union, and skeptical of climate change. Also, I am against mandatory masks."

Group 5 (G5) also spread conspiracy theories, similar to G3. G5 had 657 users and 665 edges with a density of 0.002. The most influential user had a betweenness centrality of 13,007,065,539 and was the official account of the group, which was established in January 2021. On their website, the group claimed to publish health facts based on scientific evidence. However, many of its members were involved in spreading many anti-COVID-19 vaccination messages and conspiracy theories about COVID-19. It was challenging to validate the information provided by their website, as the description of their site gave an impression of the extent of their specialised skills and the strength of their analysis and academic qualifications, with some members even starting their titles with ‘Prof’ or ‘Dr’. Additionally, the group’s website also ended in “.org” and had a name and design that made it difficult to disbelieve or question it. Based on their personal profiles, some members believed that the government controls science, resulting in scepticism towards scientific claims. Therefore, it is clear from the user’s profiles that what is meant by science is the science that they believe to be true rather than what is circulated on official and trusted websites. This shows how difficult it is to differentiate between facts and misinformation. Misinformation and conspiracy theories may be supported by those that are highly educated and experienced in the field. Unfortunately, this leaves individuals who receive this information with no choice but to believe the misinformation and support it without questioning its validity. It is a critical concern that demands immediate consideration and action to prevent the spread of misinformation.

“I support individual freedom and choice”

“I am a Director of Research who believes that science is not infallible. Science is always in the process of correcting itself, and it is necessary to consider all sides of the argument without prejudice in order to arrive at the truth.”

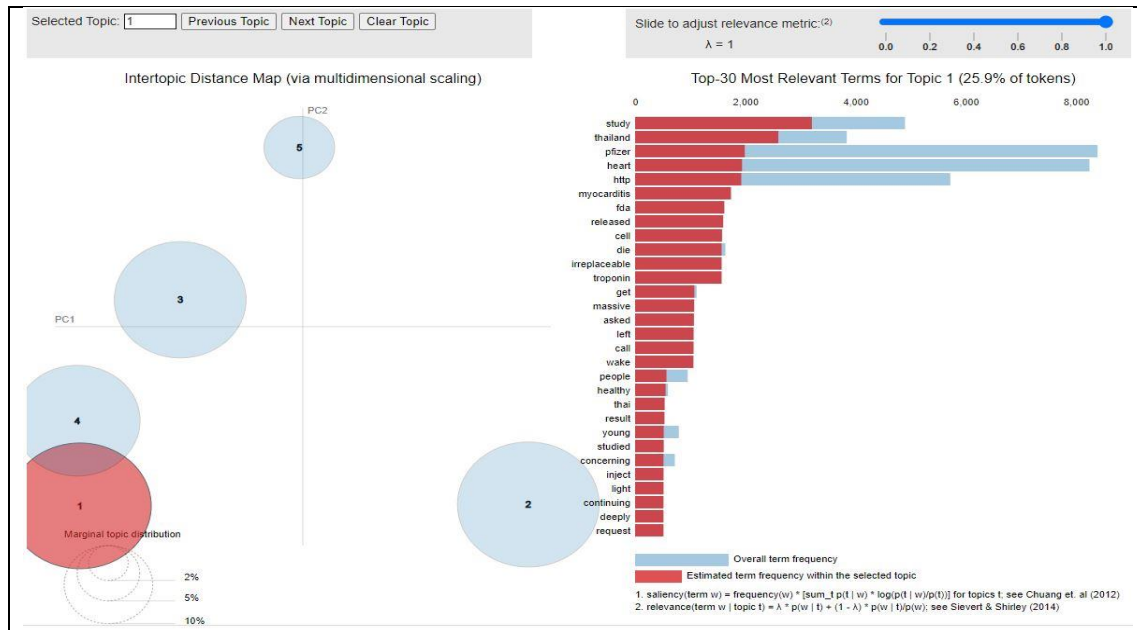
“I am a UK retired pharmacist who believes in health and science and believes that Vaccines ought to be banned as they are ineffective and unsafe.”

Overall, this study examined 13,255 tweets from 11,950 unique users on Twitter and revealed a complex network of COVID-19 misinformation that relied heavily on retweets (85.18%), mentions (6.40%) and replies (5.69%) to spread misrepresentations. This engagement revealed the pivotal role played by retweeting in the spread of misinformation across geographically diverse yet thematically uniform discussions involving keywords such as ‘Pfizer,’ ‘#vaccinedeaths’ and ‘#vaccineinjuries’ within the US, UK and Canada. The content analysis identified three key user clusters, namely Conservative/Right-leaning, Libertarian and Truth-Seeker/Anti-Vaccine, which had specific ideologies and a shared scepticism towards vaccines and government narratives. The presence of influential individuals with great social capital in these networks exacerbated the spread of false information, making it difficult to address it effectively. Politically motivated biases greatly influence how facts can be countered.

6.2.3 Users’ Engagement with Misinformation

Retweets were the most common type of interaction among users who engaged with misinformation during the COVID-19 pandemic. This suggests that users tend to pass on misinformation to their followers.

Figure 51 Visualisation of Topic Modelling Using Latent Dirichlet Allocation (LDA) Showing the 4 Emerging Topics on an Intertopic Distance Map (Left), with the Top 30 Most Salient Terms (Right)



Exploration of the topics showed the following distribution of key terms, together with a summary of emerging themes (terms in *italics* were considered for manual exploration):

Topic 1 keywords: 'study', 'thailand', 'pfizer', 'heart', 'http', 'myocarditis', 'fda', 'released', 'cell', 'die', 'irreplaceable', 'troponin', 'get', 'massive', 'asked', 'left', 'call', 'wake', 'people', 'healthy', 'thai', 'result', 'young', 'studied', 'concerning', 'inject', 'light', 'continuing', 'deeply', 'request'

Themes: (1) There were retweets 'raising concerns' about a Thai study claiming adverse cardiovascular effects in 29% of teenagers after the second dose of the Pfizer vaccine. Some retweets also shared personal experiences of individuals who received the second dose and experienced heart attacks, some of which were fatal. (2) However, some retweets 'highlighted the correction of misinformation', stating that the Thai study actually found only mild and temporary changes in heartbeats after the second Pfizer vaccine dose in one of every six teenagers, rather than one-third, as previously circulated. (3) Other retweets demanded the immediate cessation of the Pfizer vaccine, citing potential risks and 'criticizing Pfizer directly'. These tweets claimed that Pfizer knew about 35 cases of heart damage to teens just a week after getting the mRNA injection but chose not to disclose this information to people. In addition to this, there were other tweets accusing Pfizer of promoting certain weight loss products that lead to heart or skin problems and maybe death.

Topic 2 keywords: *'pfizer', 'heart', 'stop', 'new', 'name', 'made', 'hey', 'girl', 'line', 'favorite', 'pickup', 'los', 'de', 'http', 'q', 'cada', 'experimental', 'stroke', 'long', 'cancer', 'se', 'data', 'en', 'adolescentes', 'alarmistas', 'alteraciones', 'así', 'cardiacas', 'como', 'con'*

Themes: (1) A widely circulated tweet insinuated that the Pfizer vaccine could cause heart problems. The tweet involved a person asking about the name of a girl if her name was

Pfizer, which made his heart stop. Although the tweet was written artistically, it ‘hinted indirectly’ that the Pfizer vaccine causes heart failure. It did not provide direct evidence or any factual basis for the claim; however, it gained a lot of retweets. (2) Another viral tweet ‘insulted people’ who supported vaccinations as “sick and weird”. It also ‘accused’ them of targeting children, which is a serious allegation.

Topic 3 keywords: ‘pfizer’, ‘heart’, ‘vaccine’, ‘http’, ‘vaccination’, ‘problem’, ‘effect’, ‘attack’, ‘study’, ‘people’, ‘cardiovascular’, ‘following’, ‘know’, ‘risk’, ‘reuters’, ‘one’, ‘covid’, ‘inflammation’, ‘young’, ‘rate’, ‘jab’, ‘teen’, ‘amp’, ‘new’, ‘adverse’, ‘shot’, ‘virus’, ‘around’, ‘concern’, ‘found’

Topic 4 keywords: ‘http’, ‘teenager’, ‘vaccine’, ‘heart’, ‘second’, ‘pfizer’, ‘study’, ‘teen’, ‘thailand’, ‘one’, ‘six’, ‘change’, ‘rhythm’, ‘dose’, ‘found’, ‘medium’, ‘mild’, ‘social’, ‘temporary’, ‘post’, ‘among’, ‘claim’, ‘major’, ‘small’, ‘anyone’, ‘cdcgov’, ‘boy’, ‘dangerous’, ‘far’, ‘suggests’

Topic 5 keywords: ‘pfizer’, ‘heart’, ‘http’, ‘issue’, ‘like’, ‘le’, ‘dose’, ‘never’, ‘reaction’, ‘really’, ‘said’, ‘covid’, ‘de’, ‘su’, ‘still’, ‘reuters’, ‘felt’, ‘getting’, ‘started’, ‘adverse’, ‘experiencing’, ‘die’, ‘mom’, ‘hour’, ‘efenigson’, ‘going’, ‘active’, ‘cammy’, ‘patterson’, ‘sur’

Themes: (1) Some retweets were not quite right and somewhat exaggerated compared to the original research, which said that only one percent of people surveyed experienced myocarditis. This was a fall in numbers from the initial report even though an exaggeration was apparent when it came to symptoms. All that happened was very mild changes in heart beat that did not lead to inflammation of heart muscles. (2) This retweet aimed to scare people (fear provoking), following someone’s tweet about a mother who had adverse reactions involving her heart 24 hours after getting her second Pfizer dose. (3) The starting point for these retweets was a Thai study that warned the government and maintained that: “the USFDA directed Pfizer to conduct the study; but Thailand did it and monitored it”. (4) It raised concerns about vaccine safety. The retweet aimed to spread information discrediting Pfizer and the vaccination it issued against COVID-19. There are indications that the United States Food and Drug Administration asked Pfizer to conduct investigations regarding its new vaccine for COVID-19. Then came another retweet showing how Thai research found negative effects on blood vessels and the heart in young people. The results showed that replies and mentions were relatively low-frequency interactions among users engaging with misinformation during the COVID-19 pandemic such that users tended to engage through retweets rather than reply or mention other users.

6.3 Moderate to Spot Misinformation (Linking COVID-19 with Lab)

There were misleading claims circulating on social media suggesting that Boston University researchers had created a new COVID-19 strain that could potentially kill 80% of those infected. This claim was a subject of debate and investigation at the time. It was not immediately clear whether this claim is true or false, and further investigation and analysis of the scientific evidence and expert opinions was necessary to determine its validity.²⁶

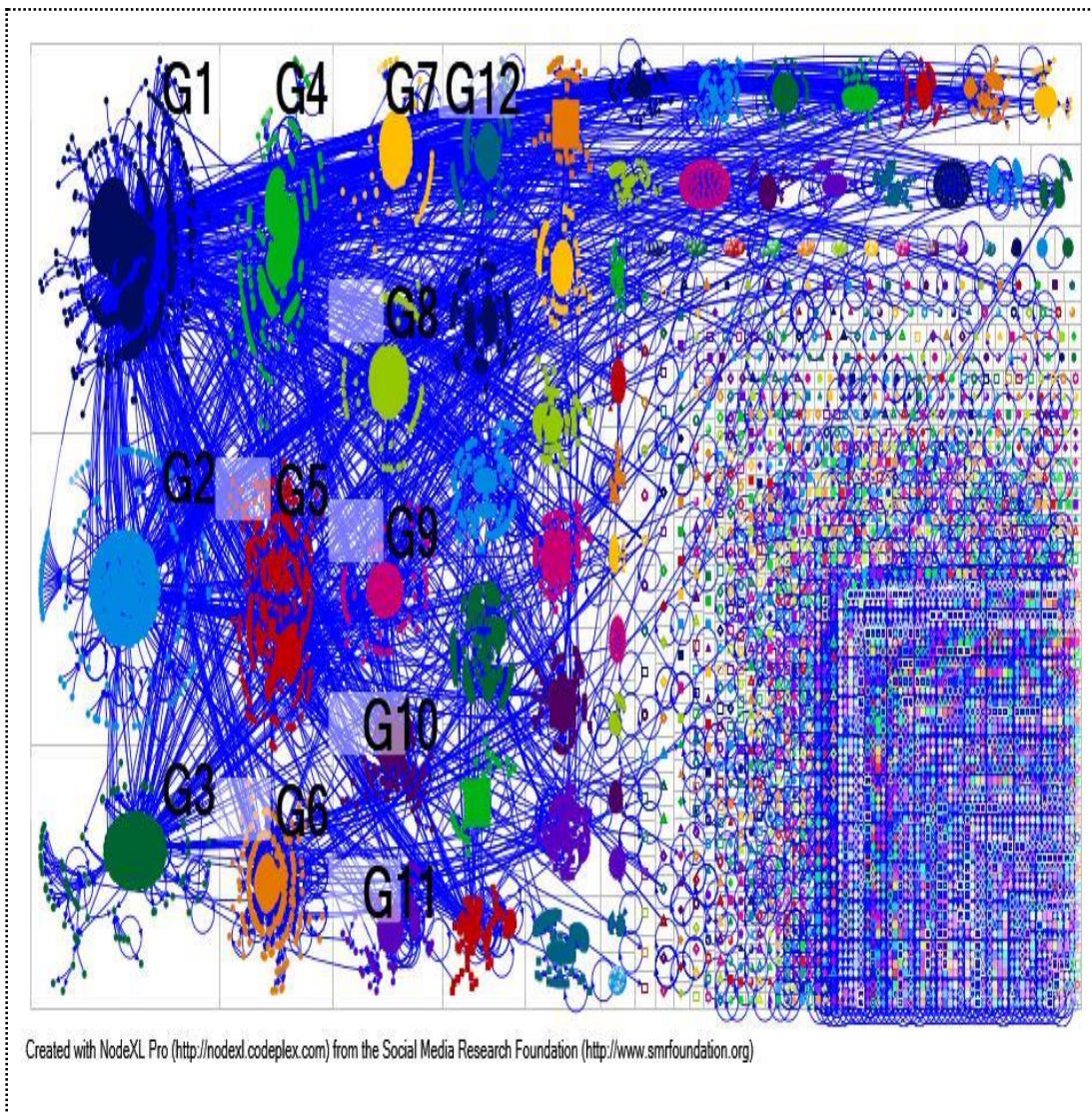
²⁶ <https://www.science.org/content/article/was-study-created-hybrid-covid-19-virus-too-risky>

However, the study in question only involved infecting transgenic mice, and experts pointed out the limitations of this study, emphasising that the mouse model could not accurately predict human outcomes.²⁷

6.3.1 Overall Network Structure

The network consisted of tweets, which were composed of 19.8% (n = 5242) mentions, 45.6% (n = 12,070) retweets, 10.8% (n = 2860) mentions in retweets, 11.6% (n = 3083) replies and 12.2% (n = 3228) individual tweets in the sample dataset. These interactions involved 18,902 unique users, with a network density of 0.000060148342623881 and an average betweenness centrality of 38,947.246. The most influential users in the network were identified based on their betweenness centrality scores.

²⁷ <https://www.reuters.com/article/factcheck-boston-virus/fact-check-boston-university-hybrid-covid-virus-kills-80-of-mice-not-people-idUSL1N31Q0ZK/>

Figure 52 Overall Social Media Network Structure of Twitter Users**Overall Contents:****Table 24** Top Words, Words Pairs and Hashtags from Tweets in the Entire Graph

Top Words	Count	Top Word Pairs	Count	Top Hashtags	Count
covid	15,224	covid,19	3567	covid	514
lab	14,340	covid,strain	3318	boston	250
boston	5885	boston,university	3025	covid19	245
new	5565	strain,lab	1949	wuhan	231
strain	5477	boston,lab	1822	foxnews	143
80	3866	kill,rate	1726	omicron	121
virus	3702	made,lab	1686	godspeed	87
research	3683	more,lethal	1549	bostonuniversity	59
19	3624	80,kill	1512	covid_19	59
created	3119	cov,2	1425	tories	46

As shown in **Table 18**, commonly used words included “covid”, “lab”, “boston”, “new” and “new”, commonly used word pairs included “covid,19”, “covid,strain”,

6	https://fxn.ws	Right-wing news website	Boston University researchers claim to have developed new, more lethal COVID strain in lab	440
7	https://fxn.ws	Right-wing news website	Boston University researchers claim to have developed new, more lethal COVID strain in lab	282
8	www.dailymail.co.uk	Right-wing news website	Top NIH director admits Boston lab that created new COVID strain did NOT clear research with agency... and only learned of details—on DailyMail.com	229
10	www.dailymail.co.uk	Right-wing news website	EXCLUSIVE: ‘This is playing with fire - it could spark a lab-generated pandemic’: Experts slam Boston lab where scientists have created a new deadly Omicron strain with an 80% kill rate in mice	220
11	http://DailyMail.com	Right-wing news website	It’s Harry and Meghan 2.0 as couple launch Sussex.com‘ Royals rebrand with website for 'The Office of Prince Harry and Meghan' - which modestly insists pair are 'shaping the future through business and philanthropy'	210

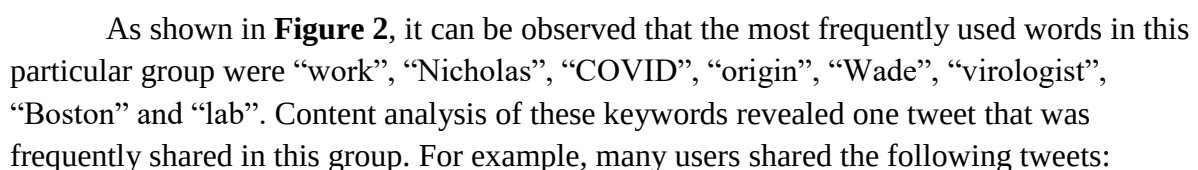
Table 26 Influential Users

Rank	Betweenness centrality score	Followers, n	Account description	Network group, as in Figure 1
1	52,981,088.564	275.7K	British social commentator and director for a right-wing British organisation	2
2	43,091,153.444	69.4K	Molecular biologist and laboratory director at a university	1
3	27,434,763.853	24.4M	Right-wing news website	3
4	13,700,634.706	162	Bot spreading covid misinformation	4
5	12,704,703.058	-	This account does not exist	8
6	12,027,073.298	27.8K	Professor at university	6
7	11,869,535.787	331.7K	Media and news account	9
8	11,740,501.186	46K	Television producer	7
9	9,616,110.770	376.6K	Account for a conservative individual	4
10	9,597,602.817	2.8M F	Account for a right-wing news website	4

6.3.2 The Largest Groups

There were a total of 3178 groups formed around the misinformation, among which seven large groups formed within the network structure.

The largest of these groups, G1, had 1368 users and 2213 edges with a density of 0.001249160452949. The influencer of the group was a molecular biologist and laboratory director at a university. They had a betweenness centrality degree of 43,091,153.44387



There is a growing body of evidence suggesting that Covid-19 may have originated in a laboratory through genetic manipulation (Including a reference to a conservative public policy magazine).

"An individual who was involved with EcoHealth and was against the COVID-19 origin investigation conducted by The Lancet works at the Boston laboratory where the contentious chimeric COVID experiment was carried out" (Including a reference to a right-wing news and opinion website).

Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “opinion”, “science”, “love”, “truth” and “tweet”. Some users have included the following statements in their profiles:

"My opinions and thought are my own"

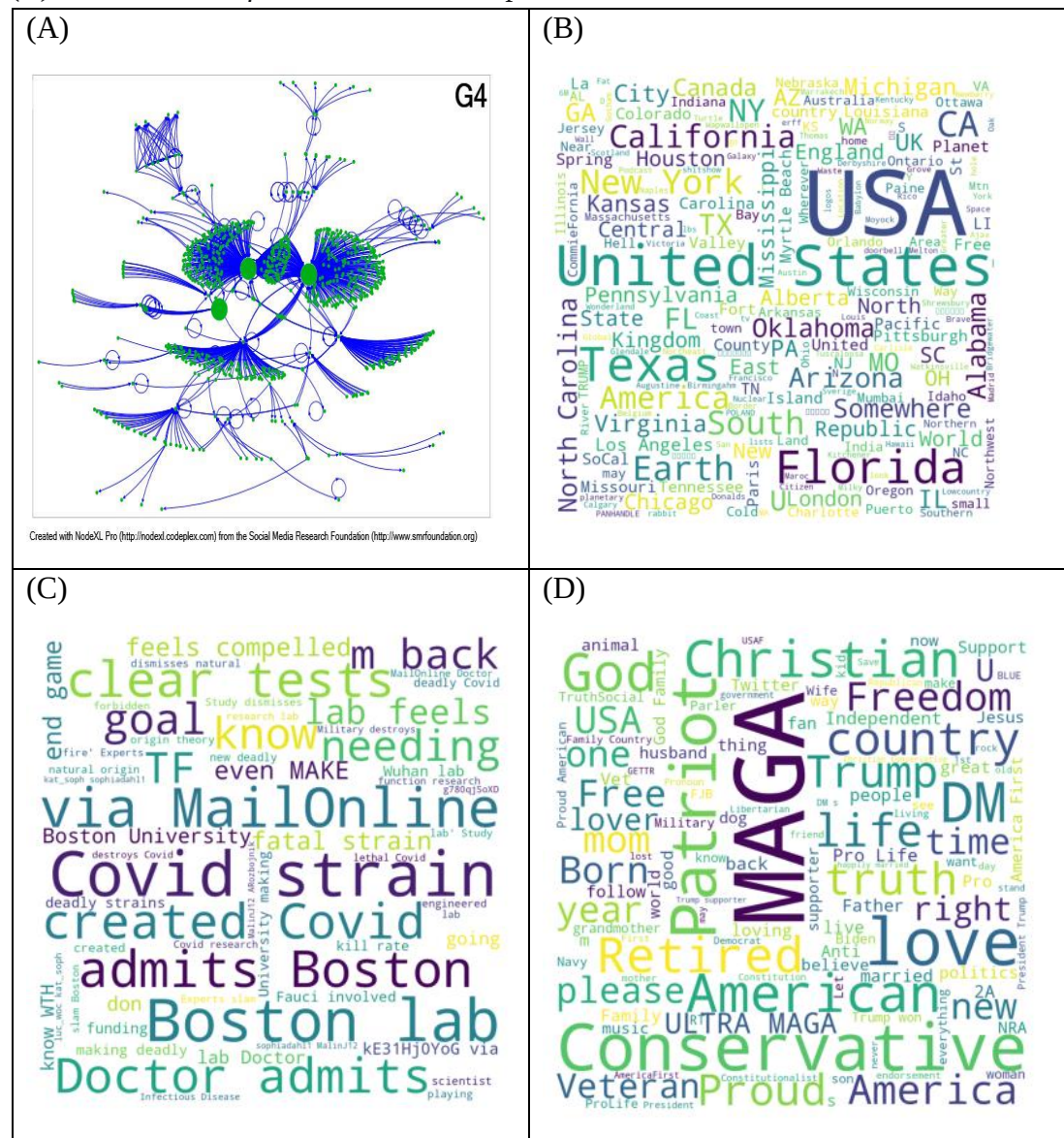
"I'm a truth-seeker who values rationality and science, and enjoys questioning things."

""I use social media to explore concepts, debates, proof, methods, and narratives. When I like, follow, or share something, it doesn't mean I endorse it. I use these actions as bookmarks or to express curiosity."

Based on word cloud analysis, the most used words in the profiles of users who retweeted a G1 influencer were -----.

G2 had 1099 users and 1128 edges with a density of 0.000925663502670916. The interconnectivity between users in this group was lower than that in G1.

Figure 59 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 4



As shown in Figure 2, the most frequently used words in this group were “MailOnline”, “Covid”, “strain”, “created”, “Boston”, “lab”, “Doctor” and “admits”. Based on content analysis using these keywords, one tweet was frequently shared in this group. For example, users shared the following tweets:

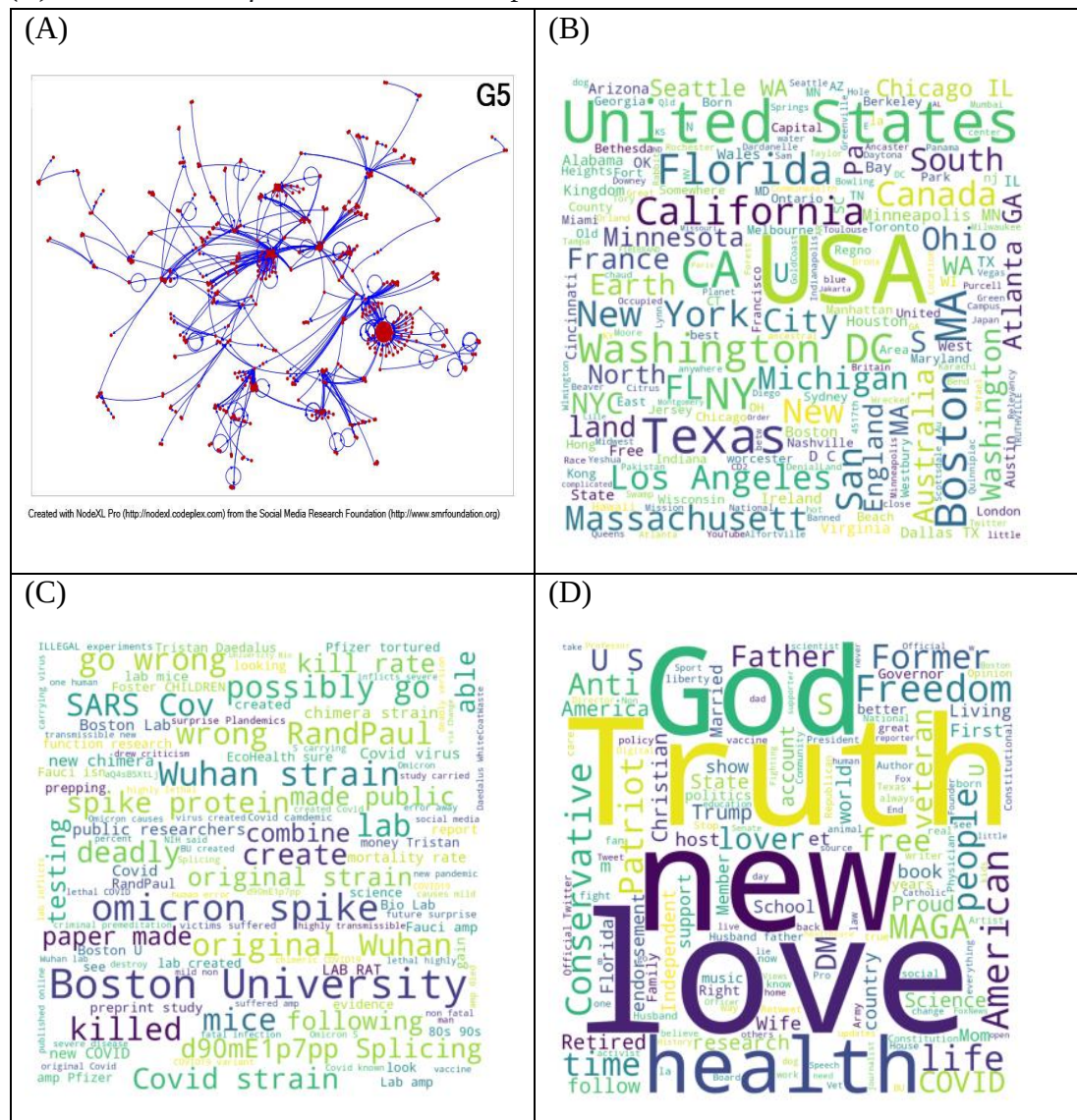
A Boston lab that created the Covid strain did not pass the tests, as admitted by a doctor. This is how pandemics can begin. (News website).

The doctor has acknowledged that the Boston lab, which produced the Covid strain, did not pass the required tests.

Furthermore, word cloud analysis found that the most commonly used terms in the profiles of users who retweeted this group influencer were “MAGA”, “Conservative”, “American”, “DM” and “Patriot”.

G5 had 677 users and 887 edges with a density of 0.00197967014237893.

Figure 60 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 5



As shown in **Figure 2**, the most frequently used words in this group were “MailOnline”, “Covid”, “strain”, “created”, “Boston”, “lab”, “Doctor” and “admits”. Content analysis of these keywords revealed one tweet that was frequently shared in this group. The majority of users shared the following tweets:

What kind of trouble could arise from inserting the omicron spike into the original Wuhan strain of SARS-CoV-2? Mentioning one of the U.S. Senator. (Including a reference for the lean right news website).

Researchers from BU have developed a highly lethal form of COVID-19 that may have the potential to spread undetected. They said Our lab-created virus carrying the Omicron S gene causes a severe illness with an

80% mortality rate in mice (including a reference for account who dedicated to share misinformation).

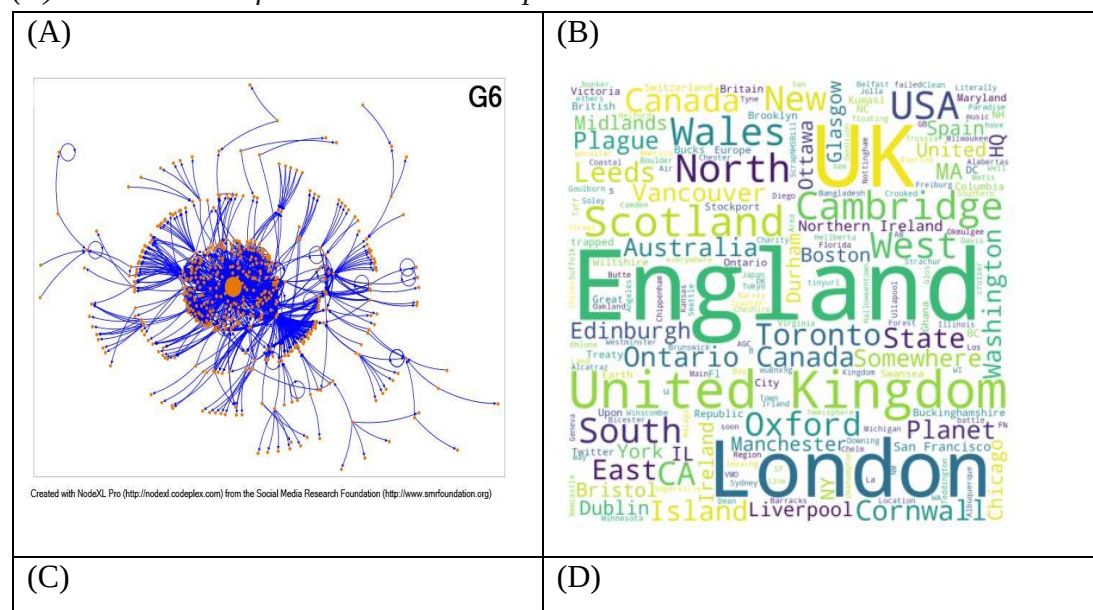
Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “MAGA”, “Conservative”, “American”, “DM” and “Patriot”. For instance, some users included the following statements in their profiles:

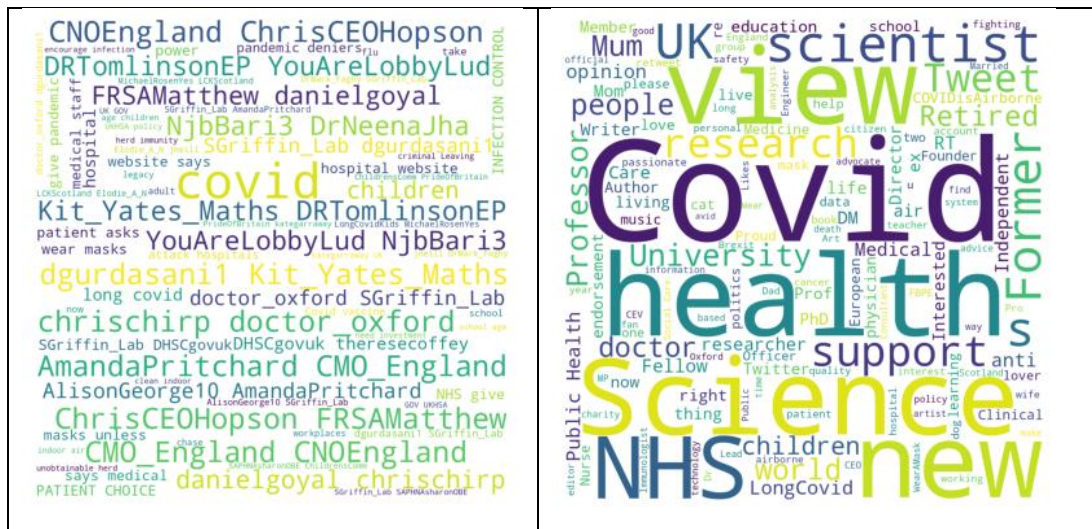
“The existence of truth and untruth is undeniable. If you hold on to the truth, even in opposition to the entire world, you are not insane.”

PhD in physical chemistry. Covid affects respiratory system & spreads through air. I value integrity, diversity & inclusion. Passionate about lifelong learning. NHS plays a crucial role in healthcare & social care.

G6 had 514 users and 1519 edges with a density of 0.0062158205717493. The most influential user had a betweenness centrality 0.0062158205717493.

Figure 61 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 6





Based on the findings presented in **Figure 2**, the most frequently used words in this group were “covid”, “CMO”, “chrishirp”, “doctor”, “Yates” and “Maths”. Content analysis of these keywords revealed one tweet that was frequently shared in this group. Users shared the following tweets:

I understand that Twitter appears to have stopped their efforts to combat misinformation surrounding Covid-19, at least in the UK. However, it seems that the option to report false information or the spread of misinformation regarding COVID-19 vaccines has disappeared.

The hospital website states that medical staff aren't required to wear masks without patient's request. This raises question about the infection control policies and concerns about pandemic deniers attacking hospitals.

Furthermore, word cloud analysis revealed that the most commonly used terms in the profiles of users who retweeted this group influencer were “covid”, “View”, “health”, “Science” and “NHS”. For example, some users included the following statements in their profiles:

As an Emergency Physician, I am dedicated to combating misinformation and fighting against the spread of Covid-19.

As a Medic, Researcher, and Citizen, I believe that corruption and disinformation pose the biggest threat to our progress. I will be sharing health updates and my opinions on the matter.

Life can be complicated, but death is simple. We must put an end to war and do our part to stop the spread of Covid-19. Covid-19 is a test of our ability to deal with future challenges due to the climate crisis. Those who downplay the seriousness of COVID-19 are not helping, and we must show love and solidarity to one another. Science and cooperation are key to overcoming these challenges.

“Trump” and “Patriot”. For instance, one user included the following statement in their profile:

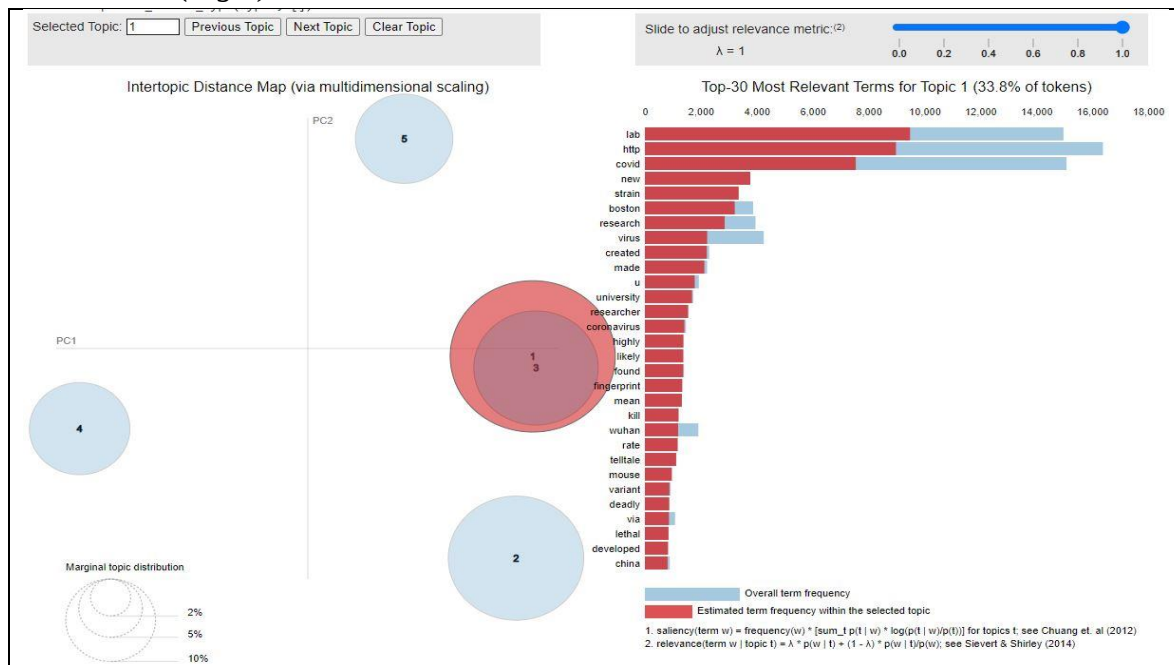
“I am a supporter of conservative politics. My preferred pronouns are "Trump Won!" and I always identify as a patriot. Additionally, I follow back all those who share my beliefs and values as a fellow patriot.”

Overall, the most common form of misinformation contained claims about a Boston University laboratory that developed an even deadlier strain of the COVID-19 virus, which were often linked to sources ranging from left-centre to right-wing news sites. This disinformation suggests a deliberate engineering of the pandemic, thus raising queries regarding its origins and implications for public health. The political parties involved in spreading this disinformation were mainly conservative or right-leaning groups who mentioned MAGA sentiments and support for President Trump. Additionally, there were indications of anti-vaccine groups sceptical about vaccine safety that were critical of the origin of COVID-19 origin and its risk factors.

6.3.3 Users' Engagement with Misinformation

Retweets were the most common type of interaction among users who engaged with misinformation during the COVID-19 pandemic, suggesting that users tend to pass on misinformation to their followers.

Figure 63 Visualisation of Topic Modelling Using Latent Dirichlet Allocation (LDA) Showing the 5 Emerging Topics on an Intertopic Distance Map (left), with the Top 30 Most Salient Terms (Right)



Exploration of the topics showing the following distribution of the key terms and a summary of the emerging themes (terms in *italics* were considered for manual exploration):

Topic 1 keywords: 'lab', 'http', 'covid', 'new', 'strain', 'boston', 'research', 'virus', 'created', 'made', 'u', 'university', 'researcher', 'coronavirus', 'highly', 'likely', 'found', 'fingerprint', 'mean', 'kill', 'wuhan', 'rate', 'telltale', 'mouse', 'variant', 'deadly', 'via', 'lethal', 'developed', 'china'

Topic 2 keywords: 'covid', 'amp', 'http', 'lab', 'vaccine', 'year', 'result', 'scientist', 'hospital', 'like', 'since', 'virus', 'probably', 'infection', 'kind', 'amandapritchard', 'chrisciehopson', 'youarelobbyslud', 'chrischirp', 'wade', 'nicholas', 'frsamatthew', 'could', 'virologist', 'natedoromal', 'despite', 'genetic', 'patient', 'government'

Topic 5 keywords: 'http', 'covid', 'child', 'lab', 'de', 'vaccinated', 'virus', 'school', 'het', 'een', 'mailonline', 'see', 'long', 'need', 'en', 'marionkoopmans', 'infection', 'wuhan', 'door', 'know', 'van', 'dat', 'uk', 'news', 'afkomstig', 'immunity', 'age', 'longcovidkids', 'la', 'full'

Themes: (1) There is scepticism and critique of research priorities. The ethics of gain-of-function research are being questioned; whether manufacturing more deadly virus strains is worth it is doubtful. Gain-of-function research, which is the cause of these ethical dilemmas, has been criticised for introducing stronger lethal virus variants. Official narratives are met with scepticism by users who see potential financial interests at work in public health and research deliberations. Such scepticism is extended to questioning the safety and effectiveness of vaccines due to perceived financial profit compromising honesty in health information. (2) The concern for misinformation and clarification efforts emphasises that reading scientific articles and original preprints should be used to comprehend nuances within research, debunk falsehoods and promote well-informed conversations. (3) Conspiracy theories and trust issues reflect the distrust in the handling of information by platforms and authorities.

Topic 3 keywords: 'lab', 'http', 'covid', 'new', 'strain', 'boston', 'research', 'virus', 'created', 'made', 'u', 'university', 'researcher', 'coronavirus', 'highly', 'likely', 'found', 'fingerprint', 'mean', 'kill', 'wuhan', 'rate', 'telltale', 'mouse', 'variant', 'deadly', 'via', 'lethal', 'developed'

Topic 4 keywords: 'die', 'drpuerner', 'da', 'und', 'samyprivat', 'der', 'ist', 'nicht', 'mit', 'http', 'covid', 'ich', 'sie', 'du', 'zu', 'sind', 'auch', 'menschen', 'e', 'ohne', 'bei', 'wir', 'das', 'oder', 'wenn', 'den', 'ja', 'noch', 'einen', 'wie'

Themes: (1) Public health and safety concerns questions the wisdom of conducting high-stakes research, reflecting fears of repeating past mistakes, such as the speculated Wuhan lab leak. (2) Ethical and moral questions on scientific research reflects the ethical and moral justifications for developing more lethal virus strains, even in the context of research.

6.4 Easy to Spot Misinformation (Linking Deaths to Low Vitamin D Levels)

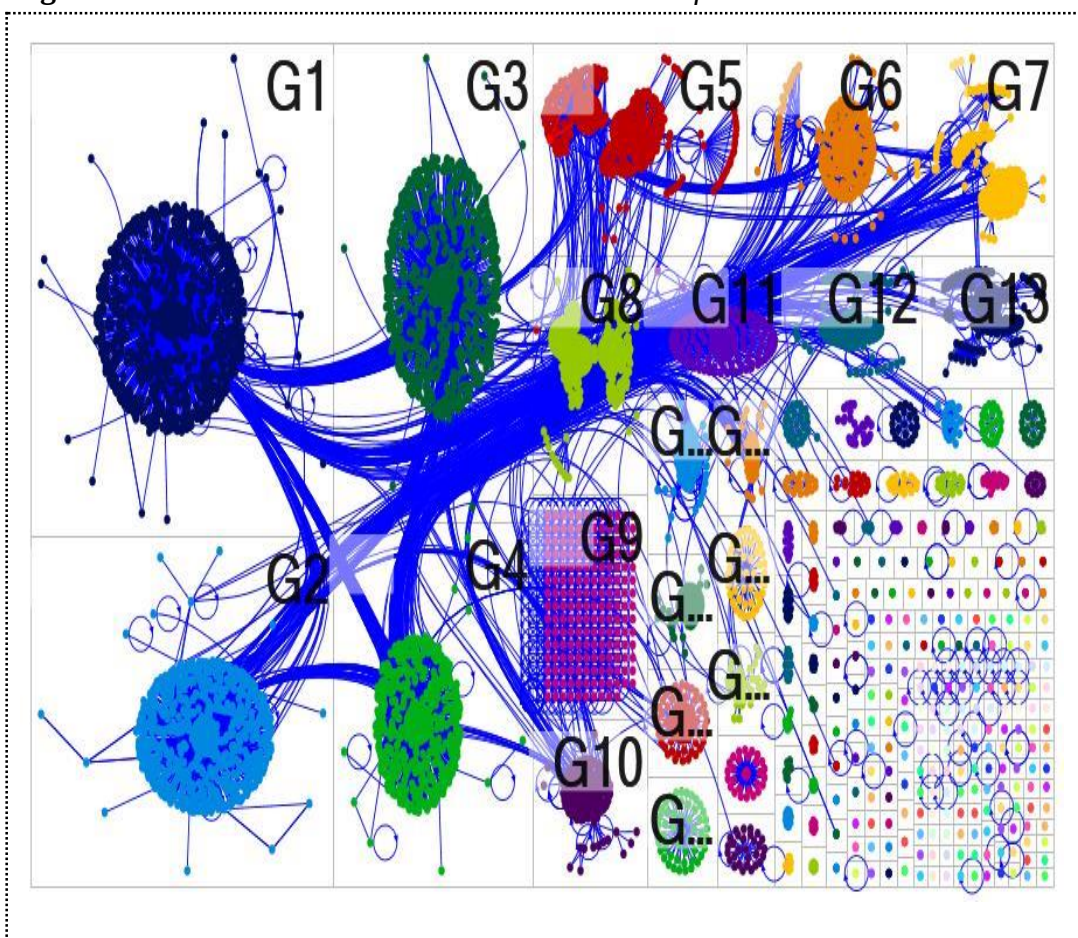
In this section, misinformation suggesting a link between deaths and low levels of vitamin D was given to participants. However, this claim contained several errors and was misleading. While it was true that there could be some correlation between vitamin D levels

and immune function²⁸, this does not necessarily establish a direct link between low vitamin D levels and death.²⁹

6.4.1 Overall Network Structure

The network consisted of tweets, which were composed of 11.3% (n = 1026) mentions, 58.9% (n = 5320) retweets, 15.3% (n = 1382) mentions in retweets, % (n = 869) replies and 4.7% (n = 427) individual tweets in the sample dataset. These interactions involved 6005 unique users, with a network density of 0.000225744591033122 and an average betweenness centrality of 11,810.677. The most influential users in the network were identified based on their betweenness centrality scores.

Figure 64 Overall Social Media Network Structure of Twitter Users



Overall Contents:

²⁸ <https://fullfact.org/health/vitamin-d-study-flawed/>

²⁹ <https://www.factcheck.org/2020/06/does-vitamin-d-protect-against-covid-19/>

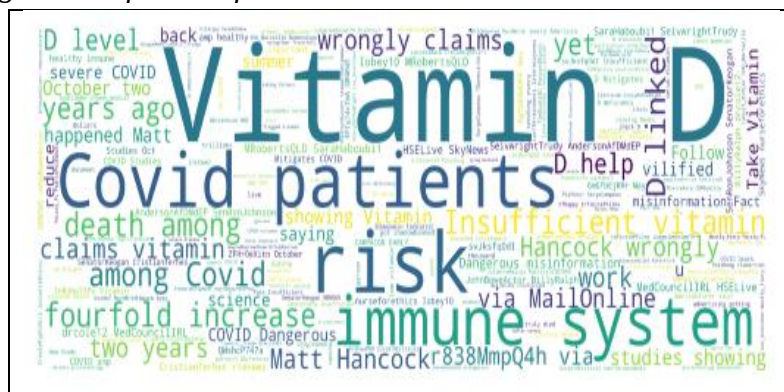
As shown in **Figure 2A**, commonly used words in users profiles included “Love”, “Truth”, “Freedom”, “World”, “Life” and “Anti”. Content analysis of these keywords revealed three main groups in the dataset: truth-seekers, anti-vaccination passports, anti-left ideologies and anti-climate change. Some users mentioned the following statements in their profiles:

"I am someone who thinks deeply and seeks the truth. My tweets reflect my personal opinions."

"I am against vaccination passports, don't identify with any political party, dislike left-leaning ideologies, and opposed to illegal immigration."

"Anti climate change mafia"

Figure 67 *A Tag Cloud of Words from the Twitter Dataset*



As shown in Figure 2A, commonly used words in tweets included “Vitamin”, “D”, “cCOVID”, “Patients”, “Risk”, “Immune” and “System”. Content analysis using these keywords showed that some tweets were frequently shared in the dataset. For example, users shared the following tweets:

"The risk of COVID is linked to the levels of Vitamin D."(Including reference for UK health website)"

"Vitamin D benefits the immune system, but in October 2020 (two years ago), the Secretary of State for Health and Social Care stated that it's ineffective in treating Covid-19.." (Including reference for Right-wing news)

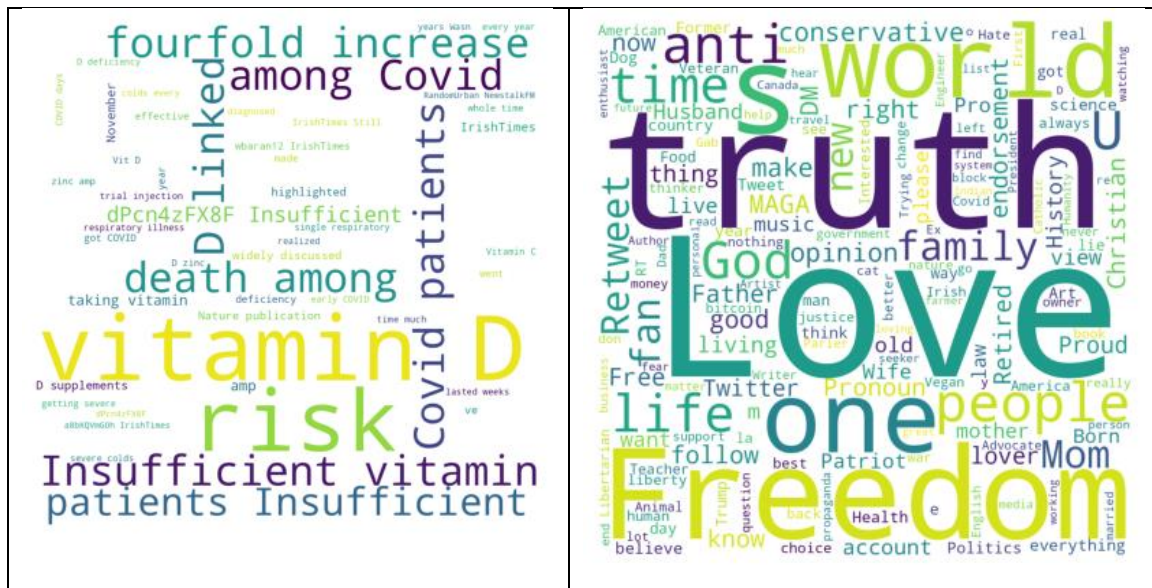
"A research conducted on mortality rates among Covid-19 patients admitted to Connolly Hospital has revealed that Irish Covid-19 patients of all ages are at a significantly higher risk of death, up to 2-5 times more, if they have low levels of vitamin D." (Including reference for Irish independent politician post in Twitter)

Table 28 *Influential Web Sources*

Rank	Domains	Type	Website title	Count
1	www.irishtimes.com/health	Center News Media	Insufficient vitamin d linked to fourfold-increase in risk of death among covid-19 patients	2053
2	www.irishtimes.com/health	Center News Media	Insufficient vitamin d linked to fourfold-increase in risk of death among covid-19 patients	814
3	www.dailymail.co.uk	UK Right News Media	Since the Covid-19 epidemic started multiple studies have repeatedly shown a link to Vitamin D deficiency yet when Matt Hancock was asked about it he WRONGLY said a British study had found the opposite. Is he ignorant or incompetent?	663
4	www.youtube.com	YouTube channel focusing on science and health	Ep73 Vitamin D Status and Viral Interactions...The Science	151
5	Twitter.com/IrishTimes	Center News Media	Insufficient vitamin D linked to fourfold increase in risk of death among Covid-19 patients	106
6	Twitter.com/IrishTimes	Center News Media	Insufficient vitamin D linked to fourfold increase in risk of death among Covid-19 patients	91
7	www.youtube.com	YouTube channel focusing on broadcast	Vitamin D DRASTICALLY Lowers COVID Death Rates – New Study	77
8	www.mdpi.com	Publisher of peer-reviewed journals	Vitamin D Status and Mortality from SARS CoV-2: A Prospective Study of Unvaccinated Caucasian Adults	70
9	https://www.youtube.com	YouTube channel focusing on broadcast	Vitamin D DRASTICALLY Lowers COVID Death Rates – New Study	66
10	Medicaldialogues.in/amp/coronavirus	Health and medical news site	Low vitamin D levels tied to increased risk of COVID-19 infection: Study	59

Table 29 *Influential Users*

Rank	Betweenness centrality score	Followers, n	Account description	Verified	Network group, as in Figure 1
1	12,406,291.488	689876	Center News Media	TRUE	1
2	7,612,117.019	316309	Account sceptical about the efficiency of COVID-19 vaccines	FALSE	2
3	6,331,276.949	2164	Someone who works as both a personal trainer and physical therapist	FALSE	3
4	3,350,865.950	11776	Someone who is uncategorised	TRUE	4
5	1,749,103.918	750349	scottadamssays	FALSE	6



As shown in Figure 2, the most frequently used words in this group were “vitamin”, “D”, “risk”, “Insufficient”, “linked”, “increase”, “covid” and “patients”. Content analysis of these keywords revealed a tweet that was frequently shared in this group, as follows:

Low levels of vitamin D may increase the risk of death fourfold among Covid-19 patients (Including reference for Center News Media).

Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “Love”, “truth”, “Freedom”, “one” and “world”. Some of these users included the following statements in their profiles:

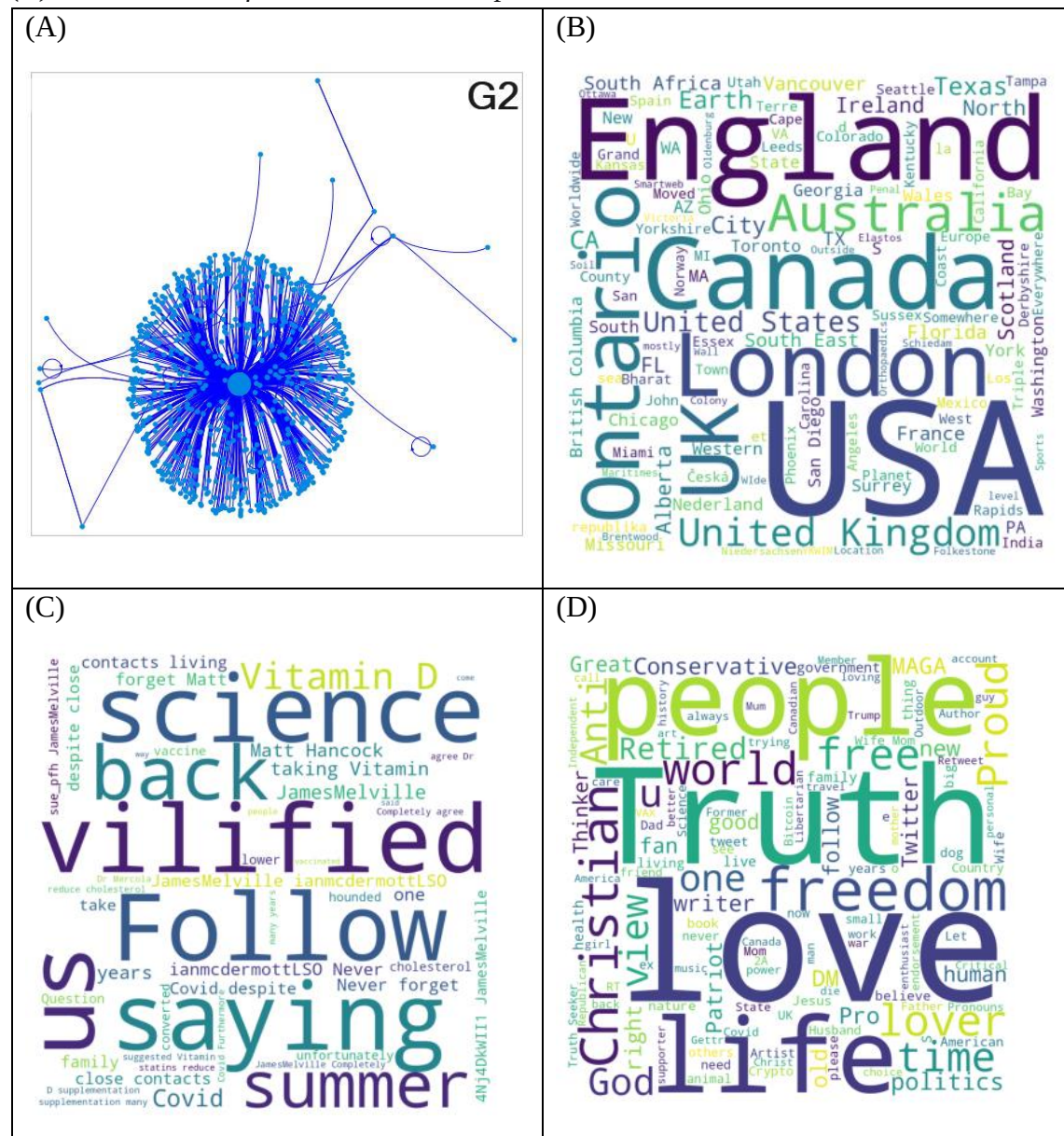
"I believe in honesty, affection, and acknowledging the vastness of the cosmos. I am a proud supporter of my English heritage and President Donald Trump."

The only truth is Conspiracy .

"We live in a world that is full of deception. In this world, truth is our most powerful weapon. It is important to question everything."

G2 had 740 users and 761 edges with a density of 0.00140072413414768. The most influential user of the network was sceptical about the efficiency of COVID-19 vaccines and had a betweenness centrality of 7,612,117.018955.

Figure 69 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C), and Users' Profiles Related to Group 2



As shown in Figure 2, the most frequently used words in this group were “vilified”, “Follow”, “Science”, “saying”, “us”, “summer”, “back”, “Vitamin D” and “Covid”. Content analysis using these keywords revealed one tweet that was frequently shared in this group, as follows:

"In the summer of 2020, there were a few of us who expressed the same opinion but were criticized for it. It's important to follow scientific evidence. 🧐 (Including reference for Center News Media). "

Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “Truth”, “love”, “life”, “Christian” and “people”. For instance, some users included the following statements in their profiles:

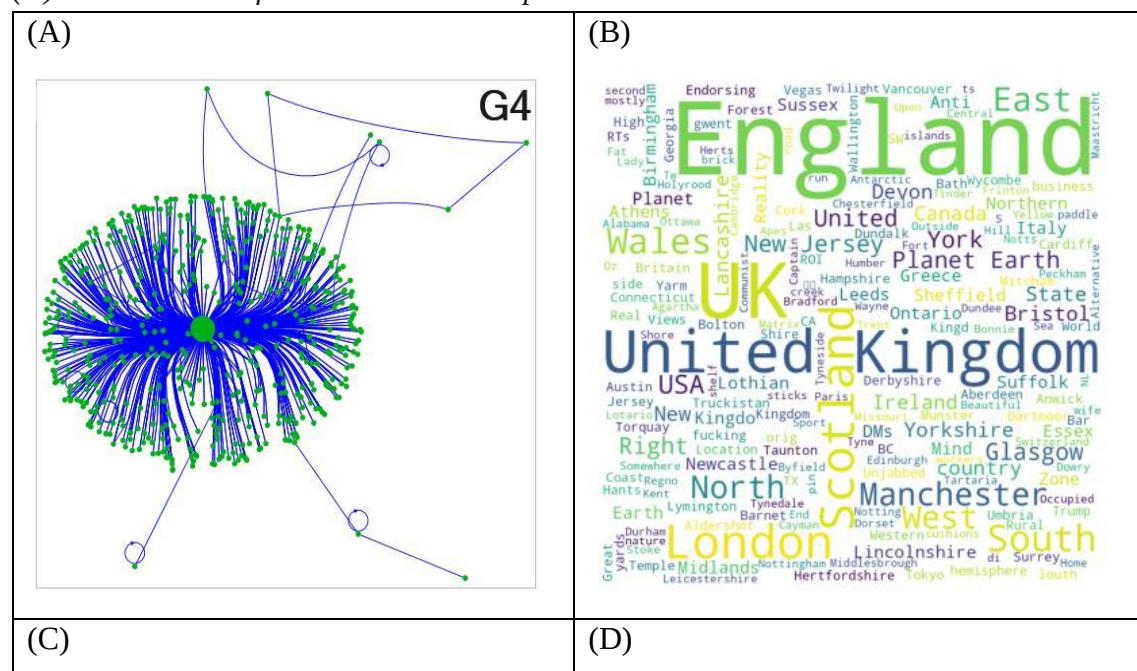
As shown in Figure 2, the most frequently used words in this group were “Vitamin”, “Take”, “Risk”, “severe”, “COVID”, “reduce”, “Dangerous” and “misinformation”. Content analysis using these keywords revealed one tweet that was frequently shared in this group, as follows:

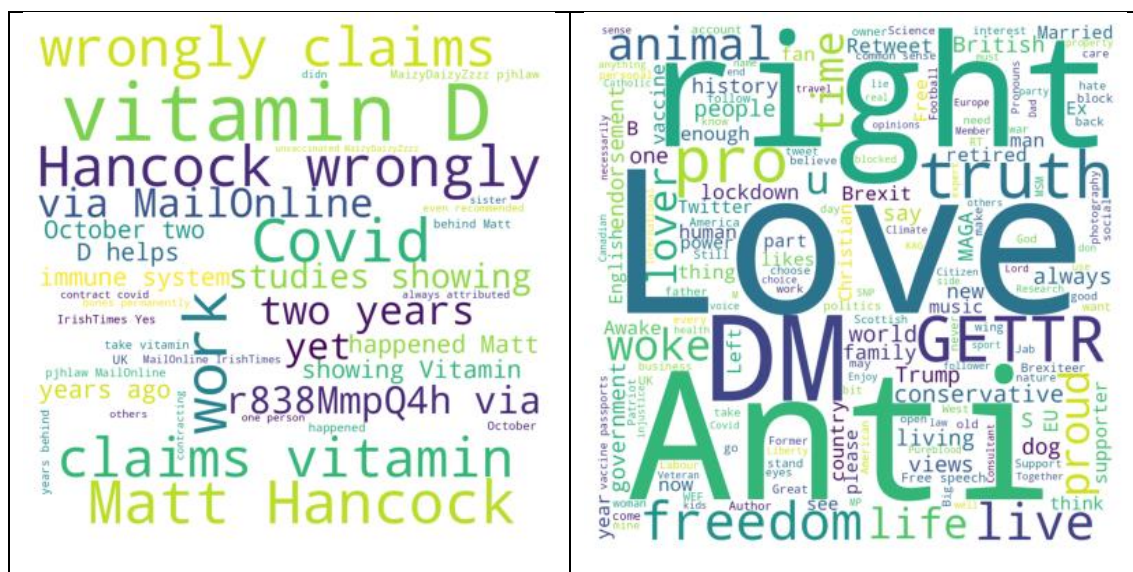
"Vitamin D was once considered dangerous misinformation for reducing the risk of severe COVID in 2020. In 2022, it's now recognized as a fact that Vitamin D can help reduce the risk."

Word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “Love”, “Freedom”, “truth”, “God” and “Proud”.

G4 had 509 users and 1013 edges with a density of 0.00392153829494299. The most influential user of the network was an uncategorised account. This user had a betweenness centrality of 3,350,865.949613.

Figure 71 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 4





As shown in Figure 2, the most frequently used words in this group were “Hancock”, “wrongly”, “Covid”, “work”, “claims”, “vitamin”, “Matt” and “helps”. Content analysis using these keywords revealed one tweet that was frequently shared in this group, as follows:

"Vitamin D benefits the immune system, but in October 2020 (two years ago), the Secretary of State for Health and Social Care stated that it's ineffective in treating Covid-19.." (Including reference for Right-wing news)

Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “Love”, “Anti”, “DM”, “GETTR” and “proud”. For instance, some users included the following statements in their profiles:

"I identify as a person who believes in conspiracy theories, practices witchcraft, and often avoids discussing irrelevant topics. You can find me on Gettr with the handle @...."

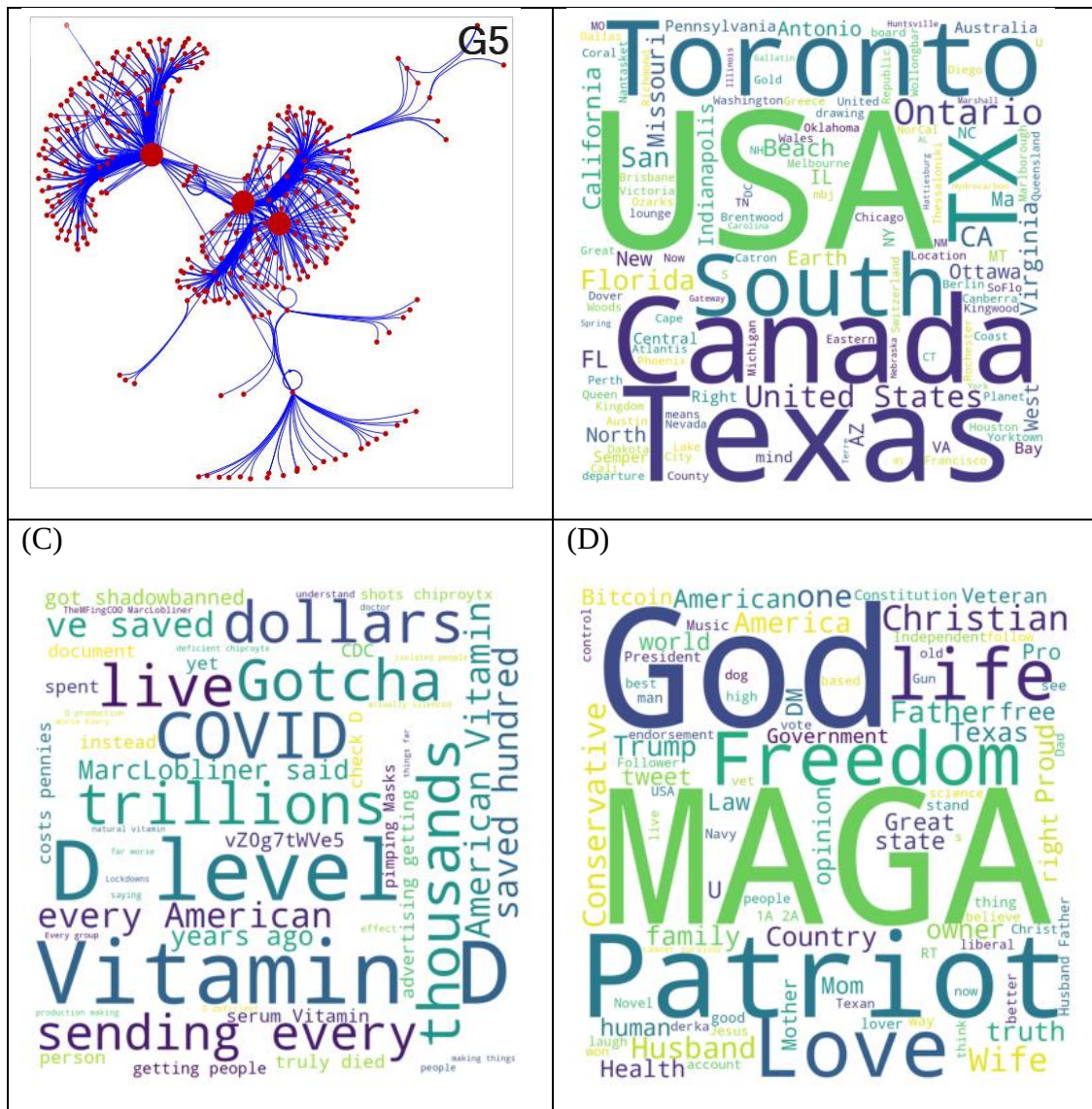
"I used to vote for the Conservative party. I believe in small government and personal responsibility. I am against lockdowns and vaccine passports, and I support liberty."

" I am a supporter of the color green and oppose imperialism and fascism. When I retweet something, it does not necessarily mean that I endorse it"

G5 had 314 users and 587 edges with a density of 0.00607435746118313. The user who held the most influence within this group was uncategorised and had a betweenness centrality of 721,906.989972.

Figure 72 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 5

(A)	(B)



Based on the findings presented in Figure 2, the most frequently used words in this particular group were “Vitamin”, “D”, “level”, “COVID”, “Gotcha”, “trillions”, “sending” and “every”. Content analysis using these keywords revealed one tweet that was frequently shared in this group, as follows:

"Would it have been possible to save hundreds of thousands of lives and trillions of dollars if every American was provided with Vitamin D, as mentioned by @... over 2 years ago before being shadow banned for it? (Including reference for Center News Media). "

Furthermore, word cloud analysis showed that the most commonly used terms in the profiles of users who retweeted this group influencer were “MAGA”, “God”, “Patriot”, “Love” and “Freedom”. For instance, some users included the following statements in their profiles:

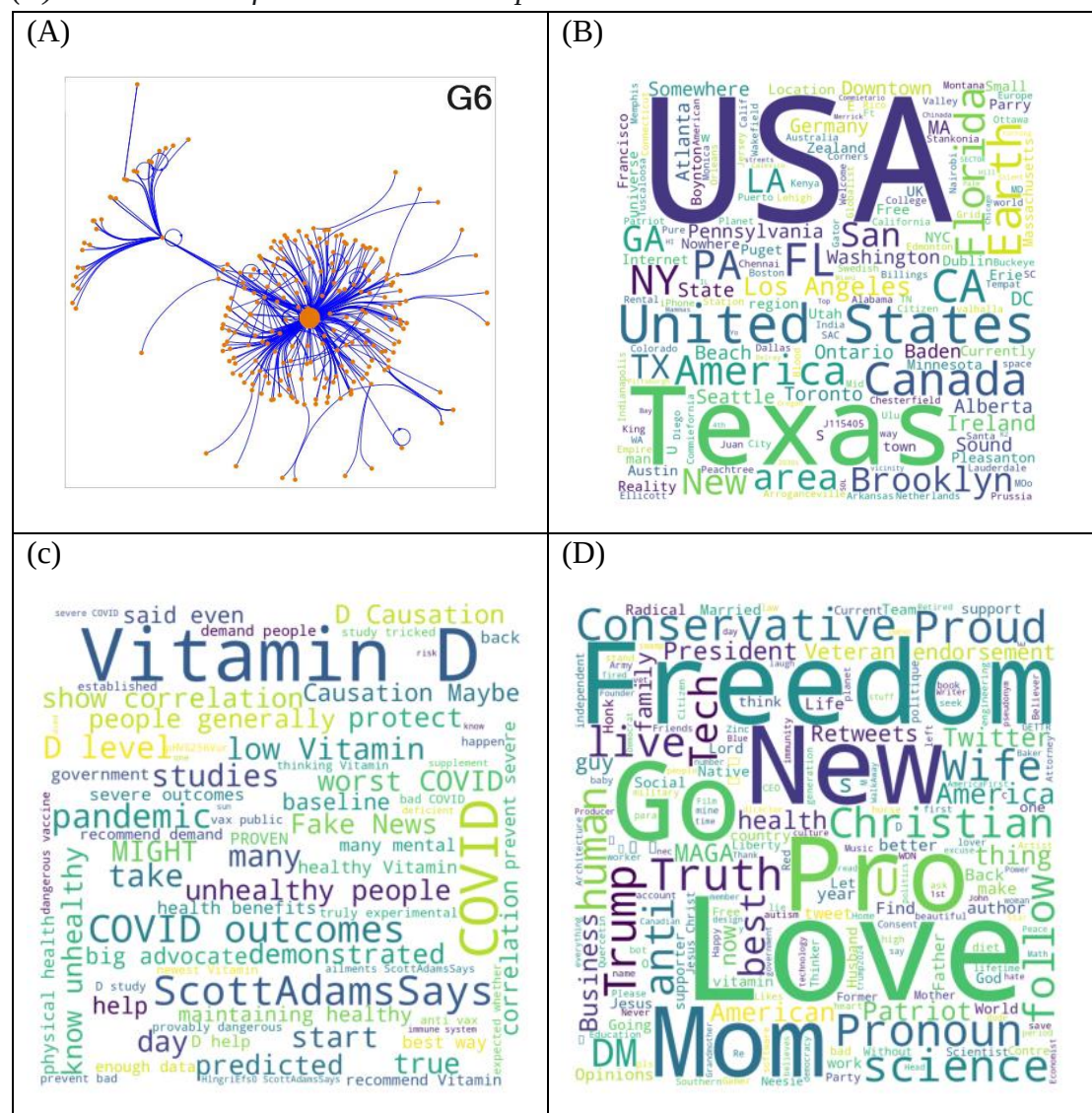
"Donald Trump is still considered the US President. General ... advocate for border wall construction and eradicating corruption in politics.

Hashtags used: "Make America Great Again," United States Air Force, and Trump running for President in 2024."

"Trump's ideology: MAGA, Pro-life, Patriot, Constitution, 1A, 2A, Conservative. ... Humor on social media: Satire, tongue-in-cheek tweets."

G6 had 236 users and 288 edges with a density of 0.00526505589614136. The most influential user of the network was a politician, and they had a betweenness centrality of 1,749,103.917716.

Figure 73 Network Structure (A) and Word Clouds of Users' Locations (B), Shared Tweets (C) and Users' Profiles Related to Group 6

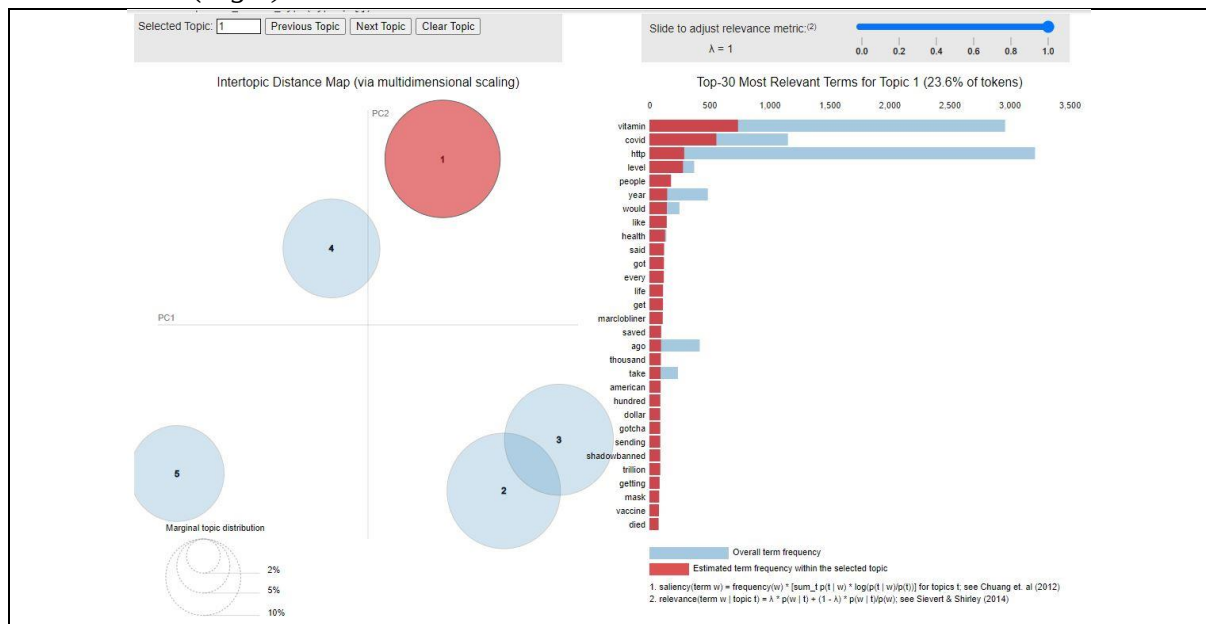


As shown in Figure 2, the most frequently used words in this particular group were "Vitamin", "D", "COVID", "Outcomes", "pandemic", "unhealthy", "predicted" and "low". Content analysis using these keywords revealed one tweet that was frequently shared in this group, as follows:

6.4.3 Users' Engagement with Misinformation

Retweets were the most common type of interaction among users who engaged with misinformation during the COVID-19 pandemic. This suggests that users tend to pass on misinformation to their followers.

Figure 75 Visualisation of Topic Modelling Using Latent Dirichlet Allocation (LDA) Showing the 5 Emerging Topics on an Intertopic Distance Map (left), with the Top 30 Most Salient Terms (Right)



Exploration of the topics showed the following distribution of key terms with a summary of the emerging themes (terms in *italics* were considered for manual exploration):

Topic 1 keywords: '*vitamin*', '*covid*', '*http*', '*level*', '*people*', '*year*', '*would*', '*like*', '*health*', '*said*', '*got*', '*every*', '*life*', '*get*', '*marclobliner*', '*saved*', '*ago*', '*thousand*', '*take*', '*american*', '*hundred*', '*dollar*', '*gotcha*', '*sending*', '*shadowbanned*', '*trillion*', '*getting*', '*mask*', '*vaccine*', '*died*'

Topic 2 keywords: '*http*', '*vitamin*', '*covid*', '*mrobertsqld*', '*andersonafdmdep*', '*billyralph*', '*cristianterhes*', '*gbnews*', '*hselive*', '*johnboweactor*', '*medcouncilirl*', '*nurseforethics*', '*rtenews*', '*seivwrighttrudy*', '*senatorkeogan*', '*senronjohnson*', '*skynews*', '*campaign*', '*may*', '*risk*', '*important*', '*amp*', '*system*', '*immune*', '*study*', '*healthy*', '*mitigates*', '*nov*', '*oct*', '*october*'

Topic 3 keywords: '*http*', '*vitamin*', '*u*', '*system*', '*saying*', '*work*', '*immune*', '*help*', '*back*', '*study*', '*hancock*', '*october*', '*science*', '*year*', '*two*', '*matt*', '*vilified*', '*mailonline*', '*follow*', '*summer*', '*claim*', '*via*', '*wrongly*', '*happened*', '*showing*', '*ago*', '*yet*', '*published*', '*author*', '*evidence*'

Themes: (1) There was a striking increase in actual promotion of vitamin D as protection against COVID-19 by many people. This campaign was often supported by personal experiences and some preliminary scientific studies indicating its possible benefits. (2) A considerable number of people accused health authorities of not promoting consumption of vitamin D early enough. This criticism was one aspect of a larger lack of confidence and scepticism towards official public health recommendations, such as

vaccination programs or lock down orders. (3) Many people believed that there were deliberate attempts to conceal information on alternative treatments and preventative measures, such as vitamin D supplementation. This perception added to the over-arching narrative about distrust for medical professionals and drug makers.

Topic 4 keywords: *'http', 'vitamin', 'study', 'covid', 'patient', 'new', 'would', 'rate', 'low', 'pierre kory', 'bobbileders', 'bobwoodson', 'btysonmd', 'carolmswain', 'creolerightgirl', 'curepolicy', 'dfhappy', 'dnc', 'drshayphd', 'drsubhasree', 'gop', 'infinitefilms', 'judgejoebrowntv', 'julietteakinyi', 'lateresajones', 'lkatrinag', 'pastordscott', 'paulmarik', 'pearlspolkadots', 'possdoug'*

Topic 5 keywords: *'http', 'vitamin', 'death', 'patient', 'risk', 'increase', 'linked', 'insufficient', 'among', 'fourfold', 'dit', 'lower', 'de', 'al', 'het', 'meteen', 'ze', 'niet', 'aan', 'bekend', 'criminelen', 'gemaakt', 'volk', 'waarom', 'wisten', 'amp', 'supplementation', 'research', 'narrative'*

Themes: (1) A prevailing view was that natural health remedies and supplements, such as vitamin D, have been overlooked or dismissed in public health responses to COVID-19. (2) Seeking alternative sources of information can expose one to wrong and deceptive information, as people are increasingly turning to social media and non-peer reviewed studies for health advice. 3) The propagation of exaggerated claims hampers efforts towards fostering an evidence-based approach in healthcare dialogues.

6.5 Summary

COVID-19 misinformation on Twitter can be studied by analysing networks in retweeting behaviour within different ideological communities, showing various network sizes and compositions with high activities surrounding lab-made virus claims, vitamin D misinformation and linking the 2nd Pfizer vaccine with heart problems.

User engagement occurred mainly through retweets, suggesting quick misinformation spread. Support for misinformation tends to be greater among anti-science and anti-vaccination political parties and other groups. In such cases, there are always planned projects that aim at ensuring there is enough financial support to promote the dissemination of the same lies. However, the correction process does not have supporters from either non-scientific or nonpolitical individuals; instead, it frequently rests upon ordinary individuals who intend to disseminate nothing but factual information. Consequently, it has been noted that misinformation has more political and organisational backing than corrective backing, meaning that misinformation often spreads haphazardly driven by a concern for humanity. For this reason, equal measures should be taken to fortify its reversal path to effectively address the spread of misleading information.

Networks focused on wider social issues around vaccines' safety and scientific principles, while users could be classified into groups by their ideologies. These included certain influential users who played a role in spreading false information. Various responses ranged from scepticism towards alternative theories to attempts at criticism or correction; these attempts were hamstrung by large volumes of disinformation as well as entrenched beliefs. At the same time, conspiracy theories fuelled this spread together with a mistrust of official sources.

Chapter 7: Discussion

7.1 Chapter Overview

This chapter provides a discussion of this study's insights, including the interpretation and evaluation of previous research. This chapter discusses people's reactions to different types of misinformation on social media platforms during public health crises. The discussion also contributes to a better understanding of preferred information sources and the use of social media platforms. Additionally, it sheds light on how individuals engage with, respond to, and verify misinformation. The discussion also emphasises the impact of cues for identifying misinformation and the dynamics of its acceptance and spread on social media.

7.2 Social Media Usage vs. Trust Gap

In answering RQ2, one of the main findings of this study was that people preferred social media, especially Facebook and Twitter, to access information about COVID-19, despite often encountering misinformation and having limited trust in the information. This highlighted a significant gap between user behaviour and trust in social media, which is consistent with previous studies confirming the popularity of social media during health crises (Maria & Manzon, 2020; Vinta & Sevilla, 2020). It is also consistent with previous literature highlighting the channels through which misinformation spreads, including social media (Sanderson & Ecker, 2020; Schreiber & Sergent, 1998). This is also consistent with previous studies highlighting the complex relationship between preference and trust (Lauren et al., 2023; Vicol, 2020). Although participants preferred social media for accessing information about COVID-19, their hesitation was consistent with concerns raised in previous studies about the reliability of information published through social media channels (Chen et al., 2015; Vellani et al., 2023).

This aligns with previous research showing how misinformation about COVID-19 is widespread on social media and difficult to combat (Grinberg et al., 2019; Nyhan et al., 2020). For example, Susmann and Wegener (2023) suggested that it can be difficult to stop believing misinformation. It is crucial to improve the trustworthiness of information sources on social media. Previous studies have also found that people who trust online sources are less likely to verify news before sharing it (Talwar et al., 2019). The difficulty of tackling false information on social media platforms is emphasised, as a significant portion of the population still relies on these sites for information, even though they acknowledge that they may not be trustworthy. This observation coincides with earlier studies on misinformation (Buchanan, 2020) and implies that despite recognising the existence of false information on social media, people still tend to use these platforms as a source of information (Morosoli et al., 2022).

The popularity of social media as an information source can be attributed to its convenience and accessibility. Past studies have suggested that people tend to depend on social cues and habits when choosing where to obtain information (Flanagin & Metzger, 2000; Metzger et al., 2010). However, using social media for information requires caution since users may have confirmation bias and seek out information that supports their existing beliefs (Mercier et al., 2017). This tendency to favour sources that confirm existing viewpoints can worsen the proliferation of false information.

Social media platforms should focus on improving the credibility of information sources, making fact-checking easier and encouraging users to verify information before sharing it (Bago et al., 2020). To help users become more discerning consumers of information on social media, public awareness campaigns and educational programs, as recommended by Rosie Jahng et al. (2020), can be effective. However, social media companies face a challenge in providing accurate information, as users are aware of its limitations. Therefore, interventions are needed to improve the quality of information and enhance users' digital literacy.

7.2.2 Impact of Exposure to Misinformation

The results showed that exposure to misinformation affected participant's assessments of social media platforms. The more participants were exposed to misinformation, the less comfortable and engaged they felt, making them more likely to question its trustworthiness. Participant's perceptions of social media were also influenced by how they saw them providing useful information during the COVID-19 pandemic. Negative impressions about how social media platforms implement their misinformation policies and provide misleading information can lead to a decrease in participant's trust in them. This finding is consistent with the literature that highlights the complex relationship between trust and misinformation (Zucker, 2020). The study's findings are also consistent with the broader literature on the consequences of misinformation during health crises (Cooper et al., 2018; Starbird, 2020) and public discussions of the social and psychological harm that people experience when exposed to misinformation (Cacciatore, 2021; Wang et al., 2019). These results also resonate with existing concerns that have highlighted the potential for misinformation to erode trust in online platforms (Boberg et al., 2020; Edgerly et al., 2020; Gehrau et al., 2021).

This study's findings regarding the role of social media platforms in reducing misinformation are consistent with concerns raised on the UK government's website (COV.UK, 2018). Understanding these relationships is important for the development of effective interventions that can reduce the consequences of exposure to misinformation. These findings also highlight the need for communication strategies and effective misinformation policies on social media platforms.

7.3 Preferred Reactions to Misinformation

To answer **RQ1**, participants' reactions to encountering misinformation differed, with the most popular being reporting posts, doing nothing, reaching out to the author for an explanation or blocking users who share misinformation. These reactions show attempts at fighting the spread of misinformation and reducing doubts that exist during times of uncertainty, which is in line with previous research highlighting how people put forth uncertain opinions during crises as a way of trying to make sense of them (Heverin & Zach, 2012; Kou et al., 2017; Starbird et al., 2014).

Moreover, this study confirmed that interventions such as accurate reporting and credible communication can play an important role in mitigating misinformation (Kyriakidou & Cushion, 2021; Greifeneder et al., 2021). Additionally, researchers have shown that misinformation has far-reaching effects on thoughts, actions and memories, which explains why some individuals fail to correct misinformation due to a focus on themselves, their

relationships and the content (Fridman et al., 2023; Greenspan & Loftus, 2021; Gurgu et al., 2013).

However, this study explores into what other ways did participants prefer, including interacting with the author or making use of platform features, such as snooze. The understanding of reaction strategies is crucial for developing targeted interventions to better combat misinformation. Additionally, some participants in the study preferred talking directly with the author instead of blocking them. This is also evidenced in past studies showing that knowing misinformation and its origins can discredit the story leading to elevated scepticism among readers (Di Domenico et al., 2021; Nekmat, 2020).

Additionally, there is an inclination towards ignoring misinformation due to the fear of confrontation which also typifies the challenges of counteracting false information successfully (Effron & Raj, 2020; Gurgu et al., 2023). This study's findings are consistent with studies showing that strategies such as crowdsourced correction on social media platforms, official accounts publishing denials, and credible presentations by experts are effective for detecting, countering and replacing incorrect beliefs with accurate information (Lupia, 2013; Mendoza et al., 2010; Starbird et al., 2014).

Moreover, past studies discuss the influence of credibility of an information source on the acceptance and spread of misinformation. Consistent with other studies, our research reveals the importance of source credibility in shaping reactions towards false information, as participants sought to validate their thoughts with authority figures and crosscheck data for reliable sources (Bhattacharjee, 2022; Sterrett et al., 2019).

Our study differs from some aspects of our literature review. For instance, Buchanan (2020) did not find a relationship between the authority of a source and sharing behaviour, although we found that users considered source credibility when verifying information on social media platforms and that there was always a connection between the source and the participants' reactions. This divergence could be accounted for by different methodologies or settings employed in various studies.

Moreover, unlike the assertion of Ognyanova et al. (2020) that exposure to misinformation erodes trust in mainstream media outlets, this study found that confidence in most expert sources, i.e., government bodies and reputable mass media organisations, influences individuals' reactions to factoid stories. This also highlights the importance of considering different types of sources when determining individuals' attitudes and behaviours regarding misinformation.

7.4 Reactions to Different Types of Misinformation

There were several reactions to misinformation, depending on the level of agreement. Individuals could ignore the misinformation, ask for sources, report the misinformation or block the user who posted the misinformation. This reflects the previous literature that has shown the different responses that individuals use when encountering misinformation (Chou et al., 2009; Marwick & Lewis, 2017; Mendoza et al., 2010; Pennycook et al., 2020; Starbird et al., 2014). This study adds depth by categorising these responses based on the level of agreement with the misinformation and the difficulty of spotting the misinformation. This finding also explains how individuals interact with misinformation, which may have been caused by factors such as beliefs, attitudes and cognitive processes (Ecker, 2017; Tully et al., 2020). Ignoring misinformation was the most common reaction across different

misinformation types. This is consistent with literature showing that users may ignore, doubt or deny misinformation (Ng & 'oke, 2020).

Participants' reactions to different types of misinformation revealed valuable insights. The results from the behavioural tasks, including difficult, moderate and easy tasks, were used to answer the research questions. To answer **RQ1**, most participants who agreed with the posts had the following reactions: (1) share the post and add their view; (2) tag an expert or friend to make them aware of the post; (3) ask the author of the post for the information source; (4) share the post via other social media platforms. Interestingly, participants who agreed with difficult, moderate and easy tasks had similar reactions since they were willing to share the post and add their views. Although it was difficult to determine why they would choose to share the posts and add their views, tag experts, or ask for an information source, this could be because the participants desired further evidence or support for these statements while engaging in discussions.

Most participants who disagreed with the misinformation posts had the following reactions: (1) ignore the post; (2) ask the author for the information source; (3) block the user who shared the misinformation post; (4) report the post to the social media platform; (5) provide their comments and the source that supports them; (6) interact with the author of the post to remove the post; (7) interact with the author of the post to question the person who posted it; and (8) share it with their friends if it is outrageous and bizarre. Some of these observations have also been reported in previous research. For example, Geeng et al. (2020) noted that users with other views shared misinformation (observations 8, 5). Studies, such as that by Tandoc et al. (2020, p. 12), have also noted how users correct misinformation when the post was created by themselves or by people they know (observation 8). Users were likely to enquire about the misinformation they encounter (observations 2, 5, 6, 7). Geeng et al. (2020) found that users interacted with misinformation in seven ways, including making other views, sharing or liking, and misinterpreting misinformation. Another study found that 45% of users questioned misinformation when they had doubts (Ng & Loke, 2020, p. 4). However, it is difficult to generalise these behaviours, as a different set of behaviours was noted based on how obvious a piece of misinformation was. As such, the findings are contextualised based on the three tasks, answering **RQ1 and RQ2**.

Interestingly, participants who disagreed with the difficult and moderate misinformation tasks had similar reactions since they ignored the misinformation posts. This is also evidenced in the literature showing that most users ignore misinformation (Geeng et al., 2020; Tandoc et al., 2020, p. 12). Participants were willing to block users who shared the misinformation post in moderate and easy tasks. They were also willing to report the post to the social media platform in moderate and easy tasks with political aspects. These findings are aligned slightly with Al-Zaman (2021), who found that users would identify, deny and doubt political misinformation than other misinformation. Therefore, as shown in **Table 22**, misinformation posts 2 and 3 had a slightly political side compared to misinformation post 1. Therefore, misinformation posts in moderate and easy tasks had more disagreement (29.68 and 59.27%, respectively) than misinformation post 1 (19.63%).

Table 30 *Participant's Levels of Agreement for the Three Tasks. Although Most Participants Disagreed with the Misinformation in Moderate Task and 3, Most Agreed with the Post for the Difficult Task*

Task	Agreed	Hesitant	Disagreed
Difficult Task - Pfizer vaccine to be a yearly vaccine	435 (42.9%)	206 (20.32%)	373 (36.7%)
Moderate Task - COVID origin from unsuccessful experiment in a lab	246 (24.26%)	282 (27.81%)	486 (47.92%)
Easy Task - COVID and subsequent variants are planned	176 (17.36%)	134 (13.21%)	704 (79.43%)

As shown in **Table 22**, the three tasks (misinformation) also provided some insight on how participants assessed their levels of agreement. For example, more participants agreed to the misinformation shared in the difficult task, while most participants disagreed with the posts in the moderate and easy tasks. The misinformation aspect of the difficult task was primarily the 'confirmed by WHO' component, which, it is believed, was either missed by the participants or assumed to be true. At the time of the survey, much of the discussion in the media surrounded the possibility of COVID-19 vaccines becoming a yearly vaccination. The misinformation posts in moderate and easy tasks had more obvious misinformation, which led to more participants disagreeing with them.

To answer **RQ2**, as shown in **Figures 12, 14 and 16** in Chapter 4, participants' responses to different types of COVID-19 misinformation on social media varied based on how much they agreed with the content. They had the following reactions: ignoring the posts, requesting the information source, and even reporting and blocking the user. This indicates that personal beliefs and attitudes might play a crucial role in determining how misinformation is shared and engaged. These findings are in line with previous research suggesting that individuals tend to amplify information that aligns with their existing beliefs (Morosoli et al., 2022).

Table 31 *Participant Responses in the Three Tasks. Most Participants Ignored the Misinformation and Requested an Information Source in Difficult, Moderate and Easy Tasks*

Participants' responses	Ignoring	Requesting information source
Difficult Task - Pfizer vaccine to be a yearly vaccine	(n = 481; 29.69%)	(n = 235; 14.51%)
Moderate Task - COVID origin from unsuccessful experiment in a lab	(n = 452; 26.81%)	(n = 251; 14.89%)
Easy Task - COVID and subsequent variants are planned	(n = 363; 1768 %)	(n = 245; 12.89%)

Importantly, as shown in **Table 23**, when participants encountered misinformation, a cautious approach predominated, characterised by either ignoring the posts or requesting the information source. The cautious approach taken by most participants when encountering misinformation suggests a healthy level of scepticism and that many individuals are inclined to seek validation before accepting and spreading information, aligning with previous research (Morosoli et al., 2022). This also aligns with research emphasising the role of source credibility in shaping users' responses to misinformation (Di Domenico et al., 2021; Nekmat, 2020).

This study also highlights the influence of agreement levels on response patterns. As shown in **Figures 12, 14** and **16** in Chapter 4, participants who agreed with misinformation were more likely to ask for an information source or share it on other platforms, potentially perpetuating the spread of misinformation. Conversely, when they disagreed, they tended to ignore or report it. This suggests that the persuasiveness of misinformation is influenced by the specific content and context. These findings are in line with the idea that individuals are more motivated to verify information when they perceive it as important (Flanagin & Metzger, 2000; Oh & Lee, 2019) and that the level of agreement influences their responses. This suggests that individuals are not passive consumers of information; they critically evaluate and respond to it (Kim & Dennis, 2019), highlighting the proactive role individuals play in verifying information, which can contribute to combating its spread. This highlights the importance of addressing confirmation bias and promoting critical thinking skills, particularly in the context of health-related information (Ashley et al., 2013). User responses to misinformation are complex and influenced by attitude and cognitive processes (Ecker et al., 2013; Morosoli et al., 2022). Therefore, targeted interventions that consider the nature of misinformation being encountered are essential. Public health campaigns should leverage this tendency to encourage users to question the accuracy of information and seek credible sources when in doubt. Additionally, previous research indicates that correcting

misinformation may not entirely reverse its impact on a person's memory and reasoning abilities (Ecker et al., 2013).

To answer **RQ2**, as shown in **Figure 2** and **Figure 76** Theoretical Conceptual model of people reactions to misinformation (modified from Bautista et al., 2021). The modified conceptual model expands upon Bautista et al.'s (2021) framework by incorporating a more nuanced pathway for responding to misinformation. While previous models primarily emphasized authentication and correction, this version integrates a broader range of user behaviors, including validation, debate, actions, caution, and ignoring, thus offering a more comprehensive view of misinformation engagement. One significant contribution is the explicit differentiation between internal and external acts of validation, allowing for a multifaceted assessment of credibility before corrective action is taken. Moreover, the model introduces pre-debate considerations, recognizing interpersonal dynamics and the role of trust, authority, and relationships in misinformation correction. This refinement reflects contemporary findings that social and psychological factors strongly influence whether misinformation is challenged or ignored. Additionally, the model categorizes responses based on misinformation severity, distinguishing between corrective actions, cautious engagement, and intentional ignoring, addressing gaps in prior models that lacked graded intervention strategies. By integrating these elements, this model provides a more context-sensitive framework for understanding and mitigating misinformation, aligning with emerging interdisciplinary research on online misinformation management.

To answer **RQ4**, the presence of influential users within misinformation networks, as highlighted in this study, resonates with research by Ahmed et al. (2020), who conducted a social network analysis of Twitter conversations related to e-cigarette safety. They identified influential users discussing the topic, similar to how influential users exacerbate the spread of false information in the current study. Additionally, the diversity of user reactions from scepticism towards official narratives to advocacy for alternative health practices aligns with findings by Ahmed et al. (2020a), who observed that users voiced opinions against conspiracy theories during the COVID-19 crisis.

The emergence of conspiracy theories and general distrust of official sources, as observed in this study, corresponds with previous research by Jin et al. (2014) and Starbird and Wilson (2020). Starbird and Wilson (2020) highlighted how disinformation campaigns on Twitter often challenge mainstream narratives, promoting alternative media to substantiate arguments. Jin et al. (2014) evaluated rumours and conspiracy theories on Twitter in the context of the Ebola epidemic, identifying similar patterns of distrust and misinformation spread.

In answering **RQ4**, the recent US presidential elections showed that misinformation can play a significant role in shaping public opinion. In particular, groups affiliated with the right-wing Republican Party were found to promote misleading information about COVID-19 and vaccinations. Individuals who supported the Conservative Party and those with right-wing leanings were more likely to share inaccurate or false news. These findings are consistent with Guess et al. (2019), who showed that during the 2016 US presidential election, conservatives and extremely conservative individuals shared "fake news" on Facebook. Recent findings from Jamieson and Albarracín (2020) confirmed an association between the consumption of conservative media and belief in conspiracy theories. In

addition, conservative media use (e.g., Fox News) correlated with conspiracy theories including believing that some in the CDC were exaggerating the seriousness of the virus to undermine the presidency of Donald Trump (Hall Jamieson & Albarracín, 2020).

7.5 Strategies for Verifying Misinformation

To answer **RQ1**, this research showed the various ways individuals verify information on social media. The study participants used a holistic approach to verify information, which involved conducting internal verification, making reference to prior knowledge and content reasoning, and external authentication in which they sourced credible sources and checked the author's credibility. Other methods included seeking help from search engines, consulting experts they trusted and checking for consistency with what was previously known. These results agree with those of Katarzyna-Wolny (2008) and mirror the great importance of critical thinking skills as well as media literacy (Dutton & Fernandez, 2019; Nekmat, 2020; Laato et al., 2020; Jones-Jang et al., 2021; Taghipour & Soleymani, 2023).

This study's results indicate that participants' approaches to verification were focused on reducing uncertainty brought about by misinformation, using sense-making to understand challenging details from unreliable sources (Frankl, 2006; Ghani et al., 2015; Hua et al., 2009; Starbird, 2020). Thus, cognitive factors, age, levels of education, background and past experiences are key in determining an individual's strategy for verifying facts (DiFonzo & Bordia, 2007; Landau, 2007; Mitchell et al., 2018). This study also suggests how important it is for people to consider source credibility and be good thinkers when it comes to interpreting information accurately, such as evidence-based arguments and respectful debates with authors about misconceptions. Furthermore, our study supports previous studies showing that community feedback and cross-referencing from reliable sources are important during verification processes, emphasising a focus on external authentication (Tandoc et al., 2018) and indicating many strategies for verifying information.

To answer **RQ2**, different age groups exhibited varying responses to misinformation. Participants aged 35–44 preferred information from trusted experts, while those aged 25–34 and 45–74 used search engines or checked the author's profile. Younger participants were more likely to engage in discussions with the authors of misinformation, while older age groups were more inclined to block the user. The age-related variations in responses to misinformation are consistent with existing literature highlighting demographic differences in information-seeking and verification behaviours (Edgerly et al., 2020; Jun et al., 2017). The observed differences in responses to misinformation across age groups mirror findings in the literature, in which age has been identified as a factor influencing information-seeking behaviour and engagement with misinformation (Betsch et al., 2018; Mitchell et al., 2018; Starbird et al., 2014). The literature also discusses variations in age groups' responses to misinformation (Ng & Loke, 2020). The findings further contribute to understanding how different age groups may adopt distinct strategies in responding to misinformation. This finding is also consistent with previous research highlighting the impact of information source choices on individuals' interactions with misinformation during health crises (Nicholson & Leask, 2012; Reyna, 2012).

In answering **RQ2**, a key finding of the study was that higher levels of education were associated with certain verification choices, such as reading responses and searching for peer-

reviewed studies. This is consistent with previous studies that explore the role of individual traits in responding to misinformation (Edgerly et al., 2020; Talwar et al., 2019) and those that stress the impact of individual characteristics on information processing and decision-making during crises (Mitchell et al., 2018; Nicholson & Leask, 2012). This finding is consistent with previous research linking educational background with information verification (Blank & Launay, 2014; Bora et al., 2018; Flanagan & Metzger, 2000; Khan & Idris, 2019; Talwar et al., 2019; Walter & Murphy, 2018) and that emphasises the role of education in enhancing digital literacy and critical thinking skills (Livingstone & Third, 2017; Pennycook & Rand, 2018). This association highlights the importance of education in identifying misinformation.

7.6 Factors Influencing Reactions to Misinformation

7.6.1 Demographic Factors

To answer **RQ2**, the study provided a comprehensive analysis of how demographic factors, such as age and education background, affect the reaction towards misinformation. The findings are consistent with previous research showing that several background factors, such as personality (Buchanan, 2020; Chen, 2016), gender (Buchanan, 2020; Filkuková et al., 2021), age (Buchanan, 2020; Taghipour & Soleymani, 2023), personality traits (Taghipour & Soleymani, 2023), education level (Buchanan, 2020; Filkuková et al., 2021), marital status (Taghipour & Soleymani, 2023), lack of media literacy (Taghipour & Soleymani, 2023), lack of health literacy (Taghipour & Soleymani, 2023), digital literacy (Buchanan, 2020), critical thinking skills (Taghipour & Soleymani, 2023), cognitive load (Laato et al., 2020), play a role in the acceptance and spread of misinformation (Cinelli et al., 2020; Taghipour & Soleymani, 2023). In this respect, the observed differences in responses to misinformation across age groups mirror findings in the literature, where age has been identified as a factor influencing information-seeking behaviour and engagement with misinformation (Mitchell et al., 2018; Betsch et al., 2018; Starbird et al., 2014).

However, this study expands on this by showing how young people generally prefer self-verification methods, including dialogue on social media, because they act proactively against misinformation. Older individuals chose to take immediate action, such as blocking sources of misinformation, which implies more defensiveness. The level of education is crucial since it correlates with educational attainment levels when administering more complex verification methods. Previous studies support that education develops critical thinking skills and information literacy, which become tools for effectively scrutinising misinformation (Gërguri, 2022; Khan & Idris, 2019; Majerczak & Strzelecki, 2020; Oh & Lee, 2019). This study also recognises how demographic characteristics influence the way people navigate misinformation, indicating that tackling misinformation calls for unique approaches.

Previous research has also found a direct relationship between education and the likelihood of engaging with false information, as well as believing in it (Chadwick & Vaccari, 2019; Guess et al., 2019; Morosoli et al., 2022). Furthermore, whether a person agrees with misinformation or not has substantial consequences for their social media behaviour, reflecting the weight of personal beliefs and attitudes that shape reactions under

similar circumstances. This is supported by previous findings linking cognitive biases with poor information processing or sharing (Ecker et al., 2013; Morosoli et al., 2022).

In answering **RQ2**, the results also showed how social media platforms were designed to spread false information. Twitter's retweet feature and WhatsApp's forward button accelerate the dissemination of misinformation, indicating that interventions on such platforms can stop misinformation sharing (Ashwin et al., 2022; Bao et al., 2022; DeVerna et al., 2024; Hern, 2020; Kou et al., 2017). This aligned with study 2, which found that the most frequent interaction type was retweet across the three misinformation tasks, showing how this feature accelerates the dissemination of misinformation. The retweet feature could be limited to certain accounts need it to announce specific information and not all users should have this feature.

7.6.2 Information Sources

In answering **RQ3**, several studies have found that news consumption and trust in information sources are two factors that contribute to accepting misinformation (Enders et al., 2023; Filkuková et al., 2021), as stories from more credible sources are more believable (Bhattacharjee, 2022; Sterrett et al., 2019). This study's findings go a step further to show the specific COVID-19 information sources users prefer and how this affects their perceptions about information containing false claims. For example, in relation to previous studies, this study demonstrated the role played by government sources in minimising the sharing and spread of misinformation through social media platforms personally by individuals. The government was relied upon for information about COVID-19, who do not therefore participate in disseminating untruths on social networks and notice it when they encounter it. Likewise, these users were highly active as they try to limit authors and others from further spreading misinformation.

In answering **RQ3**, this study shed light on factors influencing individuals' ability to identify misinformation and decisions to report or share it. Users who preferred authoritative sources, such as WHO and CDC, as information sources were more likely to report misinformation, highlighting the role of trusted institutions in misinformation detection and reporting. This aligns with the idea that individuals rely on credible sources and may actively combat misinformation by reporting or tagging others (Sun, 2022). Furthermore, participants' education level affected their ability to identify misinformation, emphasising the role of media and digital literacy in combating misinformation (Dutton & Fernandez, 2019; Jones-Jang et al., 2021; Nekmat, 2020). This highlights the importance of information and media literacy programs, which can empower individuals to critically evaluate information (Nekmat, 2020; Oh & Lee, 2019; Parrott, 2018).

7.6.2.1 Preferred Information Sources. In answering **RQ3**, participants relied on specific sources for accurate information, including CNN, government websites, CDC, BBC, Fox News and the New York Times. This finding is consistent with previous literature showing the importance of verifying the credibility and reliability of the source when evaluating information (Buchanan & Benson, 2019; Majerczak & Strzelecki, 2020; Tandoc et al., 2018). This finding is also consistent with much of the literature emphasising the importance of established media outlets, government sources and official health organisations, as they are often considered reliable sources (Cairns, 2013; Cooper et al., 2018; Edgerly et al., 2020; Fridman, 2020; Gefen et al., 2003; Gerguri, 2022; Graves, 2016;

Huber et al., 2019; Larson, 2018; Marrie, 2013; Oh & Lee, 2019; Robertson et al., 2020; Succi, 2018).

Trust in credible sources has a significant impact on user belief and information acceptance (Bhattacharjee, 2022; Sterrett et al., 2019). Additionally, studies have found that lower news consumption is associated with the spread of misinformation (Filkuková et al., 2021). To combat this, social media platforms can also collaborate with trusted sources and promote their content (Cheng & Chen, 2020). Users should be encouraged to follow reputable sources to receive accurate and up-to-date information directly from experts (Edgerly et al., 2020; Filkuková et al., 2021; Morosoli et al., 2022). By leveraging these findings, the credibility of information shared on social media can be enhanced to reduce the prevalence of misinformation (Cheng & Chen, 2020).

7.6.2.2 Media Preferences and the Reaction to Misinformation. One of the main findings of this study was that participants' preferences for specific information sources influenced their responses to misinformation. Participants who preferred Fox News were more likely to share misinformation, while participants who preferred CNN were more likely to engage in a discussion with the author of the misinformation. Participants who preferred government websites, CDC and WHO were more likely to ignore and report misinformation, while those who preferred Fox News were more likely to share it. This finding is consistent with previous research suggesting that information source preferences shape individuals' information consumption, impressions and sharing behaviour (Edgerly et al., 2020; Robertson et al., 2020; Thorson & Rodgers, 2006).

7.6 Factors that Influence the Identification of Misinformation

In answering **RQ2**, Clear Markers in Misinformation Posts. To answer **RQ3**, the presence of clear markers in misinformation posts, such as a "This fact is disputed" mark or poor image quality, played a significant role in helping participants identify misinformation. This study's findings are consistent with existing studies that emphasise the role of visual and contextual clues in identifying false information (Larson, 2018) and are also consistent with the broader discussion of media literacy (Breakstone et al., 2019).

Table 32 *Participants' Levels of Agreement for the Three Tasks. Although Most Participants Disagreed with the Misinformation in the Moderate Task and 3, Most Agreed with the Post for the Difficult Task*

Task	Markers or Cues	Agreed	Hesitant	Disagreed
Difficult Task - Pfizer vaccine to be an annual vaccine	No	435 (42.9%)	206 (20.32%)	373 (36.79%)
Moderate Task - COVID origin from unsuccessful experiment in a lab	1: "This fact is disputed" mark	246 (24.26%)	282 (27.81%)	486 (47.92%)

Easy Task - COVID and subsequent variants are planned	1: “This fact is disputed” mark 2: Poor image quality	176 (17.36%)	134 (13.21%)	704 (79.43%)

This finding emphasises the importance of visual cues and content markers on users’ ability to discern misinformation on social media platforms. This aligns with the idea that individuals can improve information authentication by evaluating how information is presented (Fallis, 2004), emphasising the role of visual content and cues in shaping user perceptions, message credibility and sharing behaviour (Ecker et al., 2013; Kim & Dennis, 2019; Sundar et al., 2007; Taghipour & Soleymani, 2023). It also highlights an opportunity for platform designers to incorporate visual cues to signal potentially unreliable content. To combat this, social media platforms can include visual cues or labels to indicate the accuracy of information, similar to the “blue tick” on Twitter (Rosie Jahng et al., 2020). Educating users about these cues and promoting critical thinking could be valuable strategies in the fight against misinformation.

In answering **RQ3**, factors that influenced the identification of misinformation included preferred information sources, educational levels, preferred verification methods and age groups. Some of the previous literature is consistent with the finding that educational levels and information sources influence the identification of misinformation (Edgerly et al., 2020; Flanagan & Metzger, 2000). This study found that educational levels, preferred information sources and verification methods influenced how people spot misinformation, which is consistent with existing studies emphasising the role of cognitive factors and individual characteristics in discerning false information (Khan & Idris, 2019; Kou et al., 2017; Larson, 2018; Majerczak & Strzelecki, 2020). In addition, these findings are consistent with previous research highlighting the importance of critical evaluation skills in navigating information online (Bora et al., 2018; Kang, 2010).

Chapter 8: Conclusions

This chapter contains conclusions, limitations and the ethical aspects of the study. A detailed discussion of the results is presented in the subsequent section. This study provides valuable insights into how social media users react to misinformation, particularly in the U.S., as 95% of the participants were based there. While these findings shed light on behaviors within the United States, they may not fully represent the reactions of users in other English-speaking countries. As misinformation dynamics can vary significantly based on cultural, political, and regional factors, future research should consider more diverse samples to extend the applicability of the results to the broader English-speaking world.

8.1 Answering the Research Questions (RQs)

8.1.1 RQ1: *How Did People React to Content on Social Media That They Believed to be Health Misinformation During the COVID-19 Pandemic?*

8.1.1.1 Approaches Used for Verifying Information. Participants adopted various strategies to verify information on social media, primarily using search engines for primary research (15.54%, $n = 667$) and consulting trusted experts (15.30%, $n = 657$). Other methods included assessing alignment with existing knowledge (14.05%, ($n = 603$)) and evaluating the credibility of the source's profile (13.91%, $n = 597$). Some also relied on community feedback in replies and discussions (10.62%, $n = 456$), peer-reviewed research (8.20%, $n = 352$), and cross-referencing with other posts or platforms (7.52%, $n = 323$). Fewer participants judged credibility based on engagement metrics, such as shares (3.70%, $n = 159$) and likes (2.66%, $n = 114$), consulted trusted friends (4.38%, $n = 188$) and assessed visual quality (4.12%, $n = 177$). This highlights a comprehensive approach to discerning trustworthy information. Please see Appendix B (0) for more details.0

8.1.1.2 Internal Acts of Authentication. This theme is the first step of authentication to offer credibility in news messages, as proposed by Tandoc et al. (2018). This theme showed a number of internal acts of authentication used by some users to determine information's credibility, including checking who posted the information, checking how the content was explained, what is known about the author's political affiliation, whether it aligns with the presented arguments and checking whether the information fits in with their prior experiences. In addition, the theme also pointed out that credible information must be supported by current information and scientific studies and devoid of biased and emotive language. This theme recommended increased scrutiny for discrepancies with science and signs of made-up content. Thus, these findings indicate that credibility is difficult to assess accurately; therefore, solutions require more comprehensive strategies for evaluating online information (Section 1.1.2).

8.1.1.3 External Authentication. The second step of authentication to offer credibility in news messages is 'external authentication' (Tandoc et al., 2018). External authentication supports news messages by checking several things, such as the author's credibility and content reasoning. Participants used different methods depending on their familiarity with a given author, considering relationship, authority and trust dynamics. It is thereby possible to imagine various degrees of misinformation being countered through

several tactics, including requesting evidence from authors, evaluating their attitudes towards why they share the misinformation, conducting cross-checking across trusted sources and performing independent research. Sources are considered credible if they have credentials, authority, accuracy, reputability, impartiality, familiarity, originality, longevity and coverage. Conversely, less legitimate sources disclose bias, anonymity, bad reputation, lack of specialisation, opinionatedness or a connection with mainstream media. Therefore, source credibility has become a critical issue in which misinformation has become part of our daily lives (Section 1.1.2).

8.1.1.4 Preferred Reactions to Misinformation. Participants were asked about their reactions if they were to stumble upon something they thought was false while scrolling through their favourite social media platform. The most common reactions were to report it (n = 438; 18.27%), ignore it (n = 341; 14.22%), ask the author for the information source (n = 315; 13.14%), discuss the misinformation post with the author (n = 258; 9.76%) and block the user (n = 279; 11.63%). Other reactions included tagging, snoozing and sharing the post, even when the information was false. Please see Appendix B (0) for more details.0

8.1.1.5 Strategies for Debating with the Author When Misinformation is Identified. This theme showed how some participants would discuss misinformation with an author, how they refuted misinformation and made requests to help combat the spread of misinformation. This theme showed complex ways for combating misinformation, such as by engaging authors, and considered relationship, authority and trust factors. The approaches for combatting misinformation differed among participants, depending on how close they were to the source. Methods of approaching it included direct confrontation and private conversations to obtain answers from their relatives without insults or fights. These decisions often lead to evidence-based arguments. Some individuals would refute false information immediately if it was dangerous, whereas others would rather have a respectful private conversation before refuting the false information. Many participants preferred politeness when addressing authors, especially if an authority was involved. Consequently, the problem of misinformation calls for critical thinking and accountability among users, who should rely on trusted sources to correct misinformation promptly. Moreover, respectful communication is important when correcting misinformation, and private discussions are recommended so that relationships are not damaged. People should remain factually accurate when fighting against false information (Section 1.1.2).

8.1.1.6 Actions to Take When Misinformation is Identified. This theme showed how some participants took actions against misinformation. This theme explained that the actions against misinformation depend on their relationship with the author, authority dynamics and trust. Actions were more likely taken against trusted sources than friends or managers; thus, there was less forgiveness when dealing with trusted sources than friends and cautious consideration when dealing with managers. These actions ranged from hiding, disliking, resharing, tagging, snoozing, unfollowing, reporting and blocking users posting misinformation depending on relationship, authority and trust factors. This theme stressed polite communication and verification of information, which fosters trust and ensures that relationships do not break while combating fake news (Section 1.1.2).

8.1.1.7 Ignoring Misinformation. This theme showed the way people avoid or ignore misinformation. Ignoring misinformation occurred frequently regardless of whether

the scenario was affected by a relationship, authority or trust factor. Ignoring it was a significant response among participants. Typically, a chosen friend was ignored to keep the peace and to avoid ending the relationship and because participants valued the views of their friends. Likewise, it was common to ignore misinformation propagated by a manager at the workplace to maintain job security and other employment benefits. In addition, trust in the source affected whether a person would consider a message from a trusted source a mistake, as it was expected that it would be corrected. Therefore, confrontation issues, lack of time for verification and plenty of sources that are untrustworthy caused many instances of misinformation being overlooked. Thus, strategies need to be put in place to address this while appreciating people's diverse opinions and relationships (Section 1.1.2).

Overall, on social media, the majority of participants used different methods to verify information, including search engines (15.54%, $n = 667$) and expert consultations (15.30%, $n = 657$). Other techniques involved linking up with known knowledge (14.05%, $n = 603$), appraising source credibility (13.91%, $n = 597$), feedback from community members (10.62%, $n = 456$), peer-reviewed research articles (8.20%, $n = 352$) and cross-referencing with trusted sources (7.52%, $n = 323$). Distinguishing trustworthy from untrustworthy information online was complex, necessitating a multilayered approach, including internal acts of authentication, such as evaluating the information based on prior knowledge and content reasoning, and external authentication, such as cross-checking with trusted sources and considering the author's and source's credibility. Many participants preferred to report ($n = 438$; 18.27%) or ignore misinformation ($n = 341$; 14.22%) or confront the author ($n = 315$; 13.14%), depending on how they perceived relationship, authority and trust factors. This implies that fighting against fake news requires a comprehensive approach in which critical thinking is paramount and that people should communicate respectfully.

8.1.2 RQ2: What Factors Influenced People's Reactions to Misinformation During the COVID-19 Pandemic?

8.1.2.1 Age Impact on Verification Approaches. There were variations in verification approaches among participants based on age categories. Users aged 25–34 years mainly verified information through search engines or looking at authors' profiles, while those between 35 and 44 years depended more on experts they trusted for validation purposes. Additionally, those aged between 45 and 74 years shared the same tendencies as the 25–34 age group. Generally, this denotes divergent ways through which different ages verify information (Section 1.1.2.1.1.1).

8.1.2.2 Education Level Impact on Verification Approaches. This study showed that verification approaches, such as search engines, author's profile checking and expert consultation, were the three most common approaches taken by individuals across different educational levels. Nevertheless, higher education levels, such as bachelor's and master's degrees, prompted more complicated methods of verification, such as reading responses to the post and searching peer-reviewed studies. Conversely, people with lower levels of education, such as secondary school degrees, relied on superficial indicators, such as the number of likes. This might be because some verification measures require a certain level of education (Section 1.1.2.1.1.2).

8.1.2.3 Age Impact on Reactions to Misinformation. Participants' age affected their preference in relation to reactions to misinformation. Although all age groups regularly

reported, asked sources or ignored false information, those between 25 and 34 mostly queried positions and requested sources, while those aged 45–64 often blocked the account, thus indicating a distinction between younger and older people (Section 1.1.2.1.1.3).

8.1.2.4 Education Level Impact on Reactions to Misinformation. Participants with secondary school or associate's degrees were more likely to ignore misleading information. Those who had bachelor's or master's degrees were more likely to report misleading information or engage in a discussion with the author. In contrast, those who had secondary school or associate's degrees were more likely to report the misleading information but less likely to engage in a discussion with the author. This suggests a relationship between education and reactions, in which those with higher education were more likely to engage in a discussion with the author instead of ignoring the misinformation compared to those with secondary school or associate's degrees (Section 1.1.2.1.1.4).

8.1.2.5 Participants' Reactions to Misinformation: Insights from Different Types of Misinformation. Participants' reactions to misinformation depended on their preferred information source. For example, those who preferred government websites or CDC were more likely to ignore misinformation, while those who preferred Fox News were more likely to share it. Additionally, people who preferred CNN were more likely to enter into a discussion with the author of the misinformation, while those who preferred government websites or CDC were more likely to ask the author not to post it. Additionally, people who agreed with misinformation were more likely to share it on social media, regardless of the difficulty. People were more likely to tag a friend or expert to make them aware of misinformation when they agreed with it. This study's findings suggest that people who agree with misinformation were more likely to spread it and that they may also be more likely to try to convince others to agree with it (Section XX).

Overall, this study suggests that people's reactions to misinformation are complex and vary depending on a number of factors, including their age, education level, preferred source of information and level of agreement with the misinformation. In addition to the factors that were explained previously, including relationship, authority and trust factors, and how dangerous the misinformation is.

8.1.3 RQ3: Are There Associations Between Personal Characteristics and Misinformation Reactions?

8.1.3.1 The Type of Interaction Individuals Exhibit Towards Misinformation Depends on Their Preferred Information Source (H1). Individuals' responses to misinformation depended on their preferences for information sources. Those favouring government sources were less prone to spread misinformation, more inclined to report or ignore it, and may request that authors not share misinformation. Those who preferred public health agencies, such as CDC and WHO, showed contrasting patterns. CDC viewers were less likely to spread misinformation but more likely to report and block the author, while those who preferred the WHO were more likely to report, ignore or block misinformation. Conservative/leaning republican, such as those who preferred Fox News, tended to ask for the information source or block or ignore/share misinformation but were highly likely to share the misinformation. Conversely, democrats who preferred BBC, CNN and the New York Times had varying responses that involved requesting sources and blocking, ignoring, reporting and sharing misinformation. The overall findings demonstrate how the complexities

of people's choices in response to misinformation are influenced by their preferred information sources and political affiliation (Section H1: The type of interaction individuals exhibit towards misinformation depends on their preferred sources of information.).

8.1.3.2 Individuals' Agreement with Misinformation Posts Depends on the Type of Information Sources They Rely On (H2). Individuals relying on various information sources to verify content on social media platforms possess different abilities in identifying misinformation. Those depending on newspapers, academic journals, books, aggregated news websites (e.g., Google News) and government websites showed an increased ability to identify misinformation across all difficulty levels. This relationship was statistically significant for all tasks, indicating the effectiveness of these sources in helping individuals separate facts from misinformation. However, those who relied on magazines could only identify misinformation in moderately difficult and easy to spots misinformation tasks but failed in difficult to spot misinformation tasks. Thus, source selection plays a crucial role in enhancing verification efficacy among individuals using social media sites (Section H2: Individuals' agreement with misinformation posts depends on the type of information sources they rely on.).

8.1.3.3 Individuals' Reactions to Misinformation Depend on Their Level of Agreement with Misinformation (H3). Individuals demonstrated distinct behavioural patterns based on their agreement or disagreement with social media posts. Those who agreed were more likely to engage in discussions, share the posts and express their views, tag friends or experts, and even share the misinformation on other platforms. The same was true regardless of task level. Those who disagreed with a post were more likely to request evidence to suggest not sharing the misinformation, blocking the user, using the snooze option and ignoring the post; the relationships were statistically significant across all difficulty levels. These findings suggest that the agreement calls for more interactive and sharing behaviours, while disagreement is focused on clarification seeking, reporting or disengaging from the content (Section **Error! Unknown switch argument.**).

8.1.3.4 Individuals' Personal Attitudes Towards Social Media Can Affect How They Respond to Misinformation (H4). The trustworthiness of social media during the COVID-19 pandemic might have affected people's behaviours, although the analysis was difficult due to violations in several tests. Individuals' opinions about social media during this time were related to certain actions; however, there were methodological limitations that made the associations uncertain. The only association found was that perception of social media's trustworthiness during COVID-19 influenced their likelihood of ignoring misinformation. This association had a statistical significance under the moderate task (Section **Error! Unknown switch argument.**).

8.1.3.5 Individuals' Personal Attitudes Towards Social Media Can Affect Their Ability to Identify Misinformation (H5). Individuals' perceptions during the COVID-19 pandemic significantly influenced their ability to identify misinformation on social media. Trust in social media, belief in its effectiveness in providing needed information, and confidence in its capability to handle the pandemic were associated with improved identification of misinformation at all difficulty levels. However, persons who believed that social media platforms intentionally provided misinformation struggled to recognise misinformation. Similarly, people who trusted that the platform was trying to correct or

remove fake news had an increased ability to detect misinformation. In sum, these findings emphasised how users' attitudes towards social media shaped their capacity to identify misinformation during a pandemic and highlighted the role played by trust and confidence in platform capabilities for effective information evaluation (Section H5: Individuals' personal attitudes towards social media can affect their ability to identify misinformation).

8.1.3.6 Individuals' Background Factors Affect Their Ability to Identify Misinformation (H6). Age, education level and employment status significantly impacted individuals' ability to identify misinformation across different difficult tasks. This implies a statistically significant relationship for all three tasks. This highlights the importance of considering demographic factors, such as age, education and employment status when assessing individuals' effectiveness in determining misinformation (Section H6: Individuals' background factors affect their ability to identify misinformation).

8.1.3.7 There is No Evidence for the Association Between Individuals' Background Factors and Their Reactions to Misinformation (H7). There was no evidence for an association between individuals' age, education level, employment status and their willingness to engage with misinformation on social media because several test violations existed for all tasks. There were less than five expected counts for some cells, which violated the tests, thus precluding definitive conclusions regarding the association between these demographic factors and users' behaviours related to sharing, reporting, discussing, asking for information sources, blocking and ignoring misinformation (Section H7: Individuals' background factors affect their reactions to misinformation.).

8.1.3.8 The Way Individuals Verify Information Affects Their Ability to Identify Misinformation (H8). Different verification strategies significantly affected people's ability to detect misinformation on social media at various difficulty levels. For example, those who verified information by checking conformity with their understanding of the topic, looking into other platforms' mentions, looking at the picture quality and using search engines demonstrated enhanced effectiveness in spotting misinformation. Moreover, relying on likes, expert sources and research papers as verification methods could enhance the identification of misinformation. However, only in moderate and easy cases did looking at other people's replies and discussions or trusted friends enhance the identification of misinformation. Misinformation was identified by looking at a user's original profile, which was effective only when the task was easy. However, the effects of these tactics varied with difficulty level, indicating the subtle association between verification methods and users' discernment of misinformation on social media in different difficulty levels (Section H8: The way individuals verify information affects their ability to identify misinformation).

Overall, government sources played an important role in reducing the sharing and spread of misinformation via social media channels by individuals themselves. Although individuals who relied on government sources for information were less likely to share or spread misinformation on social media channels, they were more likely to report instances of encountering misinformation and ignore it. These users were also more active, i.e., requesting authors and users refrain from further dissemination of misinformation. Through their accounts, they were also willing to block users who shared misinformation, which changed based on the task performed. Various demographic factors, such as age, education level and employment status, considerably influenced individuals' capacity to identify misinformation.

Therefore, the null hypotheses were rejected for all three factors, indicating a statistically significant relationship between all three factors and the ability to identify misinformation across tasks. Hence, these factors should be considered when evaluating an individual's ability to spot misinformation. Verification strategies are crucial in identifying misinformation on social media platforms. Checking conformity with their understanding of the topic, checking picture quality and using search engines increase the effectiveness of identifying misinformation. Identification was also performed by relying on likes, expert sources, and research papers. However, it is important to highlight that using other people's replies or trusted friends for verification only increased the identification of misinformation in moderate and easy tasks. The impact varied depending on difficulty levels, thus showing that verification methods had a nuanced relationship with identifying misinformation on social media.

8.1.4 RQ4: What Characteristics of Social Networks Formed Around COVID-19 Misinformation on Twitter, and How Did Users React Within Such Networks?

8.1.4.1 Social Networks' Characteristics. According to the explanations, characteristics of social networks created around COVID-19 misinformation on Twitter displayed users with various responses to misinformation.

8.1.4.2 Size and Composition of Networks. The networks differed greatly in size; the largest ones being related to claims about a laboratory-created COVID-19 strain and the smallest concerning vitamin D misinformation. The composition of each network emphasised different types of interactions, such as mentions, retweets, replies and original tweets, underscoring preferred modes of engagement within these systems.

8.1.4.3 User Engagement. Retweets primarily drove engagement, suggesting that existing messages were amplified by users, thereby enabling the rapid spread of misinformation. Although less frequent than retweets, mentions and replies indicate efforts at dialogue or contestation of the misinformation.

8.1.4.4 Unique User Participation. The number of unique users involved in the misinformation discussions showed how far reaching the misinformation was, involving a wide audience with diverse viewpoints and influences.

8.1.4.5 Misinformation Themes. Different themes were observed in networks based on the type of misinformation, ranging from vaccine-related side effects to laboratory created strains of COVID-19 and effects of vitamin D on COVID-19. These themes reflected bigger societal issues, such as vaccine safety concerns, research ethics in science and alternative health practices.

8.1.4.6 User Clusters. Identifiable groups within these online communities exhibited specific ideological orientations, such as conservative/right-leaning, libertarianism and anti-vaccine/truth-seeker clusters. This indicates how political and ideological biases can influence reception and dissemination of inaccurate information.

8.1.4.7 Influential Users. The presence of influential members within these platforms demonstrated how social capital drove propagation of falsehoods. People with many followers and those regarded as authorities could substantially amplify false data's reach and effect.

8.1.4.8 Users' Reactions to Misinformation.

- There was scepticism regarding official narratives, and some users advocated for alternative health practices/theories. The presence among them reflects complex ways through which fake news resonates with existing beliefs and worries.
- Some networks shared misinformation, and others tried to correct it. Nonetheless, these campaigns met many difficulties due to the volume of misinformation as well as ingrained opinions of some clusters of users.
- Conspiracy theories were common throughout all networks as well as general disbelief in official sources, such as health agencies, pharmaceutical companies and scientific research. This scepticism drove the acceptance and spread of this misleading information.

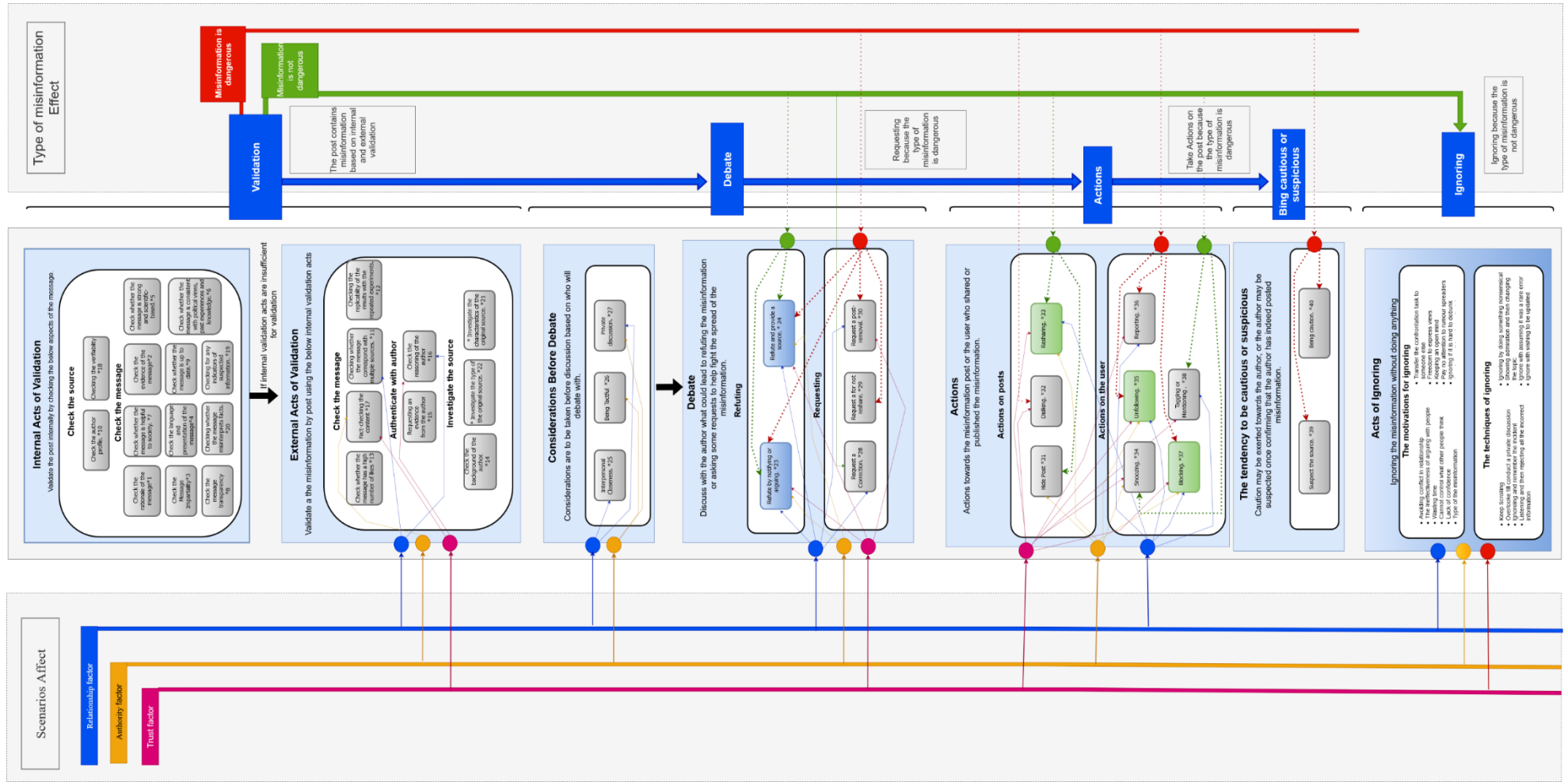
8.2 Thesis Contribution

8.2.1 Theoretical contribution

This research aimed to fill gaps in previous literature by providing a comprehensive look into how individuals access, validate and react to misinformation on social media amidst health crises. This study contributed to the existing literature by investigating how people verify health misinformation on an individual level, which is a less studied area, as researchers have concentrated on the detection and sharing of misinformation. Such a multi-dimensional standpoint comes from effects such as age, education level, preferred source of information and personal agreement with the misinformation. Consequently, this study makes a valuable contribution by presenting more elaborate relationships between personal characteristics and reaction towards misinformation than those offered in simpler models of engagements with it employed so far. These findings can help develop better targeted interventions for countering misinformation as well as more nuanced models of information consumption.

The enhanced theoretical model refines the original framework by Bautista et al. (2021), offering clearer distinctions between internal (knowledge-driven) and external (fact-checking) validation processes, structured corrective actions, and intermediate cognitive states like suspicion and caution. It emphasizes explicit pathways for refuting misinformation, categorizes actions at both content and user levels, and systematically addresses motivations and techniques for ignoring misinformation. Contextual factors such as trust, authority, relationship dynamics, and perceived danger are highlighted as key moderators of behavioral responses. Dangerous misinformation triggers active corrective actions, while non-dangerous content often results in passive responses. By introducing these refinements, the modified Model provides a more comprehensive and psychologically grounded understanding of how individuals validate, engage with, and respond to misinformation. This enhanced clarity is crucial for developing effective interventions, educational strategies, and platform policies to combat misinformation in digital spaces.

Figure 76 Theoretical Conceptual model of people reactions to misinformation (modified from Bautista et al., 2021).



- 1* Check whether the message can be verifiably by own knowledge or rational judgment; Check whether the message has an argument, and logical reasoning, and is sufficient in addressing an issue.
- 2* Check whether the message has proof and is backed up by data.
- 3* Check whether the message is objective and free from media bias. Check whether the message uses biased language, such as unconscious biases or the same wording to describe the issue or whether the message aims to achieve political agenda.
- 4* Language based; Check the message headline and the words used. Check whether the message is detailed, fluent and coherent in the story, free of typos and satisfied with the overall vibe. Check whether the message uses less credible language such as emotional, extreme, or hate words. Presentation-based; Check whether the message contains a video, photo or screenshot. Check whether the message has poor-quality photos or clickbait.
- 5* Check whether the message has a critical discussion and accepted methodology limitations.
- 6* Check whether the message aligns with political views, past experiences and knowledge. This may not necessarily be an indicator of information credibility, but it could be an aspect that affects how the message is received by audiences.
- 7* Check whether the message is helpful to society. This may not necessarily be an indicator of information credibility, but it could be an aspect that affects how audiences receive the message.
- 8* Check whether the message is transparent with provides the whole context. Check whether the message gives the exact location, time, date and the same person's name.
- 9* Check whether the message is up to date.
- 10* Check the author's profile to see whether they are verified publishers, and check their experience in the information provided.
- 11* Check whether the message corresponds with multiple sources by verifying information from various sites to ensure the claim is accurate.
- 12* Check whether the message stands with repeated experiments.
- 13* Check whether the message has a high number of likes. This may not necessarily be an indicator of information credibility, but it could be an aspect that affects how audiences receive the message.
- 14* Check the author's background.
- 15* Check with the author to judge their attitude towards the content and determine why they believe it.
- 16* Requesting sources or evidence.
- 17* * Checking the message via lateral searches (e.g. using the Google search engine to reach reliable sites to verify the information, using the fact-checking website to see if the information is already fact-checked, checking whether the message was confirmed via a third party, checking whether the message can be verified through its disclaimers or look at the fact ratings of the message).
- 18* Check whether the message has a source to be verified externally.
- 19* Check whether the message has an indicator of a suspicious. For example, checking whether the message is fictional, fabricated, hard to believe, has no sense or is suspected and needs further verification.
- 20* Check whether the message has conspiracy theories, Exaggerations, Leaving out relevant information or contradicts established facts.
- 21* Investigate the original source to see whether the source has characteristics that make it a credible information source (e.g. authority, accuracy, reputability, impartiality, familiarity, originality, long time of existence, coverage).
- 22* Investigate the type of the original source to see whether the source is considered one of the credible types of information source such as official sources (e.g., government and health organization websites), scientific sources (e.g. peer-reviewed journals), experts in their field (e.g. medical experts, research scientists, or public health professionals), and fact-checking websites (e.g. articles that have been fact-checked and showing true/false graphics). Investigate the original source to see whether the source is considered one of the less credible types of information sources such as (e.g. biased sources, opinion sources, anonymous sources, bad reputation sources, unspecialized sources, mainstream media sources, and directed sources).
- 23* Refute by notifying or arguing: Expressing a disagreement with a statement or claim through discussion or notification without providing evidence or a reliable source that supports the correction. Notifying: Notifying in a friendly manner; Notifying in a forthright manner; Notifying of Differing Perspectives; Notifying in a kidding manner; Expressing a view. Arguing: Arguing with the author if the misinformation posted was dangerous; Questioning for Validation;
- *24 Refute and provide a source: Refute the post by providing evidence from a reliable source that denies it.
- *25 Interpersonal Closeness: Prioritizing and considering social relationships and ties.
- *26 Being Tactful: Use sensitivity and diplomacy when dealing with or talking.
- *27 Private discussions: Having a private conversation instead of a public discussion.
- *28 Request a correction: Asking the user to correct the misinformation the user posted.
- *29 Request for not re-sharing: Asking the user not to spread misinformation to others so that misinformation post does not spread on a larger scale.
- *30 Request a post removal: Requesting the deletion of a specific post or content that contains misinformation from social media platforms so as not to mislead more people.
- *31 Hide the post: Hide the post to be hidden from your feed so that the post cannot be seen again without blocking or unfollowing the person who shared the misinformation post.
- *32 Dislike: Click on dislike to express disapproval of the misinformation content.
- *33 Re-sharing: Re-sharing the misinformation post with others or re-publishing it on social media by pressing the re-share button so the followers can see the post and might comment and correct it.
- 34* Snoozing: Click on snoozing to the misinformation posts of the user who shared the misinformation for a particular period from your feed.
- 35* Unfollow: Click on unfollowing or unfriend a user who shared the misinformation.
- 36* Report: Reporting the misinformation post to social media platforms to draw their attention to the violation to remove the post or ban the user.
- 37* Blocking: Blocking the user who shared the misinformation post to prevent them from interacting with you, your posts, or seeing your profile.
- 38* Tagging or Mention: Tagging or Mentioning a user's account to notify them of the misinformation content.
- *39 Suspect the source: uncertainty, doubt, and skepticism about the source that shared the misinformation post.
- *40 BeingAlarmed: Feeling worried and wary of the user who shared the misinformation post.

8.2.2 Empirical Contribution

The research design used both qualitative and quantitative methods. Questionnaires were completed by 1014 participants during COVID-19 outbreak, and Twitter data were examined. The empirical basis for understanding how such messages were understood was built by considering differences in responses due to participants' age, educational level, preferred source and agreement with misinformation. This investigation demonstrated that personal characteristics significantly influenced the involvement with misinformation depending on the level of difficulty in spotting the misinformation. This study also considered ways through which participants evaluated facts, explaining different aspects they employ when distinguishing between correct and false information. This study provided evidence how users' trust in authorities affects reporting behaviour. For example, users who preferred the CDC or WHO were significantly more likely to report misinformation posts, as evidenced by the rejection of the null hypothesis across all task difficulties. This highlights the importance of trusted institutions in combating misinformation. This study also provided evidence how agreement influences reporting and sharing behaviour. For example, Individuals' agreement with a post significantly affects their actions on social media. When they agree with a post, they are more likely to share it, tag experts or friends, or distribute it across other platforms. This behavior strengthens as task difficulty decreases, with moderate and easy tasks showing stronger relationships. Conversely, disagreement with a post increases the likelihood of reporting misinformation or blocking the user who shared it. The statistical significance across all task difficulties underlines how personal agreement or disagreement shapes proactive sharing and reporting behaviors, demonstrating the critical role of user beliefs in managing social media content.

It provided evidence gained from analysing Twitter data helping understand social network dynamics around the misinformation formation process that happens in real time. This study also provided evidence of the role of Retweets in propagating misinformation. The analysis of misinformation networks demonstrated that retweets were the predominant mode of interaction, constituting 85% of the total tweets in the case of misinformation linking the Pfizer vaccine to heart issues. This highlights how easily misinformation propagates, as users amplify content without critical evaluation. Influential users, particularly those aligned with certain political or ideological groups, played a critical role in spreading misinformation. Their high betweenness centrality scores reveal their pivotal positions in the network, enabling them to effectively shape and disseminate narratives. This study also provided evidence the influence of political and ideological biases. The study revealed that misinformation often thrives in politically polarized environments. Conservative, libertarian, and anti-vaccine groups were identified as key clusters promoting false claims. These groups were characterized by ideological alignment, skepticism towards government narratives, and distrust of established science. This ideological alignment made their followers more susceptible to misinformation, as they were likely to resonate with the underlying narratives and spread them further. This study also provided evidence the challenge of correcting misinformation. One of the most significant findings in study 6 was the difficulty of

countering misinformation effectively. Despite the presence of fact-checking accounts and reputable news organizations actively debunking false claims, their reach and impact were limited compared to influential misinformation sources. For instance, in the network analyzing claims about the Pfizer vaccine and heart problems, fact-checking accounts had considerably lower betweenness centrality scores and follower counts compared to conspiracy-promoting influencers. This asymmetry in influence highlights the rapid spread of misinformation relative to corrections. Additionally, the study revealed that many users who engaged with misinformation retweeted it without supporting or questioning it, indicating passive amplification that complicates mitigation efforts. This produced empirical evidence supporting effective information literacy and critical evaluation for online materials. Consequently, it provides important insights for developing specific communication tactics against misinformation.

8.2.3 Methodological Contribution

Methodologically, this study contributes to the current knowledge using a mixed methods exploratory sequential design combining qualitative and quantitative insights from survey data, setting a precedent for future misinformation interaction studies. The employment of exploratory sequential design in the methodology is indicative of an innovative strategy used to approach difficult research aspects on social media misinformation. This choice made in methodology shows how qualitative input can enrich the development of quantitative measures thereby improving social media research through making it more holistic and methodologically diverse. The use of this exploratory sequential design allows for a richer understanding of the issue from different angles, increasing the trustworthiness and depth of findings. Additionally, innovative use of network analysis and the Latent Dirichlet Allocation (LDA) model demonstrates knowledge about how to study misinformation differently. This approach helped showed the dynamics surrounding misinformation on social media content by looking into how people react or interact with it rather than simply identifying relevant topics and networks.

8.3 Implications

This study highlights the most common reactions to misinformation and how these reactions differed based on the type of misinformation. The results revealed that the trustworthiness of COVID-19 information from reliable information sources, such as government sites and health authorities, positively impacts the social reaction that decreases the propagation of misinformation. However, this effect diminishes to some extent when users trust national news such as Fox News. Therefore, the study findings show close cooperation between social media platforms, reliable information, and health authorities regarding information dissemination is conducive to influencing positive social reaction and fighting against misleading claims about COVID-19.

This study explores the factors affecting information verification during the COVID-19 pandemic, such as trust, agreement levels, source credibility and individual responses. It highlights the need for a multifaceted approach to tackle misinformation on social media platforms. This includes improving source credibility, relying on trustworthy information sources, promoting critical thinking skills and using visual cues to identify reliable information. Future research should focus on developing strategies to combat the spread of

misinformation on social media during health crises. These findings can guide efforts to improve media literacy, promote critical thinking and create effective interventions to counter the spread of misinformation. As suggested by Gërguri (2022) and Oh and Lee (2019), more research is necessary to explore the long-term effects of misinformation and interventions intended to address it. This research helps develop a broader understanding of the overarching topic of reactions towards misinformation. Therefore, this research contributes to future studies that focus on developing models for misinformation detection in social media.

8.4 Research Recommendations

8.4.1 Recommendations for Future Studies

8.4.1.1 Future Research into Misinformation Detection.

- **Exploring the link between information source reliability and verification behaviour:** Understanding how people perceive the reliability of information sources to determine whether users will verify the information or use keywords, such as “apology” or “mislead”, to identify potential false claims in their comments.
- **Predicting user reactions to misinformation:** Scan through user responses for specific phrases that indicate a denial (inform, debate) and correction towards the presence of misinformation in social media.
- **Leveraging user corrections:** Develop mechanisms for fact-checking databases to incorporate user-submitted corrections, thereby speeding up identification of new instances of misinformation.
- **Identifying misinformation via user sentiment:** Examine whether smiley/laughter emoticons are used in responses by other users as a pointer to unreliable sources that may be spreading untruths or jokes.
- **Analysing blocked accounts:** Examine if blocked accounts can also be considered as possible factors in detection algorithms for potential spreaders of misinformation.

8.4.1.2 Future Research Topics in Social Media Platforms.

- **Quick verification features:** Enable users verify posts directly by embedding credible fact-checking websites or one search engine at once.
- **Information source labelling:** Introduce tags indicating whether reliable sources support each post’s information with full verification details accessible from a ‘fact-check button.’
- **Prioritise verification:** Volunteering correction options linked to relevant keywords could make verification more prominent than posting, sharing and replying.
- **Topic tracking:** Users should be able to select areas and obtain updates about these subjects without exposing themselves to too many unconfirmed details by employing a keyword matching system that allows them to provide detailed information when necessary but minimises exposure to unverified rumours.
- **Facilitate verification process:** By using keywords in their search, the verification process can be more efficient by referring users to more reliable sites.
- **Hide misinformation posts (optional):** There should be an option to hide all posts identified as misinformation, which users can disable according to their preferences.

8.4.1.3 Future Research Topics in Social Sciences and Communication.

- **Re-define misinformation:** It may be valuable to add “uncertain claims” since this identifies doubtful information more easily than true misinformation.
- **Investigating why people do not fact-check:** Such reasons may include irrelevance of information or lack of need for further research by users.
- **Analysing ambiguous posts:** Focus on posts with high engagement and questions, as they might represent questionable information.

8.4.1.4 Recommendations for Future Studies in Information Literacy.

- **Identify effective methods to raise public awareness about misinformation:** It would involve exploration of diverse outreach methods and educational approaches.
- **Create comprehensive verification training programs:** Develop tailored programs that enable individuals to evaluate online information confidently.
- **Examine how technology impacts spread of misinformation:** Examine how design elements and social media algorithms contribute to the spread of false information.
- **Explore potential for media literacy laws and regulations:** Examine the possibility of having specific legal frameworks that can be rolled out to eliminate online misinformation effectively.
- **Investigate different fact-checking methodologies’ effectiveness:** Different approaches on fact-checking have been analysed with a view at finding out the most reliable ones as well as determining which methods are most efficient.
- **Study the connection between human psychology and misinformation sources:** Understand how cognitive biases and social dynamics influence individual susceptibility to misinformation.

8.4.2 Recommendations for Combating Misinformation

8.4.2.1 Fact-Checking Websites.

- **Support independent and diverse organisations:** Fund and promote various fact checking websites to avoid biasness and guarantee comprehensive coverage.
- **Improve search engine visibility:** Collaborate with platforms to ensure that rankings of fact-checking results and misinformation appear prominently in searches.
- **Develop innovative debunking methods:** Explore other methods of debunking, including using engaging formats, such as infographics or videos, to counter false information effectively.
- **Facilitate rapid alert systems:** Create user-friendly tools for reporting and verifying misinformation quickly.
- **Collaborate with reliable sources:** Engage health organisations and governments in sharing verified information as well as expertise.

8.4.2.2 Health Organisations.

- **Promote critical thinking skills:** During health crises, run campaigns educating people about how they can identify and verify information.
- **Publish accurate and timely updates:** Make available easily accessible channels providing clear unbiased health information.
- **Respond to misinformation swiftly:** Debunk false claims promptly before they spread

further by providing corrections whenever necessary.

- **Utilise user corrections:** Correct conspiracy theories using people's corrections while building trust.
- **Partner with fact-checking websites:** Collaborate for accurate and accessible health information reaches the public domain.

8.4.2.3 Governments.

- **Establish independent fact-checking bodies:** Set up impartial organisations funded that would verify information provided by governments through their agencies.
- **Impose penalties on misinformation promoters:** Think over regulations that will check intentional spreading of harmful falsehoods.
- **Develop reporting mechanisms for employee concerns:** Have anonymous reporting systems or independent organisations in place that will protect whistle blowers and encourage reporting of misconduct.
- **Promote media literacy in education:** Incorporate media literacy curriculum into school programs to help future generations acquire critical thinking skills.
- **Encourage responsible reporting:** Support media outlets which prioritise fact checking as well as responsible journalism.
- **Collaborate with health organisations and fact-checkers:** Collaborate among themselves to create a united front against misinformation.

8.4.2.4 General Public.

- **Focus on verification over debate:** Instead of lengthy discussions on misinformation, simply refuse it using reliable sources. This is because you can prevent unnecessary engagement or potential escalation.
- **Verify before you share:** Always check information with trustworthy sources before sharing it online. Otherwise, this could lead to embarrassment and an inadvertent contribution to misinformation.
- **Think before you post in crisis situations:** Misinformation often thrives when things are volatile. During an event or crisis, be extra careful about unverified info.
- **Develop critical thinking skills:** Learn to evaluate critically the source of information regardless of how many sources there may be. All sources are not equal.
- **Challenge your own biases:** Acknowledge your personal biases so that they cannot influence your consumption and sharing habits of information.

8.4.3 Ethics and Limitations

8.4.3.1 Ethics.

Ethical issues were carefully considered for both the survey and Twitter data collection components of this study to ensure compliance with ethical standards in research

3.6.1 Survey Ethical Considerations

In the survey conducted using Amazon Mechanical Turk (MTurk), the following ethical considerations were conducted:

- **Informed Consent:** All participants were given sufficient details about the aim of the study, the activities they were to engage, and how their data would be used. Participants were required from the start to provide informed consent for voluntarily taking part in the survey and were informed that they have the option to withdraw at any time during completing the survey.
- **Anonymity and Confidentiality:** Participant identities were anonymized, and no and no personal identifiable information (PII) was obtained. The responses collected were protected and shared only among the authorized members, and only for this project. Results were reported in aggregate form, ensuring that individual responses could not be traced back to participants.
- **Compensation:** Participants' compensation for time and participation was adequately done, in accordance with MTurk guidelines along with other similar studies.
- **Review & Approval:** The survey study was reviewed and approved by the relevant university ethics board, ensuring that it adhered to institutional standards for conducting research with human participants.
- **Reward:** The participants were given an option of not participating in case they felt the reward was too low. .

3.6.2 Twitter Data Ethical Considerations

The ethical issues related to the collection and analysis of Twitter data included:

The list of the ethical concerns with regards to the collection and analysis of Twitter data that were dealt with during the study:

Publicly Available Data: It is important to note that Twitter data is considered public by default, assumes that data users provide through tweets or interactions of that user with others is available to the public unless that account is set to private. The research only focused on the tweets that had been posted on publicly available tweets with an aim of making sure that no privacy boundaries were trespassed.

- **User Anonymity:** Although Twitter usernames and profiles are publicly accessible, no attempts were made to link the collected data to specific individuals. Usernames were anonymized in the analysis to protect the privacy of individuals involved in the discussions. Individual users were anonymised in-line with widely cited best practices for research on Twitter (Ahmed et al., 2017).
- **User Anonymity:** Despite Twitter usernames and profiles are publicly accessible, no attempts have been made to identify the individuals from which the provided data has been obtained. Usernames were anonymized in the analysis to protect the privacy of individuals involved in the discussions. Individual users were anonymised in-line with widely cited best practices for research on Twitter (Ahmed et al., 2017).
- **Data Minimization:** The research focused only on the collection of tweets that had a direct relevance to the narrative of misinformation being investigated. Unnecessary

personal data or information unrelated to the research was not collected, thereby observing ethnical principles of data minimization.

- **No Interaction with Users:** The research did not involve direct interaction with Twitter users, such as replying to or engaging with tweets. This ensured that users were not disturbed or influenced by the study.
- **Ethical Review:** The ethics concerning the use of social media data in research were reviewed and permission granted by the university ethics board.

These ethical considerations were integral to ensuring that the study was conducted responsibly and in compliance with both institutional and legal standards.

8.4.3.2 Funding

The Information School of the University of Sheffield funded this data collection activity.

8.4.3.3 Limitations.

This study was limited in participant demographics since most participants were MTurk workers who work on many tasks daily and might be more familiar than the average person with online information. One limitation of this study is the broad focus on users from English-speaking countries as a singular demographic. Although social media is international, misinformation reactions can vary significantly across regions due to cultural, political, and geographical factors. For instance, misinformation that resonates with U.S. users may evoke different reactions from U.K. users due to varying political contexts and media trust. By treating all English-speaking countries as one group, the study overlooks these critical regional differences.

An important limitation of in the first study is also that although it intended to capture the experiences of users from English-speaking countries, 95% of the participants were from the United States. This means the results are largely reflective of U.S. social media users, rather than the broader English-speaking world. Therefore, generalizing the findings to other English-speaking regions may not fully account for regional differences in media consumption, political backgrounds, or cultural contexts. Future research should focus on localized contexts to gain more accurate insights into how misinformation is perceived and addressed across different regions to gain broader insights.

One limitation of this study is aslo the phrasing of the question, "Your usual social media platform intentionally provides misleading information during the COVID-19 health crisis." This question could be misleading, as it implies that the platform itself, rather than the users, is responsible for providing the content. In reality, social media platforms are primarily conduits for user-generated content, and while they may influence the visibility of certain content through algorithms, they do not typically generate or directly provide the misleading information. This framing could have influenced participants' understanding of the question and their responses. Participants might have conflated the platform's role in moderating content with the content produced by users, making it difficult to draw precise conclusions about perceptions of platform responsibility. Future studies should clearly differentiate

between the role of the platform and that of the users to avoid confusion and ensure more accurate insights.

Conversely, this study aimed to fill a scientific gap because there is so much research done in this area (understanding people's reactions to misinformation). As a result, drawing several associations after collecting and analysing data led to the development of hypotheses about them that would determine how strong or weak the relationship between those factors are. The second study looked at Twitter solely; hence, it cannot be generalised for all for social media platforms or languages and countries different from what was presented by the researcher. In doing the second study, one limitation encountered by the researcher included little available information through Twitter. Twitter has taken measures that restricted data collection thereby reducing chances of getting various types of misinformation beyond those obtained earlier. The data collection limitations due to Twitter's API restrictions have impacted the comprehensiveness of this study. Data was sourced through NodeXL's search function, using specific keywords, which introduced biases. This approach skewed the dataset towards misinformation topics prevalent in U.S. media, limiting the global diversity of misinformation in the sample. As a result, the findings may not fully capture misinformation narratives from other regions. Additionally, the dataset was dominated by retweets, which constrains the analysis. While retweets reflect content amplification, they do not account for other forms of interaction, such as replies, quotes, or mentions, which provide deeper insights into user engagement with misinformation. This limitation restricts the study's ability to explore more nuanced user responses. The data collection also focused on three specific misinformation types within a limited time frame, offering only a snapshot of the broader misinformation background. Therefore, the findings cannot be generalized to other forms of misinformation or periods. Finally, the discontinuation of data collection via NodeXL limits the potential for future research. The inability to collect additional datasets hinders the expansion of the analysis to include new misinformation topics or timeframes, emphasizing the constraints imposed by limited access to comprehensive social media data.

To address these limitations, we ensured diverse sampling where possible and acknowledged the generalization limitations in our analysis. For the Twitter API restrictions, I also examined users' profiles and their associated group sources to gain more context on misinformation interactions. We expanded the scope beyond retweets by analyzing replies and mentions to capture a broader range of user engagement. Finally, we recommended future research to include additional platforms, regions, and longer time frames to better generalize findings.

The networks analyzed in this study are partial networks, as they represent only a subset of the entire Twitter network focused on specific misinformation cases. Complete network metrics, such as betweenness centrality, are typically designed for use in full networks where all nodes and edges are available for analysis. In a partial network, key actors, relationships, or interactions may be missing, which can skew the accuracy and relevance of such metrics. For example, betweenness centrality relies on the shortest paths between all nodes, and in a partial network, these paths are incomplete or missing entirely, which may lead to inaccurate centrality scores. Given this limitation, the interpretation of complete network metrics like betweenness

centrality was approached cautiously. To address this, the analysis focused more on local network metrics, such as degree centrality, which can still provide meaningful insights in partial networks by highlighting nodes with high direct connectivity. Additionally, where possible, the analysis included a discussion of the partial nature of the network and its potential impact on the interpretation of results, especially with metrics like betweenness centrality. Moving forward, future studies could benefit from employing alternative approaches, such as sampling techniques, to better address the limitations of partial networks. This would enable a more accurate application of network metrics and enhance the validity of the results.

8.5 Summary

In general, this thesis represents a considerable move forward in our comprehension of how misinformation was engaged and debunked during the COVID-19 health crisis on social media. The thesis not only helps address the gaps that exist in the current literature but also provides empirical and methodological frameworks for future research on reactions to misinformation. The results of this study provide important guidance for targeted interventions against health miscommunication on social media platforms. Consequently, focusing on source credibility is essential because it plays a significant role in reducing misinformation sharing through social media platforms. Moreover, it underpins the necessity of encouraging critical thinking and media literacy among online participants so that forthcoming researchers may carry out their studies based on these assumptions. Personal characteristics combined with reactions to misinformation have provided insights into more developed perspectives towards the challenge of propaganda; thus, paving the way for individually tailored strategies for combating misinformation. This thesis does not just contribute to knowledge but also has practical implications for healthcare providers, policy makers and social media platforms that may want to reduce the effects of misinformation during public health crisis periods. A detailed examination of verification strategies against misinformation can inform better education campaigns and interventions aimed at promoting accurate information intake while reducing false claims about health issues spread by social media users.

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Appendices

Appendix (A): Terminology

To understand the subject matter thoroughly, it is essential to have a clear understanding of the terminology. The most common terms used are defined in **Table 33**.

Table 33 *List of the Conceptual Terms Used in this thesis*

Terms	Definition
Information sources	Sources used to obtain information (Ali, 2020; Elizabeth, 2010; Soroya, 2021)
Social media	An environment that enables users to act as online information sources, sharing information, insights, experiences, concerns, suggestions and opinions with other users (Albalawi et al., 2017; Marken, 2007)

Twitter	A popular social media platform that generates large amounts of data by enabling users to interact with each other via short messages known as ‘tweets’ (Atefeh & Khreich, 2013; Sarker et al., 2015; Rosen, 2017). X is the current name of Twitter (Stokel-Walker, 2023).
Facebook	A website that allows users to connect with their networks to share pictures, music, videos, articles, and their feelings and opinions (Facebook, 2020)
YouTube	“YouTube is a free service where subscribers can upload videos of any quality (including those shot using mobile phone video recorders), thereby sharing them with a potential audience numbering hundreds of millions” (Freeman & Chapman, 2007, p. 207).
Reddit	“Reddit is an American social news aggregation, web content rating, and discussion website based on collective filtering of information” (Cinelli et al., 2020, p. 2).
Information literacy	An ability requiring individuals to identify, evaluate and apply information efficiently (Association of College and Research Libraries, 2000)
Crisis communication	Collection and processing of information used to communicate during crises or emergencies (Coombs, 2010)
Pragmatism	A philosophical worldview that values the real social problem and seeks to apply multiple methods to answer research questions and tackle these problems (Islam, 2022)
Statistical analysis	Statistical techniques used to analyse data and predict population characteristics (Morris, 1992)
Thematic analysis	“a method for identifying, analysing and reporting patterns (themes) within data” (Braun & Clarke, 2006, p. 79)
Chi-Square test	“The Chi-square statistic is a non-parametric (distribution free) tool designed to analyze group differences when the dependent variable is measured at a nominal level” (McHugh, 2013, p. 143).
Hypotheses	A “statement that can be questioned or tested, and that may be refuted in scientific studies” (Martínez-Mesa et al., 2006, p. 612)
Null hypothesis	A statement that assumes no association between the explanatory and response variables with regards to the unknown values of the parameter (Biau et al., 2010)
Alternate hypothesis	The alternate hypothesis contradicts the null hypothesis (Biau et al., 2010).
Friendship	“Friendship is defined as a kind of social dyadic relationship which involves interaction between two individuals” (Khoo & Yueh, 2022, p. 28).
Manager	“a management level employee responsible for more than two other employees within the organization” (Mackenzie, 2005, p. 4)

Trust	“expressed as a willingness of one party (the trustor) to rely on another party (the trustee) in cases that involve risk and potential loss to the trustor” (Gefen et al., 2003, as cited in Buchanan & Benson, 2019, p. 2)
Source credibility	“a communicator’s positive characteristics that affect the receiver’s acceptance of a message” (Ohanian, 1990, p. 41)
Social networks	Online communities in which users interact by posting, commenting, and expressing emotions based on information provided within a web-based environment (Baeth & Aktas, 2019)
Network diagram	“A network diagram is defined as nodes connected with edges to form a community” (Nyadenga, 2019, p. 17).
Users interactions	“Users interactions are defined as the exchange of messages between users including reply and repost” (Asha & Rajkumar, 2006, p. 4).
Echo chamber	“a network of users in which users only interact with opinions that support their pre-existing beliefs and opinions, and they exclude and discredit other viewpoints” (Alatawi et al., 2006, p. 1)
Hashtag	Represented by “#”, “the number of users who post at least one tweet containing the hashtag within the given time period” (Ma et al., 2013, p. 2)
Influential users	Users possessing personal and network attributes that enable them to significantly influence others, even indirectly (Watts, and Li (2011), as cited in Ma et al., 2013)
Mainstream media	Media with a vast influence that reaches many, shapes opinions and has a significant social impact (Newman, 2011)
Attitudes	A mental perspective or disposition that one chooses to adopt towards a particular fact or state (Hillson & Murray-Webster, 2004)
Diffusion network	“community-cascading diffusion network if the social factor takes the dominant role” (Zhu et al., 2018, p. 4)
Personality traits	Dimensions of individual differences in consistent patterns of thoughts, feelings and actions (McCrae & Costa, 2003)
Vaccine hesitancy	“a delay in acceptance or refusal of vaccines despite availability” (Macdonald, 2015, p. 34)

Appendix (A): Understanding reactions to misinformation - scenario based analyses

Quotes Examples

Internal acts of authentication

Check the message

Table 34: Example quotes that relates to check the message in Interanl acts of authentication.

Assessment Type	Example Quote
Check the rationale of the message	“Providing a thorough, well reasoned theory, argument, ... makes the information trustworthy and credible.” P:O3G60

Check whether the message is helpful to society	"the information give by the online sources should be fair to the society and current situation then only i consider itself trustworthy." P:PP8ED
	"if it's helpful and i can research to confirm the info" P:RQSSS
Check the Political views	"It's trustworthy and credible if it isn't sponsored or written by conservative shills" P:393OG
	"The poster. If I see an article or a graph from somebody whose political views disagree with mine, I find it is not as credible." P:Z8BAM
Check whether the message is consistent with past experiences	"If I already seen or heard about this information from a trustful source ..." P:LO584
	"... if the content aligns with my prior beliefs..." P:T17LW
	"If the information lines up with past information that I have verified to be true, I am more likely to believe it. ..." P:L2IWA
Check whether the message is consistent with previous knowledge	" If it has reputable sources and fits in with what I know."P:W8SXX
	"... Its a complicated weighting of things like ... how well it comports with my model understanding of the world, my understanding of the the unconcious biases at play both with the source and myself . . . its complicated." P:3Q18G
Check the evidence of the message	"Proof , statistics , Documents to support the information" P:UQA7A
	"If it's supported by scientific evidence published by academic and governmental organizations" P:V8LHQ
Check the Message Impartiality	"... it doesn't appear to be extremely biased or one sided." P:U9W5R
	"If it sounds honest and not politically motivated" P:1R0I4
	"Information that seems too controlled by the MSM where all of the outlets use the same wording or phrases to describe issue. Seems they are being told what to say to control the narrative." P:4TT46
	"... I also look at the motivation behind the message-if it's trying to convince people to do something I know is not safe, or purchase a product or give up personal information, I am less likely to trust it." P:L2IWA
Check the language and presentation of the message	" I tend to view information as being less credible if it is framed in more polarizing or extreme terms and/or ... a source that is known to peddle in distortions." P:ELLB0
	"... when it is presented in ... organized manner" P:V1L03
	"something that doesn't sound outrageous and exaggerated" P:VPAT8
	"...if it is by people who spout hate and anger, then i don't trust them at all" P:6Q8DF
	"... how it's worded" P:1QCDF
	"The information ... needs to be well written otherwise I'll have a hard time trusting it. It has to be somewhat clear and professional." P:SX3NY

	"It must have the following characteristics: it is current, original, has good spelling..." P:H9ERB
	"...it is well-written and well-thought-out." P:X8KY4
	"If it has sourced detailed information" P:VVX34
	"... quantity and quality of the engagement attached to the story." P:12LZT
	"Video Interviews" P:TWC99
	"The news headline, full reviews, photo, videos and etc..."P:X0NX2
	"terrible screenshot." P:PGRPB
	"No clickbait in the headline" P:WW082
Check whether the message is up to date	"... Currency..." P:3R1O9
Check whether the message is strong and has a scientific basis	"I believe in the total methodology for gathering the data, and therefore I believe in the range of estimate statistics." P:TKC6X
	"Information tends to be credible if it has been supplied by medical experts, research scientists, or public health professionals. If the information has been peer-reviewed in academic journals or supported in double-blind, randomized, controlled clinical trials, it probably has a good deal of credibility." P:IXSI4
	"A reliable source is one that provides a thorough, well-reasoned theory, argument, discussion, etc. based on strong evidence. Scholarly, peer-reviewed articles or books -written by researchers for students and researchers. Original research, extensive bibliography" P:89D65
	"When it's reported without inserting politics, not dramatized, asks and answers all the right questions any critical thinker would ask, is supported by solid facts and not assumptions, looks at pros and cons, balanced (playing devil's advocate), and the source reporting does not have a clear record of shutting down opposing views/partisanship/inaccurate reporting and bloviating." P:2MUO3
Bias and completeness of the information	"It presents both sides of an argument or situation and doesnt focus exclusively on one point of view. It needs to be unbiased or if not, should be transparent about its bias" P:35J23
	"Exact date, time and location, Name of the real persons or officers and practical information gives trust about the information." P:IM7JD
	"If someone posts information about something then posting the whole "context of that article is best" so I can read the whole article instead of just a quote that could make it bias. Reading the whole article of information is most important so I can make up my own mind." P:XHIYS
	"Point out potential contradictions to other established and more trustworthy sources." P:R2DTW

Information contradicting scientific knowledge	“When it goes against the grain, and it has happened before and to a lot of people. When things are considered conspiracies wind of being true.” P:T6HY0
Made-up claims	“There's a 50/50 chance ALL pieces of information are false” P:9HJLS
	“When all of the facts stated are truth with no exaggeration, no minimalizing, and no word play. leaving out relevant info is just as bad as sharing misinformation” P:RJ1PP
	“I tend to view information as being less credible if it is framed in more polarizing or extreme terms ...P:ELLB0
	The information has sources cited and makes factual claims without putting too much emotion into the information. When there's a lot of emotion or feelings, it is a good indicator that the information is not trustworthy. P:6JA08

External acts of authentication

Check the message

Table 35: Example quotes that relates to check the message in external acts of authentication.

Main Element	Factors influenced the scenario	Example Quote
Fact-checking the content	N/A	"Any news have to to authenticated by BBC, CDC and PBS or other reliable sources. I USUALLY DOUBLE CHECK CREDIBILITY BEFORE MAKING A DECISION." P:DSKK8
		"i like using forums like Reddit so many people can fact check it and discuss. Also, places like NPR and NYT get called out on being wrong, etc. which helps their credibility." P:8ORHP
		"It is credible if I believe in the media that are telling the news, and after I check it in fact checkers sites" P:3WYKR
		"Usually depending on how they interpret sources and their reputation." P:XETTR
		"Verify the information you already know against the information found in the source. Look also for disclaimers as to the accuracy of the content. You may also want to double-check the information against a source that you already know is trustworthy" P:FKMFB
		"I'd check to see if other people are commenting and correcting them, and then see if the trusted source corrects themselves later. Mistakes happen. If not, I'll

		probably consider that Strike One. I'm not going to call a source trusted if it's posting misinformation suddenly and often." P:HK9F2
		"i read the comments" P:NI41M
	Relationship	"I would find out if there was some information that maybe they did not have or were not considering and make them aware of it." P:CD3E3
		"Unsure how to go forth discussing the topic at length before attempting to softly locate the misguided and inaccurate information that only takes people a step back to thoroughly engage in such discussions." P:C982B
		"Post on other sites like Reddit to get verification." P:CTXXX
	Authority	"I'd say that's interesting, and not what I understood about the case. Then I'd do more research on my own, and if I found a good source that shared the correct information, I'd share it with them." P:D4WKD
		"i will personally check it on fact checking websites" P:KJ8XL
	Trust	"Vet it against other trusted sources. Research it thoroughly. Ask a lot of questions." P:MDXE9
		"I would do a search for more information before responding. If I found that they are the only source reporting this information, I would suggest that it may be misinformation and ask for clarification." P:X7FQ2
		"I'd check to see if other people are commenting and correcting them, and then see if the trusted source corrects themselves later. Mistakes happen. If not, I'll probably consider that Strike One. I'm not going to call a source trusted if it's posting misinformation suddenly and often." P:HK9F2
Check if the message is correspond by several sources	N/A	"Can be verified through multiple varied sources. For example information is the same on governmental, medical or university sites, and credible news sources." P:97P13
		"If I can verify the information more than one time or one different way from an independent source, that has some credentials, such as the NHS or CDC, then I consider it it be at least somewhat trustworthy." P:PGRPB

		"when you see the same info on multiple sites and the same sites tell you which info is wrong" P:5G81E
		"I need to find at least 3 reliable sources that confirm it." P:T906L
		"If I'm not sure I Google for factchecking from reliable sites and read up on the info from different sources to see how their takes match." P:ZIP7Y
		The source is the most important piece of information to me, as well as the seemingly accurateness of the information presented. If it's the same across several trusted sites then it becomes even more trustworthy to me. P:CB76C

Check the background of the source

Table 36: Example quotes that relate to check the background of the source in external acts of authentication.

Characteristic	Example Quote
Trustworthy	"The source is important and I'm more likely to take it at face value if it's one I trust but I usually try and seek out alternate viewpoints that are critical of the information. This is especially the case if I feel like the article might be giving incomplete information or the author is pushing an agenda." P:V0ZSN
	"For information to be trustworthy to me, it must come from a source that I recognize for being trustworthy in the past and it must either fit cleanly into what I have learned from reputable sources or offer something compelling that refutes those sources (for instance: a well regarded peer reviewed paper). My trust in these institutions is not something that is borne out of one article or piece of media but rather over time as they prove themselves." P:5NI6V
	"The source of the information is a sign of its credibility (both the original source and who shared it)..." P:3PEA2
	"When it has sources that can be checked for verification" P:OFGEW
	"Finally, credible sources are usually recognized as such and cited by other credible sources. Readers should be wary of sources that cannot be verified or that are not cited by other sources" P:R2SMJ
Authority	"there are many factors that make a source credible. these things include the source authority..." P:3HY3O

Accuracy	"there are many factors that make a source credible. these things include the source ... accuracy, ..." P:3HY3O
	"Reliable sources. For example, I was able to flag that recent article about male sterility and ivermectin as being unreliable, based upon the small study sample and that it was published in a small, unknown journal." P:2TQ82
	"The first thing I look at is the source. Who is posting this information? Do they have a history of credibility? Are they known for being reliable? Do they work for a reputable organization? Is their account verified? I need to be very sure of these questions before accepting a piece of information as trustworthy." P:7DO9C
Impartiality	"there are many factors that make a source credible. these things include the source ... objectivity..." P:3HY3O
Long Time of Existence	".... I totally trust someone that works in the cdc and has worked there for over 20 years. They know what they are talking about . Just because someone says it on facebook for example doesn't prove anything to me." P:QP690

Authenticate with author

Table 37: Example quotes that relates to authenticate with author in external acts of authentication.

Assessment Type	Factors influenced the scenario	Example Quote
Requesting evidence from the author	Relationship	"I'd ask them for their source of info and let them know I'm concerned about why they posted it" P:CTXXX
		"I would go to them, or text and ask where they got their information. In some cases, like some co-workers and some family, they have already made up their minds that the misinformation is the truth. No matter how much I try and make them understand, they shut me off". P:W0VPY
	Authority	"I would attempt to debate them and inquire about their sources, but I likely would not press the issue as much as I would with family or friends". P:WP1PK
		"I would politely engage him/her in a conversation, ask for the source, and advice he/she retract the post with an apology to as many who have been misled." P:L8PQL
	Trust	"i will ask them if they are sure about information and if they can give credible sources of information provided" P:U3RF3

		“I would enquire about the validity of the statement and if there are any recent publications backing the information through the comment section” P:T17LW
		“If they are a trusted source, I would have a conversation with them or ask for sources. A lot of times people mis-read and share things that they overlooked as "wrong".” P:5SEPQ
		“I would question them all the same. I want to know where they got their information from. I would look into how the research was conducted and see how it was obtained.” P:DW1VJ
Check the reasoning of the author	Relationship	“I would ask them if they are sharing to show misinformation or if they believe it to be true, just to make sure”. P:ZY5MP
		“I would be a little more lenient and understanding. Since I know the person, I would be able to tell if they were simply misinformed or trying to be destructive with their comments. It's easier to judge a friend because I have history with them. I know how they react and act. I don't necessarily have this luxury with random social media posts”.P:7DO9C
		“I would start to be skeptical of anything they said and search for clues as to why they shared misinformation to determine the best way to show them their post was wrong”.P:P4FPO
	Authority	“I would approach them regarding the post and judge their attitude towards the content i.e had they naively posted it, did they fully believe in the information... and then make a decision on what to do - i.e whether to challenge them or to just engage in discussion.” P:WUVC7
	Trust	“I'd feel disappointed. I'd wonder why they posted. I'd be more cautious going forward.” P:7DO9C
		“Tell them I think it's incorrect, ask where they got the information from, ask for more information. Probably go research a bit more on my own in case I missed something or there's new information.” P:0GRBC

Actions on the misinformation posts

Table 38: Example quotes that relates to actions on the misinformation posts.

Action	Factors influenced the scenario	Quotes Examples
Hide the misinformation post	Authority	“i would ignore it completely and simply hide the post” P:51J89
	Trust	“hide it” P:VHW6T
Disliking the misinformation post	Trust	“I would probably dislike it and unfollow.” P:833FE
		“I’d downvote, or dispute it through the platform tools.” P:6734Q
Resharing the misinformation post	Relationship	“share the news” P:46OCV
		“I am share for my family.” P:Q8BUE
		“yes, I want to share with my friends with feelings sad.” P:V6NV8
	Authority	“I would gossip about him sharing misinformation to other co workers” P:YV7EF
		“I will share that information in my office to check” P:J5ESR
	Trust	“Share the post to friends and family with other social media like whatsapp” P:TWIY3
		“I would share it adding my opinion about the topic” P:6SRO7
Tagging the misinformation post	Authority	“I would tag it on the platform and then move on.” P:AM00C
		“I would flag it and ask for supporting evidence” P:C72WM
	Trust	“I would flag it and ask for supporting evidence” P:C72WM
		“I tagged a specialist who well versed in that field and ask doubts with that post and clarify my doubt.” P:026JE
		“ignore or watch for update” P:WMRBL

Actions on the users who post the misinformation

Table 39: Example quotes that relates to actions on users who post the misinformation.

Actions	Factors influenced the scenario	Quotes Examples

Snoozing the user	Relationship	“I will give them a few passes, then mute for 30 days, if it keeps happening then a block is next” P:3WFW2
		“I would use the snooze option to snooze the user.” P:338OL
		“I’d immediately be disappointed. I would then correct them using facts from trusted resources. If they persisted in their views, I would snooze them for a period of time or, if it was egregious, unfriend them and/or block them.” P:MDXE9
	Authority	“I would snooze their posts for 30 days and try to avoid discussing COVID with them in person at work since we disagree and getting into an argument could hurt me at work.” P:ZX1N6
		“I will report it. If they consistently share misinformation, I will snooze or block them” P:HJEDA
		“I would be irritated, but otherwise I would just snooze the user on my feed.” P:N65UM
	Trust	“I put them on ignore. I don't unfriend them, but I put them on ignore so I don't have to see their posts. I would also ask them for their source(s)” P:O1F23
		“I will report it. If they consistently share misinformation, I will snooze or block them” P:HJEDA
Unfollowing the user	Relationship	“If deliberately sharing misinformation then I unfriend/block but if it's an accident I try to bring to their attention” P:977EH
		“once I might ignore it, if it happened more I would unfollow them” P:6LT0I
		“If it's a close friend, I would most likely distance myself from them. I share common beliefs and fact checking habits with my close friends, and if they post something that is factually incorrect, they most likely did it intentionally.” P:55E8X
		“i would have a conversation with them if they still spread misinformation after that i would end the friendship” P:PLV69
	Authority	“Unfollow them” P:AGJ4G

Reporting the user	Trust	“I would have to reevaluate my opinion on the trustworthiness of the source, and I might discontinue using it as a source of information.” P:AUNON
		“I'd be disheartened and wonder what happened to make them do such a thing. I'd question their legitimacy and debate unfollowing them, fearful that these actions might continue in the future.” P:VI46H
		“I'd google it and look at multiple websites, if they don't follow up with an apology post, I will unfollow.” P:5OM3D
	Relationship	“I would report the post and possible make a comment on the post about why the information is misinformation.” P:3ONON
		“I would quietly report the post but not respond to the post.” P:F8R5N
		“I'd first probably mention it privately, with evidence in hand, in the hopes they would remove the post, redact the info, etc. If that doesn't work, I would then publicly counter their argument, and even report it to the social media platform if necessary.” P:PD2L5
	Authority	“I would make an anonymous comp,aint [complaint] with HR so as npt [not] to ;put my job in jeoprdy [jeopardy].” P:OY2RG
		“I would report the post, but not comment on the post or talk to my supervisor/manager about it because I am afraid of retaliation.” P:3ONON
		“I would consider reporting this because they are in a position of authority.” P:PYMTU
		“I'd do the same as I'd do with a loved one: mention it privately, and, if that doesn't work, take them to task publicly and possibly report it.” P:PD2L5
		“I would go to them privately and ask for a private meeting. I would see where they are coming from and than base my decision on that wether to report it or not.” P:QP690
	Trust	“I would report it as it's probably an error” P:YR0H3
		“I would report them and also leave a reply stating that the information is fake.” P:HPSDX

		“I would report the post and possibly comment why the post is sharing information. I might even engage with some of the comments under the post.” P:3ON0J
		“If I knew the source confront personally if not known I would ask on line and report if necessary.” P:QP690
		“I would look into more about the information from other sources, to confirm if the information is misinformation. If it is, I would report the post as misinformation so it could be flagged, removed, or edited to be accurate.” P:XNQK1
Seek another job or resign	Authority	“If it is a persistent pattern of behavior I might look for another job.” P:3PEA2
		“I’d probably say something and get myself fired.” P:TBORI
		“I would be very upset, as I would expect them to know better. If they insisted on continuing to share misinformation, I would start looking for other jobs, as I do not want to work under someone that is deliberately ignorant.” P:52JYC
		“Inform the board of directors of this misstep of the manager.” P:7CCZX
		“Would privately discuss with Human Resources about the misinformation.” P:ASFYG
Blocking the user	Relationship	“Block them if it becomes too egregious, not that my Facebook account has worked for months-- which they know, it's deliberate, and no, I'm not "banned" outright, just shadowbanned with mysterious technical difficulties that never do get resolved. Go do something more useful with my time, like garden, have sex with my husband, pet a cat, visit the spiders who live on my back fence.” P:6PA5Y
		“I ignore, unfollow or block if required.” P:6CY9L
		“Early on in the pandemic I would have tried to explain why it was misinformation or call them out on it. Anymore, I just keep scrolling or block them. My patience has run out and people have become more and more irrational.” P:PWHPR
	Authority	“roll my eyes and block him/her” P:XDQI7

		"i would block them and only talk to them when needed" P:PLV69
		"I would most likely ask where the information came from. maybe even block them on social media" P:RL4HJ
	Trust	"I would fact check their information and try to understand if what they are saying is factual. If it was indeed misinformation, I would have to consider blocking them." P:6JA08
		"I would do nothing and/or block the account." P:T6OSJ
Mentioning the user	Relationship	"I mention it to someone else but would try not to be rude." P:T1SG9
		"I will tag an friend to make them aware of this post" P:JPBFH
	Authority	"I would mention it to them, and let them know it may not be accurate and they need to look into it further" P:65BV3

Strategies for requesting from the author of misinformation

Table 40: Example quotes that relates to strategies for requesting from the author of misinformation.

Strategies	Factors influenced the scenario	Example Quote
Request a Correction	Authority	"I will advice him to remove the information from h/her page and give a statement" P:KWB4S
		"I will tell them they are wrong, and tell them to either correct or remove the information." P:QRGCO
Request a for not reshare	Relationship	"I would ask them to check it themselves, before continuing to forward it." P:BWUXO
		"I will adjust and told him todo not do this again." P:5QMII
	Authority	"I would do my best to not allow them to spread more misinformation without jeopardizing my position at work." P:P4FPO
		"i just advice that manager or supervisor and requested for don't share misinformation" P:6CBLD
		"I would explain him that the content shared is believed to be misinformation and asked him not to share it anymore." P:K5GUC
	Relationship	"I put a crazy comment on his comment his and compelled her to remove that post." P:W39BO

Request a post-removal		“I would confront them and try to show them the error in their information. I would STRONGLY suggest they remove the misinformation and do better research before posting or sharing something like that again.” P:QXZBB
		“I would tell them to take it down and that I was pretty sure what they posted was misinformation.” P:KMCC4
		“I would be upset and I would let the friend know that I disagree with them sharing that information, especially if that information is damaging and could potentially hurt/kill. I would advise them to stop sharing immediately and delete any postings referencing said information.” P:52JYC
		“I would ask that friend to remove their post and talk to them about how it it misinformation.” P:XYAYB
		“I will contact the close friend , ask for the information source, and ask him/her not only take down the post, but also apologize publicly with a post.” P:L8PQL
		“i would simply tell them that the information is false and that they should take it down but i would not be rude to them.” P:51J89
	Authority	“I would probably tell them to take it down as well but do it a bit more diplomatically.” P:KMCC4
		“I will most likely approach him/her respectively and inform them about the fact that I can confirm the information shared is wrong hence should be edited or pulled down.” P:ILYX1
		“I would reach to him and asked if he has any evidence to back up the piece of information and if not, he should take it down.” P:GPOWD
		“I would politely engage him/her in a conversation, ask for the source, and advice he/she retract the post with an apology to as many who have been misled.” P:GPOWD
	Trust	“i would challenge him openly to stop misinforming the public” P:EJQZ1
		“I would contact the author to see if they could removed the information or see if I was incorrect.” P:KUZGS

Strategies of refuting misinformation

Table 41: Example quotes that relates to strategies of refuting misinformation (Response would depend on the relationship, Refute by Notifying or Arguing).

Refute	Factors influenced the scenario	Example Quote

Response would depend on the relationship	Relationship and Authority	“Depending on how close we were, I might confront them, or I might ignore it.” P:LTTC D
		“. I have a good relationship with my manager.” P:N3ENK
		“Depending on our relationship, I would try to tell them that I saw or read on the news that that piece of information wasn't true.” P:Q5GMO
		“I might say something to them if they shared it with me in conversation depending on how our relationship was, but if they shared it online, I would ignore it.” P:VNBLG
Refute by Notifying or Arguing	Relationship	“I would tell them right away that the info is junk/trash, and not to believe it. Seriously.”P:QBUD9
		“I will say that I have a different view of this situation” P:39W3E
		“I tend to dispute their claims by asking questions for them to validate it” P:34SXI
		“Make fun of them and call them an idiot. Sheep gonna sheep” P:DPN1E
		“I would be upset and I would let the friend know that I disagree with them sharing that information, especially if that information is damaging and could potentially hurt/kill. I would advise them to stop sharing immediately and delete any postings referencing said information.” P:52JYC
		“I would approach them regarding the post and judge their attitude towards the content i.e had they naively posted it, did they fully believe in the information... and then make a decision on what to do. I would then try to engage in discussion about what they had posted and what they expected to gain by posting it. I would be disappointed and slightly saddened especially if the misinformation posted was very easy to disprove. .” P:WUVC7
	Authority	“I would let them know but not give them any specific action to take. I have a good relationship with my manager.”P:N3ENK
		“I would try to bring to their attention in a polite manner...”P:977EH
		“I would not address it unless asked my opinion, then I would tell them.” P:9O460
		“It depends how severe the misinformation is. If it's mild, I'd do nothing. If it was blatant lies that threatened health and safety (like 5G vaccines causing cancer), I would call them out.”P:MDXE9

		“I would argue my point, and stick to my opinion. I would try to present facts to my manager, and hopefully try to change their view point.”P:3KDLP
		It the context of the workplace, if it affected my employment or quality of employment I would challenge it.P:WESZX
		“I would confront them about, either at work or online. I would mention to them that is is misinformation, and that they should be more careful about what they post.”P:XNQK1
		“I would try to bring it up with them as nicely as possible if I thought they were open to a discussion, but chances are, since they are my boss, I wouldn't mention it at all. I don't want to be on my boss's bad side because it seems like a lot of people that spread misinformation will not listen to reason or proof from the views opposite of their own...”P:QXZBB
		“ ... If they actively said it to my face I would ask them where they got that information. If they can't provide a decent source then I would probably say "okay, well I'll have to do my own research then". If I got bugged about it again I'd tell them the research doesn't support what they said, and then explain what the experts think. If they don't want to listen then I would probably start looking for a new job because that is a manager who can't learn from people below and you don't want that anyway.”P:43KIH
		“I might say something to them if they shared it with me in conversation depending on how our relationship was...”P:VNBLG
		“It depends on how it was shared. If it were online and I had the ability to comment I would probably post a reply. If not, I'd probably just ignore it.”P:DIDI7
	Trust	“I would write to the source and question them on it,” P:8BIUX
		“I would contact the source and express my belief.” P:8AEGM
		“Not repost the item and maybe leave a comment on the post” P:65BV3
		“I would tell them that I trust most of the information that they share, but this particular piece of information does not seem accurate.” P:R6X1H
		“I would reply, again scathingly, but in this case I would expect to be known by this source so I would also expect

		my sarcasm to have no lastingly harmful effect on the relationship.” P:BTI5W
		“If it is an official source I mentioned earlier like CNN or NPR, where they hold out as being an outlet that reports facts, then I would be concerned and scan comments to make sure users/pundits, etc. are pointing out that the information may be inaccurate. If no one has yet commented, I might make a brief comment, "Hey CNN, are you sure about this? New York Times is reporting something else. What's going on here?" “ P:M0RD1
		“Sometimes I ignore, but sometimes I let them know the source is debunked” P:04YR7
		“I would contact them through the contact us page on their website or comment on the page and ask them to back up their claims with credible data or sources. I would not consider them a trusted source anymore if they couldn't back up their claims with data and proof.” P:QXZBB
		“I would politely engage the source, ask for the clarification, and recommend the post retracted with an apology to as many who have been misled.” P:L8PQL
		“I will doubt their competence then assume it is human error then call their attention to it” P:8B57Y
		“I would probable re-evaluate my assessment of the source on the whole. Perhaps I would view the source with greater skepticism.” P:WP1PK
		“I will feel very doubtful for the rest of the information that they have posted would be misinformation.” P:G8VGU
		“I would seriously reconsider their trustworthiness, looking through their other recent articles. If the other things seemed trustworthy, I might contact the journalist or publication myself about it.” P:MZODB
		“I'd be suspicious of the source in future but I wouldn't discount the possibility that my conclusion could be incorrect so would seek out further information.” P:V0ZSN
		“I'd check to see if other people are commenting and correcting them, and then see if the trusted source corrects themselves later. Mistakes happen. If not, I'll probably consider that Strike One. I'm not going to call a source trusted if it's posting misinformation suddenly and often.” P:HK9F2
		“It depends. If it's just a one time thing, then hey, we all make mistakes. If it happens over and over again, then they

		just aren't reliable. Then they obviously aren't a reliable source of information.” P:2Q1OW

Table 42: Example quotes that relates to strategies of refuting misinformation (Refute and provide a source, lose confidence).

Refute	Factors influenced the scenario	Example Quote
Refute and provide a source	Relationship	“I would let the friend know that the content they provided was misinformation and give them evidence of the correct information.” P:0MNC0
		“Point out potential contradictions to other established and more trustworthy sources.” P:R2DTW
		“I would inform them that it is misinformation, and I would provide them with a link to a news article that debunks or corrects the information that they shared...” P:TY8VH
		“I'd first probably mention it privately, with evidence in hand, in the hopes they would remove the post, redact the info, etc. If that doesn't work, I would then publicly counter their argument, and even report it to the social media platform if necessary.” P:PD2L5
		“I would do the same thing I did above. I try to do this in a non-confrontational way, I don't tell people they are wrong, I just say that I found some info to the contrary and share the link.” P:L2IWA
		I'd drop a comment with a polite and friendly reply saying that there was some information to the contrary, and drop a link to a trusted source outlining the truth. P:HK9F2
		“I would find out if there was some information that maybe they did not have or were not considering and make them aware of it.” P:CD3E3
		“I would have no problem gently telling a friend that I did not believe their post was true. I'd more likely than not do a little research first to make sure I knew what I was talking about, because I don't know everything, and if I was correct and the information could be proven false by a leading, trustworthy source, I would post the link from the trustworthy source in the comments that spoke the truth about the matter and ask my friend to consider the information from that link.” AP:HNW2J
		I'd do some research on my own, and if I found out that the information was indeed false, I'd share the source of the correct information with them.P:D4WKD

		“...If I am not sure whether or not it is misinformation, I would ask them how they got the information and to cite their source.” P:TY8VH
		“I would try to get them to prove to me how the misinformation is true, and I would try and get them to understand any holes or flaws in their information, as well as try to explain to them if their source is not reputable (if applicable)” P:X1APP
		“I would be startled, and contact them, asking why it is they shared such information, calmly explaining to them why what they have shared is misinformation as well as providing them with a credible source to help them see that the information they're sharing is untrue.” P:VI46H
		“I would definitely debate with them; try to understand why they believe it, and then try to find credible sources that counter it; not to change their mind, but to make them aware about not believing everything they read.” P:1N5LA
		“I would try to talk to them first and then I would try to share them legit information. Ask them why they trust in medical information for everything else but this one thing and lead them to actual numbers and experts who know the most about it.” P:M45E2
		“I would try to open a discussion with my friend about why it's misinformation and come to them with researched sources disputing them. No blocking or sharing, just polite dialogue.” P:NA9UM
		“If it were a close friend, I would probably send them links to multiple credible sources that contained the correct information, and point out why those sources are trustworthy.” P:Q58PJ
		“If the person was a close friend, I would call or text them to discuss their opinions. And try to find out more about the source of the information and see how strongly they really believe the post. If they are on the fence, I might try to have a deeper discussion to see if we could come closer to the truth together.” P:HW9AG
		“However, if it's a trusted public figure, a friend, or a family member, it would depend on how new/developing the information is and wait first to see if they will self-correct. If I care enough about the person and believe that they are open to correction, I might make a respectful comment over DM. If they seem ingrained regarding the misinformation, then I will not do anything. If I suspect that

		they are knowingly spreading misinformation and that it is absolutely intentional, then they would no longer be a 'trusted source.' I guess it all depends on how innocent their intent appears to me and how receptive they are to constructive criticism.” P:M0RD1
	Authority	“If it was something dangerous, I would try to be tactful and correct them. But I might not say anything at all if it's just nonsense- depends what they're saying” P:XJQF6 “I would tell them the information is wrong and then post a link to a credible source.” P:CLZWT “I would tell them to stop sharing the information and I would largely ignore them and it. I would share sources of correct information with them so hopefully they could learn the truth.” P:V1S39 “I would privately message them, and send them links/sources, to explain why it was wrong, and damaging to share.”P:AHHV “I would argue my point, and stick to my opinion. I would try to present facts to my manager, and hopefully try to change their view point.”P:3KDLP “I don't think I would say anything to them, but I might try to dispute the claims later to the people it was told to.”P:MZODB “I'd ignore it, since I don't want to cause a rift with my boss (unless this was something that directly effected our workplace, in which case I might talk to him in person to try to correct him).”P:YY87V “Refute it politely and if they insist report them to higher management/university academic vice president”P:3ADYX “ The same way. I'd drop a comment with a polite and friendly reply saying that there was some information to the contrary, and drop a link to a trusted source outlining the truth. She knows I mean nothing malicious by this. “P:HK9F2 “This is a slippery slope for me but I would probably try talking to them with evidence based research. If they decide still not to do anything then I would probably just let it be since they are my boss.”P:9GJJZ
	Trust	“If it's a trusted source, I would guess that the misinformation they shared was an honest mistake. I would definitely let them know the conflicting info I found and where I found it so they can verify.” P:L2IWA

		“I would share the evidence with them that I find to validate the misinformation and discuss where they can find more data to back up what I found. If they dont change their information then I would no longer see them as a trusted source.” P:9GJJZ
		“If a trusted source shared misinformation, I would research the truth and send an email to the source. I would also spend a lot of time to see if all of my sources were reliable and what happened to my original source. For example, the source may have been bought out and now they have become unreliable.” P:HW9AG
		“Privately conduct my own research and follow up by sharing with this source anything (i.e., articles; news items, etc.) that can confirm truthfulness” P:U69RU
		“I would try to verify if other reliable sources confirmed the information and notify the original source if I thought they were incorrect.” P:ZTS00
		“I would do necessary research, provide that link or article to them in a post or response, and share that information with the poster where my close friend learned of the information.” P:VV2NP
		“I report this source and create awareness towards a people.” P:S2WS4
Lose confidence	Authority	“i would be alarmed” P:WJG4J
		“I would do nothing, but remember that they shared this misinformation.” P:DUC5V
		“I would lose trust in them and find it hard to take instruction from them.” P:H2LIY
		“I might lose a little respect for them, might assume they're less intelligent than I thought.”P:JI7ZS

Table 43: Example quotes that relates to strategies of refuting misinformation (Refute by Private Discussion).

Refute	Factors influenced the scenario	Example Quote
Refute by Private Discussion	Relationship	“I'd first probably mention it privately, with evidence in hand, in the hopes they would remove the post, redact the info, etc. If that doesn't work, I would then publicly counter their argument, and even report it to the social media platform if necessary.” P:PD2L5

		“I would not say anything unless I knew for sure, then I would have a discussion with them not on social media”P:9O460
		“I would call them on phone and talk with them. I wouldn't report them or insult them or chat about it on facebook. I would do it more lovingly and personally .” AG2YM9OWQP690
		“I would text them about it and engage in a face to face conversation with them asking them to prove their information” P:6VE6Y
		“PM the person or text/call them and ask them their sources. Some family/friends, I just don't engage in though because I know it will be a pointless conversation as they are so engrossed in their conspiracy theories.” P:YB3HO
		“I might try to gently correct them with a direct message, or maybe bring it up when we meet in person so our disagreement wouldn't be on a public platform.” P:YY87V
		“I would definitely say something to the friend but only privately. No need to shame them or air dirty laundry publicly.” P:T81HL
		“I would initiate a private conversation with the friend to get an understanding of their motivation to post the information.” P:QIFWA
		“Would privately discuss with the friend about the information as not to embarrass publicly on social media.”A2O486OILASFYG
		“If it was a close friend, I would likely personally contact them under guise of catching up and then discuss the misinformation they spread.” A P:U42D8
		“I would probably contact them privately and in a non-confrontational way let them know that they shared misinformation.” P:KTUSE
	Authority	“I would message them privately and tell them, as to not embarrass them in public” P:OX1LK
		“I would message them privately to understand the issue better.”P:SZGP0
		“I would privately ask that they check their sources because I think some of the information is incorrect. I would not want them to unintentionally spread wrong information.” P:6ZS7G
		“Depending on the severity, how certain I was it was misinformation, and how harmful that was, I would either

		(privately) speak with them about it, or potentially let it slide.” P:Z8BAM
		“I’d do the same as I’d do with a loved one: mention it privately, and, if that doesn’t work, take them to task publicly and possibly report it.” P:PD2L5
		“I would go to them privately and ask for a private meeting. I would see where they are coming from and than base my decision on that wether to report it or not.” P:QP690
		“I would message them privately and tell them, as to not embarrass them in public” P:OX1LK
	Trust	“I’d consider direct messaging them, if I feel I could change their opinion on the matter by providing a factual source that showed the correct information.” P:YY87V
		“I would discuss it with the trusted source offline - or if an online source, I would contact the trusted source via email or another method as appropriate to question the credibility of the information. P:FG71P
		“I would let them know they are wrong via direct message” P:87FGP
		“I would message them privately and tell them, as to not embarrass them in public” P:OX1LK
		If it were a trusted source, I might send an email to the fact checking department of that organization. In this case, I wouldn’t engage via social media, as it’s likely that my comment either wouldn’t be taken seriously or it might get lost in the wash of comments that appear under the post. P:B3U07

Ignoring Misinformation

Table 44: Example quotes that relates to Ignoring (Relationship).

Factors influenced the scenario	Example Quote
Relationship	“I wouldn’t do anything. That is not my concern.” P:438E7
	“I would not say anything because I feel that it is their right to believe what they want as it is my right also.” P:1DRFO
	“Nothing, it’s their way of thinking not mine.” P:UX6XS
	“I would ignore it as to not start an argument.” P:GE2UW
	“In the past, I would have either fought or debated with the friend, and in doing so, the friendship likely would have ended. Nowadays, I simply avoid talking about the topic and just focus on things we see eye-to-eye on. I have come to realize that these people will believe what they will

	believe, and that's that. Even if their belief is just utterly factually wrong, in that individual's mind, the misinformation is very real to them, and the one who is wrong is me. They 100% believe in the misinformation, and so what can I do? They are doing their best to live their life in the way they see fit." P:M0RD1
	"I wouldn't do anything, since speaking up would just jeopardize a friendship potentially for no good reason." P:3DQ3G
	"Again, nothing, I don't want to insult him or her" P:2ZCR0
	"I would probably ignore it. There are something things that you just can't argue with people about." P:G0CYR
	"That has happened so much the past few years that I just ignore it now. They know how to use fact check and they obviously don't care if it's true or not." P:MC5NV
	"I would be extremely annoyed and waste no time correcting their statement." P:DU10C
	"I don't say anything. My friend, who is a nurse practitioner, comes out with some of the most insane things. She is a Trump fan. I love a conspiracy theory as much as the next person, but I've been told (in person, not on social media) that the swabs used to collect mucus samples for COVID testing change a person's DNA. Excuse me? I do these tests on people and I order those stupid swabs. They are kind of expensive, for what they are, but not expensive enough to change DNA." P:33333
	"I would keep on scrolling and not pay attention to it." P:YOM8Y
	"I would just pay less attention to the person who posted it in future posts" P:SK3ZZ
	"I would ignore it until a private conversation" P:SK3ZZ
	"I typically don't engage with the users who promote misinformation, I simply ignore them and if it is egregious I report the profile or maybe block them from my feed." P:QGYB7
	"I probably wouldn't do anything unless the shared info seemed dangerous and there was a way to easily prove that's it's wrong." P:G7HDE
	"Either disregard or ignore it depending on the information and if I know the truth" P:O24TN

Table 45: Example quotes that relates to Ignoring (Authority).

Factors influenced the scenario	Example Quote
Authority	“I would do my best to ignore them and remain as professional as possible in the workplace.” P:QQHGC
	“I would probably not discuss it with them and would just ignore it, to avoid agitating them.” P:ELLB0
	“I would not want to be disrespectful, so I probably not do anything.” P:0525D
	“I would do nothing cause I wouldn't want to piss off my boss.” P:UV141
	“I would ignore it because it could affect my job” P:SK3ZZ
	“I wouldn't do anything. My supervisor has the right to express his own views and I wouldn't want to be retaliated against for expressing that he's wrong.” P:3DQ3G
	“Mere sharing of the misinformation would be something I could probably ignore and try to take a big picture approach to it (e.g., "it's the times we are living in now"), but if I am specifically directed to do something in furtherance of that misinformation, I would leave the job. For instance, if the supervisor just expresses his or her opinion, I would just ignore it. But, for example, if the supervisor asks me to create blog posts that reiterate his/her view or train new employees in a manner consistent with the misinformation, I would definitely quit. There is no need to argue, as it is too tedious, and I think it is too difficult to convince someone that their belief is wrong (nor do I wish to try). Also, it is especially tough in a manager-subordinate situation, as questioning the supervisor is a direct attack on their ego. Likewise, "proving" that they are wrong or debunking them is an attack on their dignity.” P:M0RD1
	“I wouldnt give it too much thought, honestly. I cant control what other people think and believe” P:8OVGN

	“I would say nothing since my survival on this planet depends on money which depends on my job which depends on my supervisor/manager thinking that i'm a good fit which depends on me pretending I'm not queer or have any unprofitable ideas” P:DSKMA
	“I would not do anything since I would not have an intimate level of confidence to comment on that issue with the him” P:4IUUN
	“I would do nothing, but remember that they shared this misinformation.” P:DUC5V
	“...ignore it but look at them differently, personally.” P:977EH
	“I would think that was unprofessional and have a lower opinion of them.” P:GE2UW
	“I would just take it in stride. I would listen but not really believe what they are telling me.” P:HIXXL
	“I would listen to them, and silently disagree, and keep my opinion to myself to avoid any trouble.” P:QBUD9
	“It the context of the workplace, if it affected my employment or quality of employment I would challenge it.” P:WESZX
	“I would likely nod my head or do something nonsensical. I have found it is best not to engage in this type of discourse at work.” P:B0NS4
	“A) not my job to police other peoples' speech! B) I have a coworker who believes that the police murder 100's of black males every year. There are no statistics anywhere to support that idea. Does that idea, which is pervasive among the online left not have severe negative effects on American society?” P:6NA18
	“I would likely just say something like "oh, that's interesting" and try to change the topic so as not to become combative with this

	person in order to not damage my professional relationship.” P:X1APP
	“I would not be surprised in the slightest, and would most likely just have to deal with it. No good can come from arguing with someone who gets paid more than you and controls your paycheck.” P:55E8X

Table 46: Example quotes that relates to Ignoring (Trust).

Factors influenced the scenario	Example Quote
Trust	“And if that information is about a critical issue like COVID-19, an election, or a political candidate, you may feel compelled to respond.” P:TG1NX
	“I would probably let them believe what they want to believe.” P:XGL47
	“I would probably ignore it since there is so much misinformation out there anyway.” P:WESZX
	“I would ignore the trusted source because I am capable of looking at all forms of information and making a conscious decision about it.” P:1CTJ7
	“Most of my trusted sources are well-known or famous people that I will never have a chance to meet or speak to. So I would do nothing. I would continue to follow their work though.” P:FKK3Z
	“I will ignore that because they will find it out soon via other sources.” P:JSLQW
	“If its an account on Twitter who is in the public eye, I ignore it” P:NT7UD
	“This has already happened. I've tried engaging in a vocal discussion to no avail, so I scroll on past it.” P:XDQI7
	“I would ignore the misinformation and not trust that source anymore.” P:7DPZG
	“I would assume it was a rare error and do nothing.” P:8KU36
	“I would probably just ignore it, and hope that they are able to recognize and admit that they made a mistake.” P:O06EG

Appendix (B): Data analysis

The demographics of participants

The 1,014 participants who completed the questionnaire had diverse profiles in terms of their age, education levels, and employment status, and location across different countries.

Age: Many participants were in the 25-34 age range ($n = 386$; 38.1%), 35-44 ($n = 287$; 28.3%) and 45-54 ($n = 147$; 14.5%), with a few in other age groups 18-24 ($n = 48$; 4.7%), 55-64 ($n = 89$; 8.8%) and some participants were in the 65-74 age range ($n = 48$; 4.7%) and over ($n = 4$; 0.4%). Some participants preferred not to disclose their age ($n = 5$; 0.5%).

Education level: In terms of education level, many participants held a bachelor's degrees ($n = 479$; 47.2%), followed by a Master's degree ($n = 177$; 17.5%), associate degree ($n = 154$; 15.2%), and secondary school ($n = 149$; 14.5%). Some participants did not have a formal education ($n = 5$; 0.5%), some university/some college ($n = 8$; 0.8%), professional degree ($n = 25$; 2.5%), doctorate degree ($n = 10$; 1.0%), and some participants preferred not to answer ($n = 7$; 0.7%).

Employment status: Majority of the participants were employed ($n = 767$; 75.6%) or freelancing ($n = 99$; 9.8%), while some participants were retired ($n = 40$; 3.9%), unable to work ($n = 19$; 1.9%) or out of work ($n = 63$; 6.2%). Some students ($n = 18$; 1.8%) also participated in the survey, while some participants preferred not to answer ($n = 8$; 0.8%).

Location: The overwhelming majority of the participants were located in the United States of America ($n = 963$; 95%). The remaining 5% constituted some participants from United Kingdom ($n = 21$; 2.1%), Canada ($n = 21$; 2.1%), Australia ($n = 2$; 0.2%), Saint Vincent and the Grenadines ($n = 1$; 0.1%), Ireland ($n = 1$; 0.1%), Georgia ($n = 2$; 0.2%), Colombia ($n = 1$; 0.1%), India ($n = 1$; 0.1%) and Argentina ($n = 1$; 0.1%). It is noticed that some ($n = 5$) participants were not from English-speaking countries (e.g., Georgia, Colombia, India, and Argentina) – it is assumed these participants connected to MTurk via a virtual private network (VPN). The following section will provide the information sources that participants preferred.

Preferred information sources to verify information

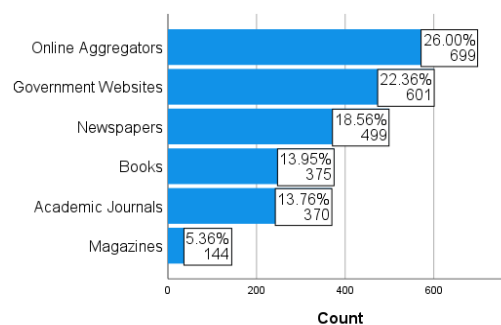
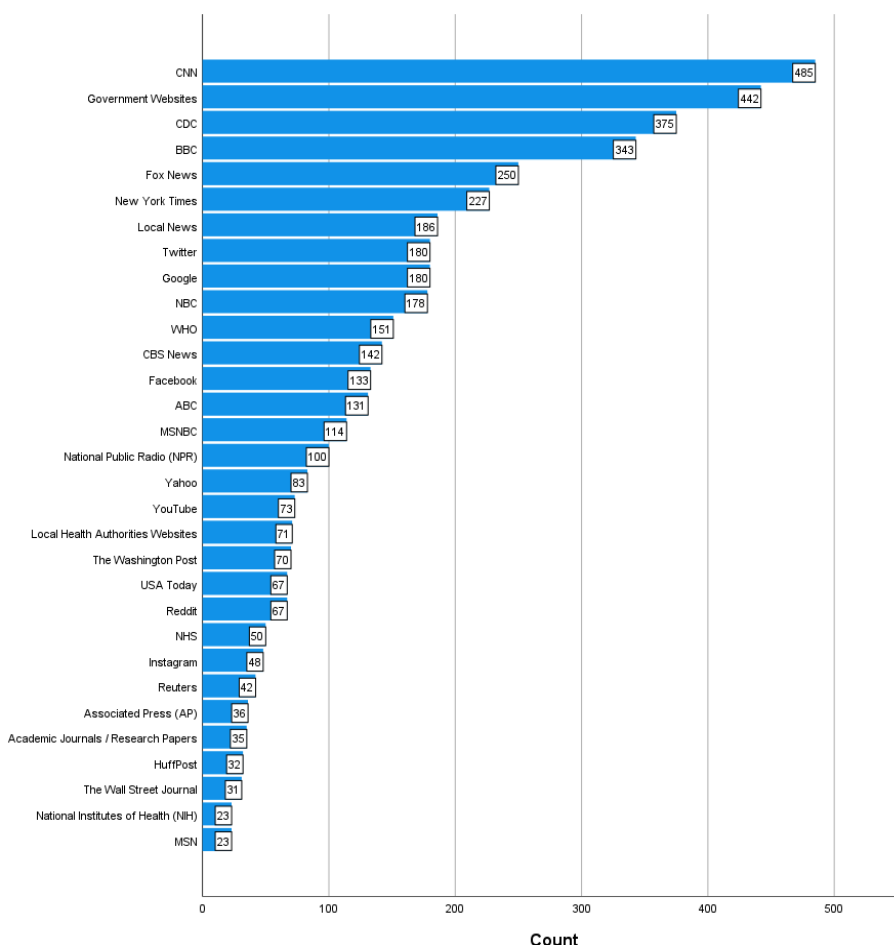


Figure 77: The Bar chart shows the information sources that participants rely on to verify the information they see on social media platforms.

“CNN, CDC, NY Times, Snopes” A1CF6U3GF7DZEJ



Top information sources.

Figure 79: A simple bar chart presenting participants' Top information sources, which participants that prefer to use to find news and information about health crises such as COVID-19.

These responses are counted in greater depth in next section. As a result of counting these open responses manually, the most preferred sources as per the result in Error! Reference source not found. were mainstream media websites, such as The Cable News Network (CNN) 48.0% (n = 485), The British Broadcasting Corporation (BBC) 33.9% (n = 343), Fox News 24.7% (n = 250), New York Times 22.5% (n = 227), The National Broadcasting Company (NBC) 17.6% (n = 178), CBS News 14% (n = 142), ABC 13% (n = 131), MSNBC 11.3% (n = 114), National Public Radio (NPR) 9.9% (n = 100), The Washington Post 6.9% (n = 70) and USA Today 6.9% (n = 70) and Reuters 4.2% (n = 42). It is also noted that many participants trust local news 18.4% (n = 186). Some participants also

preferre other mainstream media websites, such as Associated Press (AP) 3.6% (n =36), HuffPost 3.2% (n = 32), The Wall Street Journal 3.1% (n = 31), BuzzFeed 2.3% (n = 23) and The Microsoft Network (MSN) 2.3% (n = 23).

The following credible sources were official websites such as government websites 43.7% (n = 442) and health websites, including The Centers for Disease Control and Prevention (CDC) ; 37.1% (n = 375), The World Health Organization (WHO) 14.9 % (n = 151), and Local Health Authorities Websites 7.0% (n =71) and The National Health Service (NHS) 4.9% (n =50).

Many participants preferre aggregated news websites such as Google 17.8% (n = 180) and Yahoo 8.2% (n = 83). Many participants also trust social media platforms such as Twitter 8.2% (n = 180), Facebook 13.2% (n = 133), YouTube 7.2% (n = 73), Reddit 6.2% (n = 67) and some preferre instagram 4.7% (n = 48).

Interestingly, only some participants preferred academic Journals and research papers 3.5% (n = 35) despite academic essays anticipated to be considered a very credible information source, many participants did not mention them as sources they rely on for Covid-19 information. It is likely that the reason for this is that participants might consider academic papers as challenging to engage with and access.

Most social media platforms frequently used to access COVID-19 information

The first section of information credibility presents a table of the most frequently used social media platforms to access information about COVID-19.

Table 47: shows the summary statistics for Social Media Platforms that participants frequently used to access information about COVID-19. * Social media platforms are listed as a response to the open-ended question ‘other.’

Most Social Media Platforms frequently used to access information to access informatio’ about COVID-19

Social Media Platforms	All Frequency users N =1014 (%)
Facebook	419 (41.3)
Twitter	402 (39.6)
Reddit*	35 (3.5)
YouTube*	34 (3.4)
WhatsApp	26 (2.6)
Don't use social media for Covid-19 information*	18 (1.8)
None*	18 (1.8)

Instagram*	16 (1.6)
LinkedIn	14 (1.4)
Other*	11 (1.1)
Telegram	7 (0.7)
TikTok*	5 (0.5)
WeChat	3 (0.3)
Tumblr*	2 (0.2)
Gab Social*	1 (0.1)
Snapchat*	1 (0.1)
Hacker News*	1 (0.1)
Quora*	1 (0.1)

As can be seen from **Error! Reference source not found.**, the participants who participated in the questionnaire use different Social Media Platforms to access Covid-19 information. Many participants use Facebook (n = 419; 41.3%) and Twitter (n = 402; 39.6%). Some participants use Reddit (n = 35; 3.5%), YouTube (n = 34; 3.4%), WhatsApp (n = 26; 2.6%), Instagram (n = 16; 1.6%), LinkedIn (n = 14; 1.4%). The following social media platforms were the Least frequently used to get Covid-19 information, Telegram (n = 7; 0.7%), TikTok (n = 5; 0.5%), WeChat (n = 3; 0.3%), Tumblr (n = 2; 0.2%), Gab Social (n = 1; 0.1%), Snapchat (n = 1; 0.1%), Hacker News (n = 1; 0.1%) and Quora (n = 1; 0.1%). This result aligns slightly with another study that shows many participants used Facebook to acquire information about COVID-19 (Ahmad & Murad, 2020).

As can be seen from (Table 3) some participants use none of these social media forms (n = 18; 1.8%) while some participants mentioned other information sources (n = 11; 1.1 %) for example, some participants mentioned BBC News, CDC, google, Cnn, Government health website, family, friends, and Neighborhood.

Among the participants who mention that they do not use social media—or Covid-19 information, concerns around trustworthiness and reliability seem to be the predominant reason, as highlighted in the following quotes:

“I don't use social media for that--too unreliable” *AnonymisedU7SUJ*.

“I don't use social media for news as I don't trust any platform.”
AnonymisedM37T1

It can be seen from the data, some participants expressed the belief that (political) extremists affect the social media platforms information political and propaganda purposes, the participant indicated that

“Alt tech. Mainstream social media has become a cesspit of political extremists, the perpetually offended, corporate pandering and literal propaganda” *AnonymisedCDZ71*.

Level of comfort in relying on Social Media

The third section of the information credibility presents the comfortable level of relying on social media for information about COVID-19.

Table 48: shows the summary statistics for a general distribution of participants' level of comfort in relying on social media.

Level of comfort in relying on Social Media	All Frequency users N =1014 (%)
Extremely uncomfortable	192 (18.9)
Somewhat uncomfortable	274 (27.0)
Neither uncomfortable nor comfortable	150 (14.8)
Somewhat comfortable	305 (30.1)
Extremely comfortable	93 (9.2)

Participants asked how they were comfortable relying on social media for information about COVID-19. As can be seen from the Error! Reference source not found., the results show that 45.9 % of participants felt uncomfortable (somewhat uncomfortable (n = 274; 27.0%) and extremely uncomfortable (n = 192; 18.9%)), while the data also shows that 39.3% of participants felt comfortable (somewhat comfortable (n = 305; 30.1%) and extremely comfortable (n = 93; 9.2%)) in relying on social media for COVID-19 news. It can be seen from the data in **Error! Reference source not found.**, many participants were neither uncomfortable nor comfortable (n = 93; 9.2%) with relying on social media information.

The Trustworthiness assessment of social media platforms

Table 49 shows the summary statistics for Social Media Platforms 'ate in Terms of Trustworthiness with regard to COVID-19 infromation.

Social Media Platforms Variables		All Frequency users N =1014 (%)
Social Media Platforms Rate in Terms of Trustworthiness	Not trustworthy at all	123 (12.1)
	Slightly trustworthy	293 (28.9)
	Moderately trustworthy	364 (35.9)
	Very trustworthy	196 (19.3)
	Completely trustworthy	38 (3.7)

The participants were asked for how they rated the trustworthiness of their social media platforms during Covid'19. As can be seen from the Error! Reference source not found., most of participants rated their social media platforms as moderately trustworthy 35.9% (n= 364) and slightly trustworthy 28.9% (n= 293). Some participants rated their social media platforms as very trustworthy 19.3% (n= 196) and completely trustworthy 3.7 % (n= 38). Many participants rated their social media platforms as not trustworthy at all 12.1% (n= 123). The following section will present findings on the capability rate of social media platforms.

These responses are explored in greater depth in the following two sections – ‘Internal acts of authentication’ (Section: **Error! Reference source not found.**), and ‘External acts of authentication’ (Section: **Error! Reference source not found.**).

Participants attitudes and assessment of social media platforms

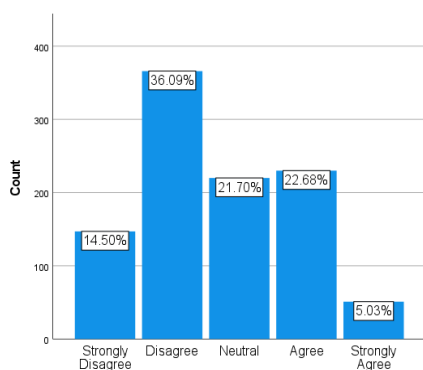
Assessment of capability of social media platforms in providing essential Covid-19 information

Table 50 shows the summary statistics for Social Media Platforms Rate in Terms of Capability with regard to COVID-19 information.

Social Media Platforms Variables		All Frequency users N =1014 (%)
Social Media Platforms Rate in Terms of Capability	Not capable at all	128 (12.6)
	Slightly capable	292 (28.8)
	Moderately capable	324 (32.0)
	Very capable	223 (22.0)
	Completely capable	47 (4.6)

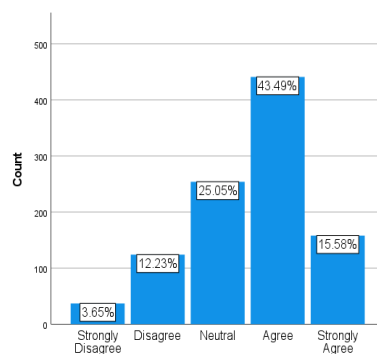
The participants were asked how they rate the capability of their social media platforms to provide them with essential information to deal with the COVID-19 health crisis. As can be seen from the **Error! Reference source not found.**, the most of participants rated their social media platforms as moderately capable 32% (n=324) and slightly capable 28.8% (n= 292). Some participants rated their social media platforms as very capable 22% (n= 223) and completely capable 4.6% (n= 47). Some participants rated their social media platforms as not capable at all 12.6% (n=128). The following section will present findings on the frequency of seeing misinformation in social media.

Evaluating Statements of Social Media Platforms



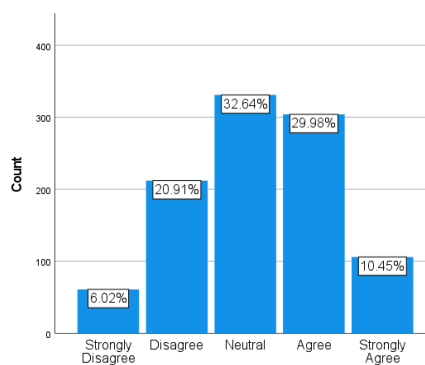
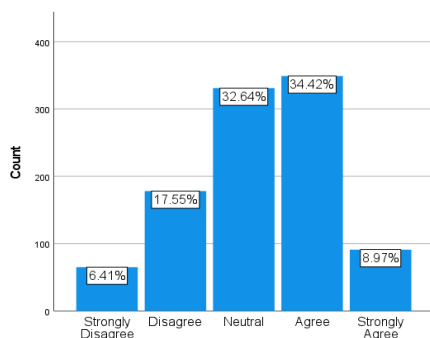
Statment (A)

“Your usual social media platform intentionally provides misleading information during the COVID-19 health crisis.”



Statment (B)

“During the COVID-19 health crisis, your usual social media platform makes efforts to correct or remove any misinformation as soon as it comes to their notice.”



Statment (C)	Statment (D)
<i>“Your usual social media platform has a consequences policy for sharing misinformation on COVID-19, but they do not really enforce this for accounts that violate”</i>	<i>“Your usual social media platform has created a “hub” to feature news and information about COVID-19 from reputable</i>
Figure 81: Participants were provided the above statements and asked to rate their level of agreement.	

The participants were asked whether they agreed or disagreed with four statements about Social Media Platforms during COVID-19. The following point will present participants responses to Statement (A).

Social Media's Intentional Spread of COVID-19 Misinformation

Statement (A): “Your usual social media platform intentionally provides misleading information during the COVID-19 health crisis.”

Most participants believe that social media platforms do not intentionally provide misleading content. Error! Reference source not found. (Statement, A), shows that most participants chose “disagreed” 36.1% (n=366) and “Strongly Disagreed” 14.5% (n= 147) with statement (A). Some participants were “Neutral.” 21.70% (n= 220) with statement. Some participants were “Agreed” 22.7% (n= 230) with statemen. Many participants also were “Strongly Agreed” 5.0% (n= 51) with this statement. The following point will present participants responses to Statement (B).

Social Media's Corrective Measures of COVID-19 Misinformation

Statement (B) : “During the COVID-19 health crisis, your usual social media platform makes efforts to correct or remove any misinformation as soon as it comes to their notice.” Error! Reference source not found. (Statement, B), Most participants overall had a positive attitude towards social media platforms in terms of correcting or removing any misinformation content. Many participants were “Agreed” 43.5% (n=441) and “Strongly Agreed” 15.6% (n=158) with the statement (B). Many participants were “Neutral.” 25.05% (n=254) and many participants were “Disagr’e” 12.23% (n= 124) and some participants “Strongly©©ed” 3.65% (n= 37) with this statement. The following point will present participants responses to Statement (C).

Social Media's Enforcement of COVID-19 Misinformation Policies

Statment (C): “Your usual social media platform has a consequences policy for sharing misinformation on COVID-19, but they do not really enforce this for accounts that violate” Error! Reference source not found. (Statement, C), most participants had a negative attitude towards social media platforms in terms of applying and enforcing their ©icy towards

accounts that violate their terms and conditions and share misinformation. Most participants were “Agreed” 34.42% (n= 349) and “Strongly Agreed” 8.97% (n= 91) with the statement (C). Some participants were “Neutral.” 32.64% (n= 331) and only a few participants were “Disagreed” 17.55% (n= 178] and “Strongly Disagreed.” 6.41% (n= 65) with this statement. The following point will present participants responses to Statement (D).

Effectiveness of Social Media COVID-19 Information Hub

Statement (D): “Your usual social media platform has created a “hub” to feature news and information about COVID-19 from reputable sources. However, this page does not help you get the news or information about COVID-19 that you really need.”

Error! Reference source not found. (Statement, D), most participants Felt that the hubs created by social media platforms were not sufficient. Many participants were “Neutral” 32.64% (n= 331) with the statement (D). Some participants were “Agree” 30.4% (n= 304) and “Strongly Agree” 10.45% (n= 106). A few participants were “Disagree” 20.91% (n= 212) and “Strongly Disagree” 6.02% (n= 61) with this statement.

The frequency of exposure to misinformation in social media

The second section of the information credibility presents a table of the frequency of seeing misinformation in social media.

Table 51: shows the summary statistics for Social Media Platforms Information with regard to COVID-19.

Frequency of seeing Misinformation in Social Media.	All Frequency users N =1014 (%)
Always	101 (10.0)
Often	363 (35.8)
Sometimes	463 (45.7)
Rarely	81 (8.0)
Never	5 (0.5)

Participants were asked how often they see misinformation on social media platforms. As can be seen from Error! Reference source not found., Many participants sometimes (n = 463; 45.7%) and often (n = 363; 35.8%) see misinformation on the social media platforms. It can be seen from the data in Error! Reference source not found. that, many participants always (n = 101; 10.0%) come across misinformation on social media platforms. Many participants rarely (n = 81; 8.0%) see misinformation on social media platforms. The following section will present findings on the comfortable level of relying on social media. The following figure will present findings of how often participants come across misinformation on their social media platform, grouped by their level of comfort in relying on social media for COVID-19 news.

		Content You Believe is Misinformation									
		Always		Often		Sometimes		Rarely		Never	
		N	%	N	%	N	%	N	%	N	%
Social Media Platforms	Twitter	46	11.4	134	33.3	187	46.5	35	8.7	0	0.0
	WhatsApp	6	23.1	8	30.8	11	42.3	1	3.8	0	0.0
	Facebook	40	9.6	166	39.7 ¹⁸²	43.5	29	6.9	1	0.2	
	LinkedIn	0	0.0	6	42.9	6	42.9	2	14.3	0	0.0
	Telegram	0	0.0	2	28.6	3	42.9	2	28.6	0	0.0
	WeChat	0	0.0	0	0.0	3	100.0	0	0.0	0	0.0
	Other	0	0.0	5	45.5	4	36.4	2	18.2	0	0.0
	Don't use social media for Covid-19 information	3	16.7	8	44.4	5	27.8	0	0.0	2	11.1
	None	2	11.1	6	33.3	8	44.4	0	0.0	2	11.1
	Reddit	1	2.9	6	17.1	24	68.6	4	11.4	0	0.0
	YouTube	3	8.8	13	38.2	17	50.0	1	2.9	0	0.0
	Instagram	0	0.0	5	31.3	8	50.0	3	18.8	0	0.0
	TikTok	0	0.0	3	60.0	1	20.0	1	20.0	0	0.0
	Gab Social	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Snapchat	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Tumblr	0	0.0	0	0.0	1	50.0	1	50.0	0	0.0
	Hacker News	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Quora	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0

The impact of exposure to misinformation on social media usage

		Content You Believe is Misinformation									
		Always		Often		Sometimes		Rarely		Never	
		N	%	N	%	N	%	N	%	N	%
Social Media Platforms	Twitter	46	11.4	134	33.3	187	46.5	35	8.7	0	0.0
	WhatsApp	6	23.1	8	30.8	11	42.3	1	3.8	0	0.0
	Facebook	40	9.6	166	39.7 ¹⁸²	43.5	29	6.9	1	0.2	
	LinkedIn	0	0.0	6	42.9	6	42.9	2	14.3	0	0.0
	Telegram	0	0.0	2	28.6	3	42.9	2	28.6	0	0.0
	WeChat	0	0.0	0	0.0	3	100.0	0	0.0	0	0.0
	Other	0	0.0	5	45.5	4	36.4	2	18.2	0	0.0
	Don't use social media for Covid-19 information	3	16.7	8	44.4	5	27.8	0	0.0	2	11.1
	None	2	11.1	6	33.3	8	44.4	0	0.0	2	11.1
	Reddit	1	2.9	6	17.1	24	68.6	4	11.4	0	0.0
	YouTube	3	8.8	13	38.2	17	50.0	1	2.9	0	0.0
	Instagram	0	0.0	5	31.3	8	50.0	3	18.8	0	0.0
	TikTok	0	0.0	3	60.0	1	20.0	1	20.0	0	0.0
	Gab Social	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Snapchat	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Tumblr	0	0.0	0	0.0	1	50.0	1	50.0	0	0.0
	Hacker News	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Quora	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0

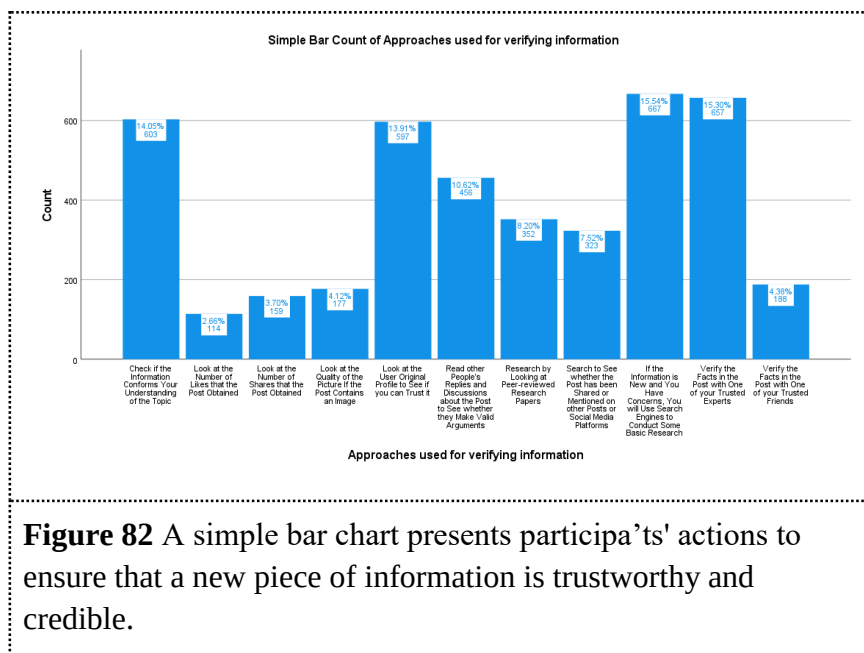
The impact of truthfulness on social media usage

		Social Media Platforms Rate in Terms of Trustworthiness									
		Not trustworthy at all		Slightly trustworthy		Moderately trustworthy		Very trustworthy		Completely trustworthy	
		N	%	N	%	N	%	N	%	N	%
Social Media Platforms	Twitter	26	6.5	111	27.6	163	40.5	82	20.4	20	5.0
	WhatsApp	0	0.0	7	26.9	10	38.5	6	23.1	3	11.5
	Facebook	61	14.6	130	31.0	13	31.0	83	19.8	15	3.6
	LinkedIn	0	0.0	6	42.9	6	42.9	2	14.3	0	0.0
	Telegram	0	0.0	1	14.3	2	28.6	4	57.1	0	0.0
	WeChat	0	0.0	1	33.3	2	66.7	0	0.0	0	0.0
	Other	2	18.2	4	36.4	3	27.3	2	18.2	0	0.0
	Don't use social media for Covid- 19 information	13	72.2	5	27.8	0	0.0	0	0.0	0	0.0
	None	10	55.6	2	11.1	5	27.8	1	5.6	0	0.0
	Reddit	4	11.4	9	25.7	15	42.9	7	20.0	0	0.0
	YouTube	7	20.6	7	20.6	14	41.2	6	17.6	0	0.0
	Instagram	0	0.0	7	43.8	7	43.8	2	12.5	0	0.0
	TikTok	0	0.0	1	20.0	4	80.0	0	0.0	0	0.0
	Gab Social	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
	Snapchat	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
	Tumblr	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0
	Hacker News	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0
	Quora	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0

Approaches used for verifying information

As shown in Error! Reference source not found. below, the participants took various actions to verify the information. Participants were provided with a list of social reactions that they would take to ensure that a new piece of information was trustworthy and credible.

Overall, most participants used search engines to conduct primary research if the information is new and they had concerns (n= 667; 15.54%). The result also showed that most participants would verify the facts in the post with one of their trusted experts (n= 657; 15.30%); would check if the information conformed to their understanding of the topic to ensure that a new piece of information is trustworthy and credible (n= 603; 15.05%); and most participants would look at the user's original profile to see if they can trust it (n= 597; 13.91%).



As shown in Error! Reference source not found. above, some participants would read other people's replies and discussions about the post to see whether they make valid arguments ($n=456$; 10.62%). The result also showed that some participants would verify the information by looking at peer-reviewed research papers ($n=352$; 8.20%); and verify the information by searching to see whether the post had been shared or mentioned on other posts or social media platforms ($n=323$; 7.52%).

Furthermore, Error! Reference source not found. above displays how a few participants would verify the facts in the post with one of their trusted friends ($n=188$; 4.38%). The results also showed that a few participants would look at the quality of the picture if the post contained an image 4.12% ($n=177$). The results also showed that a few participants would verify the information by looking at the number of shares ($n=159$; 3.70%) and the number of likes ($n=114$; 2.66%) that the post obtained. The following section will present findings on participants' reactions to misinformation posts they read on their favourite social media platforms.

Preferred reactions to misinformation

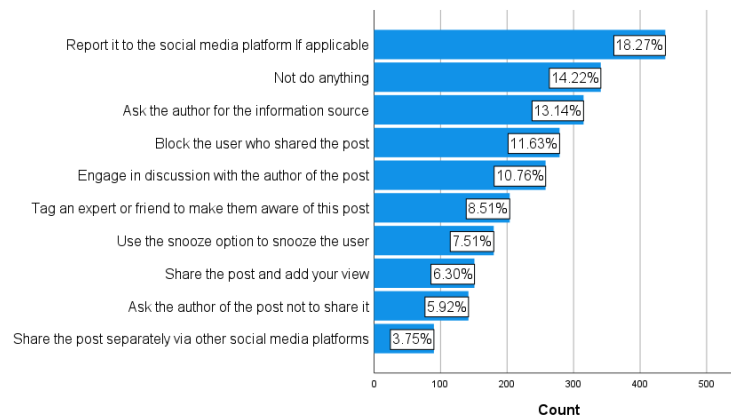


Figure 83: A simple bar chart presents participants' reactions to misinformation posts they read on their favourite social media platforms.



Figure 84: Word clou' analysis of open ended questions on' If there are other reactions not listed, what actions would you take to misinformation posts they read on their favourite social media platforms.

Participants' reactions to misinformation posts they r'ad on their favourite social media platforms. **Error! Reference source not found.** (Top) : A simple bar chart presents participants' reactions to misinformation posts they read on their favourite social media platforms. **Error! Reference source not found.** (bottom): Word cloud analysis of open ended questions on' If there are other reactions not listed, what actions would you take to misinformation posts they read on their favourite social media platforms.

As shown in **Error! Reference source not found.** above, the participants showed a number of varied reactions to misinformation. Participants were asked how they reacted to reading something on their favourite social media platform that they believed to be misinformation. Overall, most participants responded by saying they would report the misinformation post to the social media platform (n= 438; 18.27%); followed by participants would not do anything regarding the misinformation post (n= 341; 14.22%); participants would ask the author for the information source (n= 315; 13.14%); and participants would block the user who shared the misinformation post (n= 279; 11.63%).

As shown in Figure 2 above, some participants would discuss the misinformation post with the author (n= 258; 19.76%); tag an expert or friend to make them aware of the misinformation

post (n= 204; 8.51%); and use the snooze option to temporarily ignore the user who shared the misinformation post (n= 180; 7.51%).

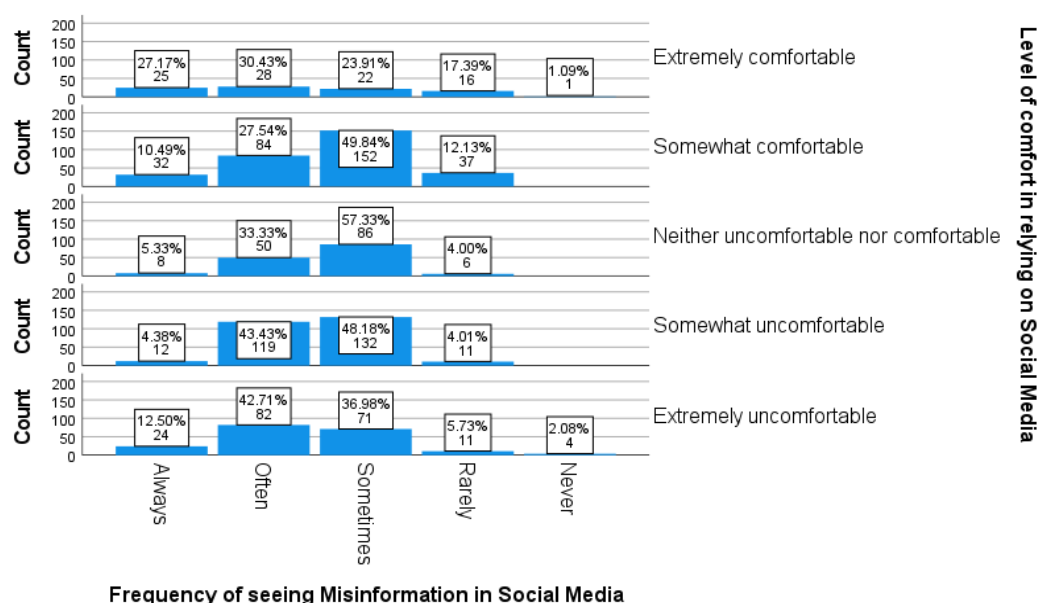
Error! Reference source not found. Error! Reference source not found. also reveals that a few participants would share the post and add their views (n= 151; 6.30%). The results also showed that a few participants would request th't the author of the misinformation post not share it (n= 142; 5.92%); and share the misinformation post separately via other social media platforms (n= 90; 3.75%). In the next section, participants' reactions to misinformation in different scenarios are addressed. This following section provides the results of scenario-based behavioral tasks that were administered to the participants in the survey.

Exposure to Misinformation on Social Media

4.5.1 Impact of Exposure to Misinformation on the Comfort Level Related to Relying on Social Media

As shown in Error! Reference source not found.6, among the participants who mentioned they were extremely uncomfortable in relying on social media, 42.71% (n = 82) often and 36.98% (n = 71) sometimes came across misinformation on social media. However, among the participants who mentioned they were extremely comfortable in relying on social media, 27.17% (n = 25) always and 30.43% (n = 28) often came across misinformation. Despite coming across misinformation regularly, these participants were extremely comfortable relying on social media. It is believed that a significant number of participants think they can filter out misinformation despite regularly coming across it.

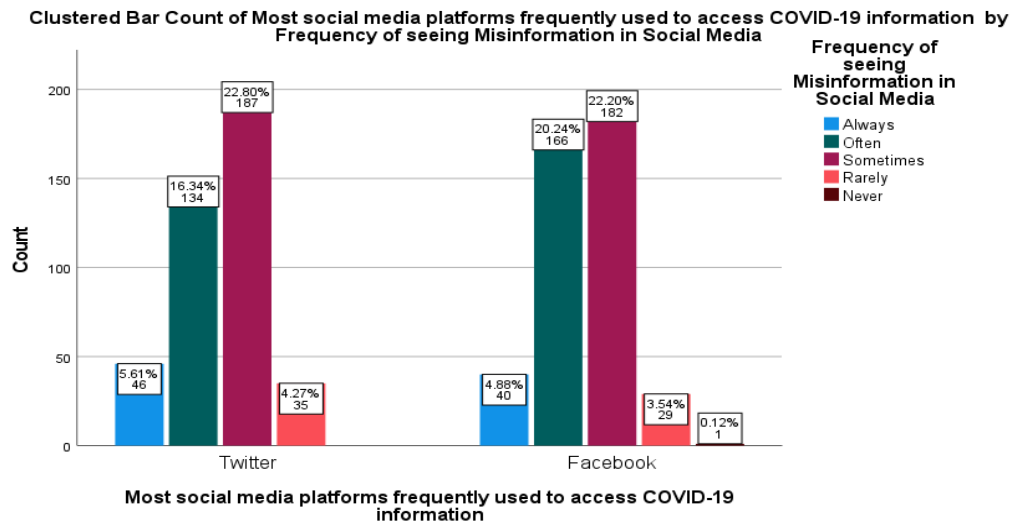
Figure 85 Bar charts showing how often participants come across misinformation on their social media platform grouped by their level of comfort in relying on social media for COVID-19 news. Please note: the blank space next to “Never” indicates a value of 0.



4.5.2 Impact of Exposure to Misinformation on the Use of Social Media

Error! Reference source not found.7 shows that most participants used Facebook and Twitter to access COVID-19 information, even though they sometimes or encountered often misinformation.

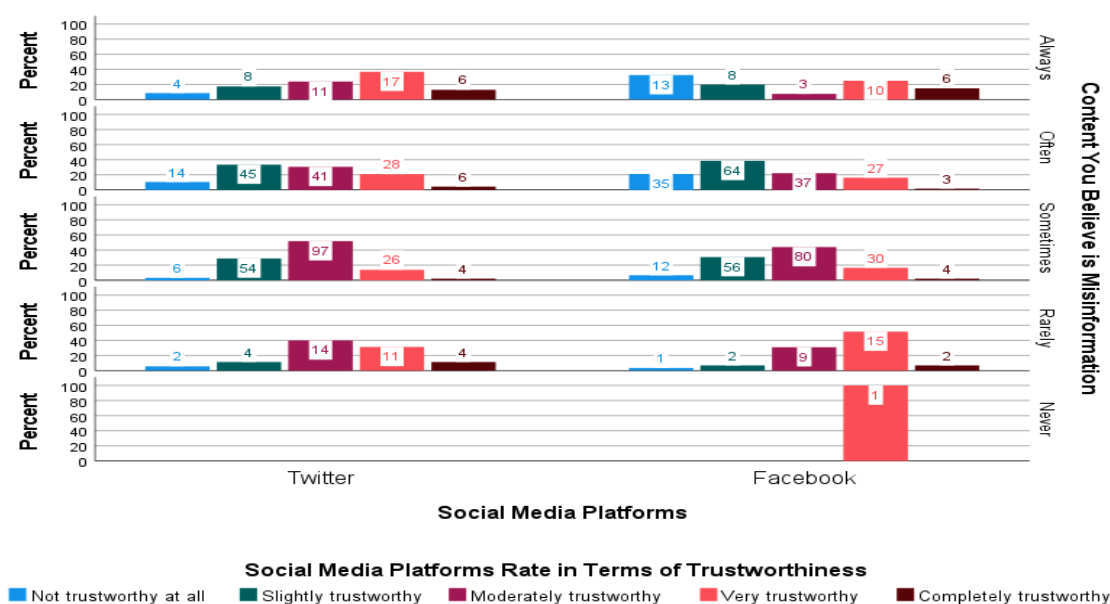
Figure 86 Clustered bar chart showing the impact of exposure to misinformation on the use of social media.



4.5.3 Impact of Truthfulness on the Use of Social Media

Error! Reference source not found.8 shows that most participants using Facebook and Twitter to access COVID-19 information thought that social media was only medium or slightly truthful. These findings revealed a significant discrepancy between people's preference for using social media to access information and their confidence in the reliability of that information. This suggests that people are aware that social media information regarding COVID-19 may not be trustworthy, and they may encounter false information even though they still prefer to use social media platforms to access such information. This suggests that people consider the convenience of the availability of information on social media and might be aware that they need to be critical of the information they come across. For more details, regarding the frequency and percentage of the aforementioned text, please refer to Appendix (0). The following hypothesis was developed based on the aforementioned results: encountering misinformation on social media affects individuals' attitudes towards social media platforms (H9). The related sub-hypotheses are listed in the hypothesis development section (Error! Reference source not found.), and the results of hypothesis testing can be found in (0).

Figure 87 Clustered bar showing the impact of exposure to misinformation on the use of social media and trustworthiness.



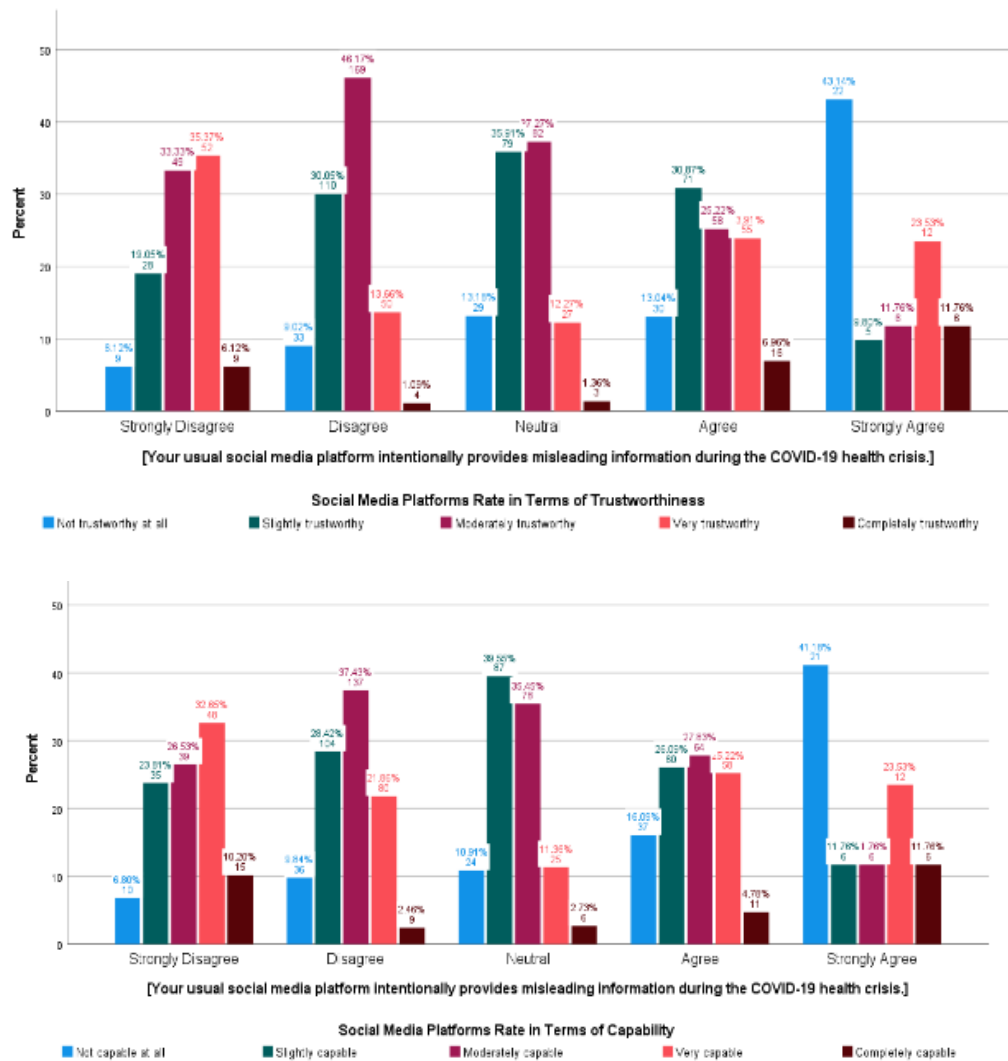
Impact of Social Media Actions on the Trust and Reliability of COVID-19 Information

Social media actions affected people's trust in COVID-19 information on social media.

4.4.1 Effects of Intentional COVID-19 Misinformation Spread on Trust and Capability

This study found an effect of social media's intentional spread of COVID-19 misinformation on its trustworthiness and capability to provide COVID-19 information. As shown in Error! Reference source not found.2, participants who had the impression that social media was of low or medium capability and low or medium trustworthiness with regard to COVID-19 information were also either not in agreement or neutral with the 'negative statement' that social media intentionally spreads misinformation. The number of participants who agreed with the statement was lower for those who had the impression that social media was of medium trustworthiness than for those who thought it was less trustworthy. Therefore, people's opinions about social media were affected based on their assessment of its trustworthiness and capability.

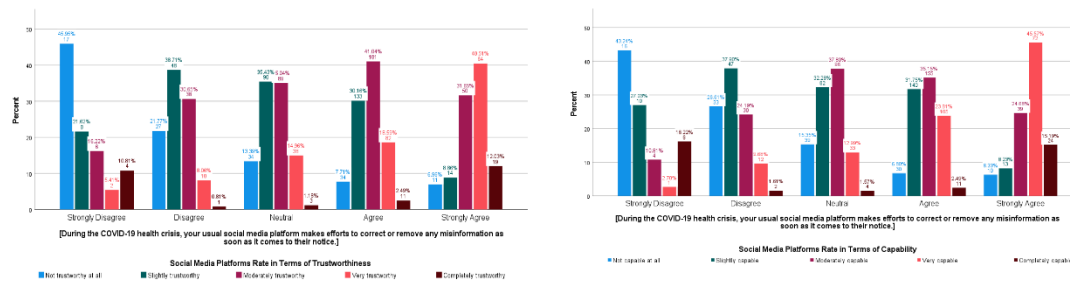
Figure 88 Effect of social media’s intentional spread of COVID-19 misinformation on the trustworthiness and capability of providing COVID-19 information.



4.4.2 Effects of Corrective Measures Against COVID-19 Misinformation on Trust and Capability

This study found an effect of social media’s corrective measures against COVID-19 misinformation on its trustworthiness and capability in providing COVID-19 information. As shown in Error! Reference source not found.3, although the number of people who agreed with the “positive statement” about social media was the highest, there was a group that did not agree with the positive statement. The more the group disagreed with the statement, the lower their rating of social media in terms of capability and reliability. Therefore, there was a relationship between the social media initiative to combat misinformation and increasing people’s appreciation of its credibility and ability to provide COVID-19 information.

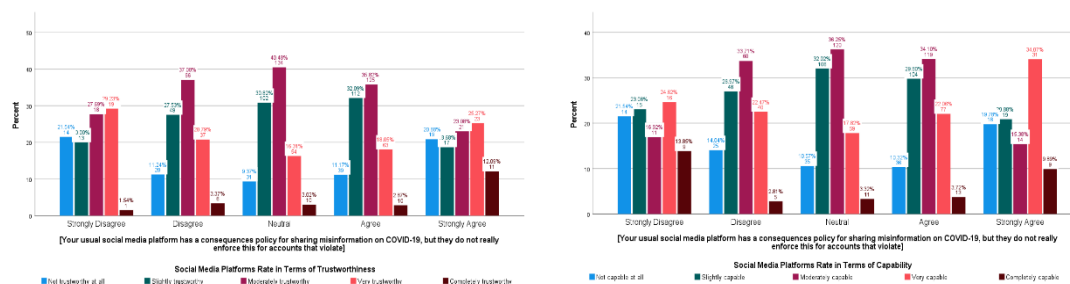
Figure 89 Effect of social media's corrective measures of COVID-19 misinformation on its trustworthiness and capability for providing COVID-19 information.



4.4.3 Effects of Misinformation Policy Enforcement on Trust and Capability

This study found an effect of social media's enforcement of COVID-19 misinformation policies on its trustworthiness and capability for providing COVID-19 information. Error! Reference source not found.4 shows that participants who agreed with the 'negative statement' about social media that they do not enforce their policies against those who spread misinformation were more likely have lower ratings about the reliability and capability of social media to provide them with COVID-19 information. There was a relationship between the increase in the negative impression towards social media in applying their policies to counter misinformation and the lack of people's evaluation of their credibility and capability of providing COVID-19 information.

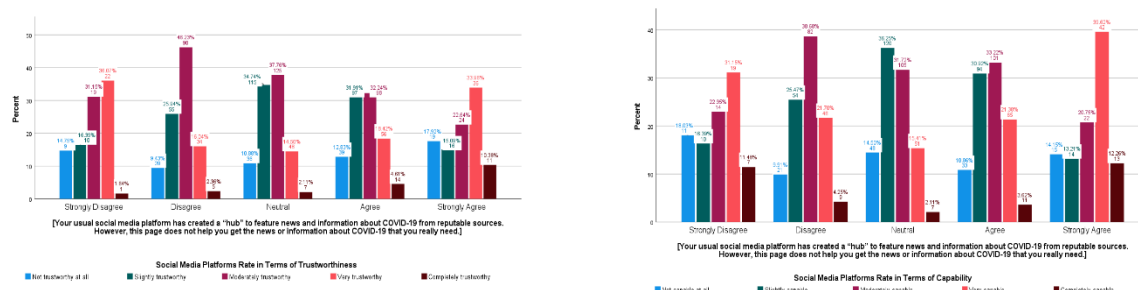
Figure 90 Effect of social media's enforcement of COVID-19 misinformation policies on its trustworthiness and capability of providing COVID-19 information.



4.4.4 Effects of Social Media's Hub Information on Trust and Capability

This study found an effect of the effectiveness of the social media COVID-19 information hub on its trustworthiness and capability of providing COVID-19 information. As shown in Error! Reference source not found.5, the number of people who rated the reliability of information and the ability of social media to provide information about COVID-19 decreased as the number of people who agreed or strongly agreed with the negative statement that social media contained unhelpful information about COVID-19 increased. This suggests a relationship between the increase in the negative impression towards social media of providing unhelpful information during the pandemic and the decrease in people's assessment of its credibility and ability to provide COVID-19 information.

Figure 91 Effect of the effectiveness of the social media COVID-19 information hub on its trustworthiness and capability to provide COVID-19 information



In summary, the study on understanding the impact of actions by social media platforms highlights the following findings:

List of other reactions that the participants would express

This section include responses that provide general feedback or additional comments provided by participants toward Behavioural Difficult, Moderate and Easy tasks aren't covered by other categories. Some of these responses were: researching the topic themselves, commenting with additional information or requesting the user to take down the post.

Verify the post

Participants who agreed: As seen in **Error! Reference source not found.**, participants who agreed with a post would verify it using credible sources. For example, some participants stated:

Difficult Task: *“conduct my own research from credible sources”*

P:U69RU

Moderate Task: *“I will try to look for information from journals.”*

P:8GR01

Easy Task: *“search in google.”* P:PP8ED

This result suggests that, although some participant agrees with the post, they still have some doubts that led to them verifying the information through credible sources, journals and Google searches. However, it is noted that the participant (P: PP8ED) would use Google in Easy Task, whereas the participant (P:8GR01) and (P: U69RU) would use credible sources and journals to verify the information. This suggests that the task became more easy, so participants used the best possible way to search for the validity of the post, and when the task became more difficult, some participants might use more credible sources.

Participants who were hesitant: As seen in **Error! Reference source not found.**, some participants who hesitated with the post would attempt to verify the post. For example:

Difficult Task: *“I would probably do a google search myself to find out more. I wouldn't interact with the poster.” P:LTTCD*

Moderate Task: *“I will do further research ...” P:A9MU2*

Easy Task: *“I would do research of my own to see if it were accurate.” P:1N4ZY*

This result indicates that hesitant people will first search for the information's validity. This behaviour suggests that people are reluctant to believe news if they do not have prior knowledge of it. Therefore, they perform their own fact checking every time they encounter new information. Another point becomes apparent from the above, that some people prefer not to communicate with the author. The reason behind this may be that some people do not want to cause embarrassment to the author, or do not wish for the author to become aware of their identity due to privacy concerns. Thus, some people may only want to confirm that the information is correct only to enhance their knowledge stock and make themselves aware.

Participants who disagreed: As seen in **Error! Reference source not found.**, participants who disagreed with the post would also verify the post. For example, some participants indicated:

Difficult Task: *“Look up information to determine if it correct” P:9H83D*

Moderate Task: *“I would do research of my own to see if it were accurate.” P:1N4ZY*

Easy Task: *“research the topic” P:2KR0B*

The above quotes indicate that the first thing some participants do is check the published information to see if the information is correct. However, it is unclear whether the some participants would use specific reliable sources. The participant might search through a regular search engine site and through the pop-up search results, there'y quickly validating without going in-depth with the topic.

Some participants stated an opinion confirming that this post was incorrect; for example, the participant indicated:

Moderate Task: *“I've heard this as a rumour, but I just find it too unlikely. People need to suppress sensationalism and go with the facts.” P:T81HL*

The above quotes indicate that one method people follow is to try to think whether they have encountered this information before, whether it be accurate or false, before doing anything else to the post. This result also highlights another point: Sensational rumors are might more potentially spread among people in comparison to the not sensational rumors.

Like the post

Participants who agreed: As seen in **Error! Reference source not found.**, this participant who agreed with a post tended to 'like' the post. For example, some participants stated:

Difficult Task: *"like" the post...* P:VTHML

This finding highlights how readers tend to press the 'like' button if they agree with what is written."

Share the post

Participants who agreed: As seen in **Error! Reference source not found.**, this participant who agreed with a post will also share it. For example:

Difficult Task: *"... MAYBE share/repeat it"* P:VTHML

This finding highlighted how if users agree with the post, they might reshare it.

Participants who disagreed: as seen in **Error! Reference source not found.**, although people disagree with the misinformation post, they still share it with family and friends:

Easy Task: *"tell people in my life personally"* P:V6BLW

This response could be interpreted in more than one way. For example, in the event that the participant tells people so that they have knowledge about the misinformation so that they do not fall into the trap of believing it. In this case, the participant spreads both the misinformation and the corrected information before sharing it. This behaviour indicates the extent of the participant's awareness of the seriousness of spreading misinformation, and indicates the extent of the participant's respect for people close to them so that they do not fall victim to the post.

The other meaning is that participant may share a misinformation post with people as a joke or to convey exciting news or expose them to a new interesting story, even if it is spurious, because some people enjoy fiction, so misinformation may be seen as an engaging story to share. However, this result highlights an important point that misinformation, if spread on the basis of it being a fictional story or joke, it may reach new people who take it seriously, believe it, and defend its validity and logic.

Discuss the post with people

Participants who agreed: As seen in **Error! Reference source not found.**, this participant who who agreed with the post would also discuss the post with their friends and family. For example, some participants indicated:

Difficult Task: *"Discuss with friends and family"* P:G0CYR

This result has another aspect, indicating that if people agree with a particular post, they may re-share it with people close to them as a form of information exchange.

Would not share the post

Participants who agreed: As seen in **Error! Reference source not found.**, participants who agreed with a post would also did not share it. For example:

Difficult Task: “... *not share the post*” P:VPJ6G

This result contradicts the previous result, but it was expected because the participant did not strongly agree with the publication, so the participant may have had some doubts about the information provided and preferred not to re-share it until they were very sure of the information’s veracity.

Participants who were hesitant: As seen in **Error! Reference source not found.**, there was a participant who was reluctant to approve the post and expressed a point of view but would not share the post with anyone:

Moderate Task: “*add my opinion and any references in comments but not share the post at all*” P:VPJ6G

This result suggests that, even if participant is hesitant, they responded to the post knowing that sharing it with others is an issue. Here it turns out that there was a good awareness among people of the danger of sharing unconfirmed information.

Participants who disagreed: As seen in **Error! Reference source not found.**, among the reactions observed from participants, one was not to share the post. For example, some participants who disagreed with the post mentioned:

Easy Task: “... *not share the post at all*” P:VPJ6G

This result indicates that some people know the danger of sharing misinformation.

Reply to the post with opinion

Participants who agreed: As seen in **Error! Reference source not found.**, the participant who agreed with the post would al’o reply to the post with an opinion. For example, some participants stated:

Difficult Task: “*i will not respond negatively but would respond*”
P:RJ1PP

The above quotes indicate that the participant's agreement with the post may not be reflected in their lack of negative response, as they may respond positively to the author. Positive responses to a post could potentially indicate agreement with the post, and negative responses could imply disagreement.

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants who somewhat disagreed with the post expressed the view:

Moderate Task: “ *Note that this is mostly wrong it came from bats, which indeed were experimented on, but the nature of its leak and its dissemination were on purpose.*” P:U6PUO

Easy Task: “*add my opinion and info to comments ...*” P:VPJ6G

Easy Task: “*comment that the facts say otherwise*” P:ISAA5

The above quotes indicate that the participant expressed their point of view without providing the author with any supporting evidence or sources. Interestingly, it was observed that the participant (P: U6PUO) believed this misinformation was not entirely wrong; the participant acknowledges that the virus came from bats but that the worldwide spread of the virus was for a specific purpose. Here, it turns out that some of the information posted online may have a mix of wrong and factual information. Therefore, the participant expressed his point of view on the topic in a way that showed they could still not access accurate and trustworthy information. This could lead to people expressing opinions without evidence, giving rise to people adopting alternative ideas and understanding controversial topics in other ways.

Reply to the post with reference

Participants who agreed: As seen in **Error! Reference source not found.**, participants who agreed with the post would also reply to the post with references. For example:

Difficult Task: “ *...i would comment with my opinion and reference ...*”
P:VPJ6G

The above quotes indicate that the participant responds to the author with a supporting source because the participant did not strongly agree with the original post, showing how the participant might think that the information needs supporting evidence to be more credible. The following section explores the reactions of participants who disagreed with Behavioural Difficult Task.

Participants who were hesitant: As seen in **Error! Reference source not found.**, some participants who 'as skeptical about the validity of the information mentioned:

Moderate Task: “*I will comment with an attached article stating that we haven't yet confirmed to be true of the covid 19 cause, and it's dangerous to say for sure without valid proof, we need more research done to get the true answers.*” P:QXZBB

This result suggests that the participant confirmed that this subject has no supporting evidence. The participant also attached an article denying the idea that COVID-19 was a virus which spread from a laboratory by mistake. The participant mentioned a significant

point, being that the discussion on this topic is dangerous because there is no evidence to prove or deny these ideas, further pointing out that research and investigation should first be done to answer these questions. Therefore, here a huge issue is exist, which is a lack of adequate answers from official sources at a time when people are searching for logical explanations. The problem here is not the spread of misinformation or talking about it; the problem is that the available information is insufficient. This post could be viewed as a kind of accusation that needs to be refuted quickly so that people do not believe it.

An analogy for this problem could be given in the form of a person being accused of committing a grave crime, but without any no evidence at the time against this person. Here the solution may be that the accused is innocent until proven guilty, and the court issues an official decision to the media that this case is still pending and there have been no developments. Hence, any information published regarding the accused must be noted by the media, and penalties for the rehabilitation of the accused should be applied to anyone who spreads these rumors. Therefore, these are often called accusations rather than conspiracy theories or misinformation.

Participants who disagreed: As seen in **Error! Reference source not found.**, participants who disagreed with the post would also reply to the post with references. For example, some participants stated:

Difficult Task: *“I would point out that many sources say a third booster shot may be required.” P:XVAR3*

Difficult Task: *“I would comment and add a link to the WHO website I found that said it is a 2 dose vaccine, possibly 3 for immunocompromised people, they may be considering yearly boosters, but that has not been confirmed according to their website.” P:QXZBB*

Moderate Task: *“I would point out that most sources now discount this theory.” P:XVAR3*

Easy Task: *“I will link one of the MANY articles written by REPUTABLE sources stating that this documents are forged and completely false.” P:QXZBB*

Easy Task: *“I would comment with the article tagged in” P:XIGCL*

The above quotes indicate that the participants (P:XVAR3 and P:QXZBB) would search for many sources that confirmed this information to be incorrect, so here it turns out that these participants sought for many references to highlight the erroneous nature of the shared information. From this point of view, it turns out that this res’lt is significant because if many sources confirm the information then people can be more sure of its veracity. Participant

(P:XVAR3) who strongly disagreed with the post would response to the post's author with arguments and evidence to challenge the validity of the post. It turns out that the participant did not like to see this view published, so they decided to refute it with available resources. Therefore, this leads us to consider beneficial actions that could help these corrective efforts that people do voluntarily. Participant (P:QXZBB) corrected the information and explained why the post was incorrect. This comment by the participant highlights another point, that some of the participants employ critical thinking skills, e.g., by questioning the post due to the inclusion of the word “confirmed” along with the obvious correcting of the post. This indicates that some people are aware of how to verify and correct information.

Engage in discussion with others

Participants who agreed: As seen in **Error! Reference source not found.**, some participants took into consideration people's opinions about the post:

Moderate Task: *“I will ask others what they think about it as well”*

P:4ZYCV

It is understood from the result that the participant values the opinions of others on the posted topic, as the participant evaluated arguments and tended towards the most convincing view.

Participants who were hesitant: As seen in **Error! Reference source not found.**, some participants was reluctant to agree to the validity of the information mentioned:

Moderate Task: *“question the person who posted it and ask them why?”*

P:L96QF

This result suggests that the participant would discuss with the author to understand the reasons that prompted them to publish and adopt this idea.

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants who somewhat disagreed with ©t stated they would discuss the matter what the author meant by publishing this spurious post:

Easy Task: *“Ask the author what they're even trying to say by posting a vague useless image of data...”* *P:1N5LA*

This r'sult indicates that ambiguous posts might be controversial and questionable. Therefore, posts with many responses contain questions that may show that the post presents something untrustworthy.

Wouldn't Engage in discussion

Participants who were hesitant: As seen in **Error! Reference source not found.**, some participants would not discuss this post online:

Moderate Task: *“If I do not know who posted this, I simply confirm the information elsewhere, I will not discuss this online.”* *P:6FLE3*

This result suggests that the participant does not want to discuss anything that has not been confirmed. The explanation for this behaviour may be that they do not know the source or the person who posted it, so it is deemed unnecessary to support and correct this post. Still, the participant might discuss this post if the person or source publishing it was a person close to the participant, or a known source. This behaviour also explains why the participant does not want the misinformation to spread further, and it is possible that the participant does not want to be embarrassed and discuss a subject that they are not familiar with.

Ignore

Participants who agreed: As seen in **Error! Reference source not found.**, some participants decided to ignore the post and not engage in discussions:

Moderate Task: *“doing anything would just warrant further aggravation”*
P:VTHML

The above quotes indicate how the participant ignored the post, not because they did not want to waste time correcting the information or entering into a controversy with the author, but because the participant might, believes that these interventions are the cause, and only serve to exacerbate the spread of misinformation, even if these discussions are aimed at refuting the misinformation. Therefore, the reaction towards misinformation may attract the attention of other people who do not know about the topic of discussion. Then, the misinformation may spread faster than it would if there had been no interaction. The following section explores the reactions of participants who disagreed with behavioural tasks.

Participant’ who were hesitant: As seen in **Error! Reference source not found.**, some participants who was reluctant to belie’e the post hinted at ignoring it, mentioning that:

Moderate Task: *“It's possible someone knows where it originated and how, but those people aren't the ones posting it on social media. It also doesn't really matter how it originated to laymen all that matters is trying to stop it.”* P:1N5LA

This result suggests that some information is difficult to be obtained. Even if there are people who know whether it is true without suspicion, they are not the ones who created this misinformation post. Therefore, it seems that the participant decided to ignore the post because they believe it is impossible to meet someone who has accurate information about it on social media. The following section will cover the overall responses of the participants in task 3. This will begin by examining their level of agreement and then proceed to their reactions to the post.

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants also ignored the misinformation post of Behavioural Difficult Task. For example:

Difficult Task: *“Disregard the government wants control”* P:U6PUO

The result suggests that the participant might intend not to act against the misinformation of Behavioural Difficult Task because the participant might believe that governments want to prevent the spread of misinformation in society. The participant might think that replying to the misinformation post may foster the indirect spread of misinformation. Therefore, some people tend to ignore misinformation because they might believe that disregarding is a positive behaviour that solves the spread of false information. This belief may be the reason why many participants chose to ignore misinformation. The problem is that ignoring misinformation may not be an effective solution, although most participants did so as shown in Figure 4.

One of the participant also stated they would also ignore the post and provide a reason for this:

Easy Task: *“Ignore... there are more variants that apparently are out now” P:U6PUO*

This result indicates that the participant may have already noted that Covid-19 variants exist. But, the participant disagreed with the post and ignored it. This result was inspiring to think about the opportunistic people who publish this kind of misinformation post. When an incident occurs, or something new appears, opportunistic people, interpret the news and change the truth to misinformation or something they believe in.

It also appears from the data that there are some participants who would ignore the post. For example, some participants decided to ignore all future posts from the user who posted the offending material:

Easy Task: *“I will ignore the user for future posts” P:A51U4*

Ask the user to take down the post

Participants who disagreed: As seen in **Error! Reference source not found.**, this participant who disagreed with the post would ask the user to remove it. For example, some participants stated:

Difficult Task: *“I will reach out to the user and ask him/her to take down the post.” P:GPOWD*

Easy Task: *“I will reach out to the user and ask him/her to take down the post.” P:GPOWD*

The above quotes indicate that the participant does not want to see incorrect information published online. Therefore, in this case, the participant asked the author to delete the post because it might mislead people or because they believe that the misinformation is dangerous. From this behaviour, it becomes clear that another important factor exists, which is a sense of responsibility towards society. This indicates that social responsibility may initiate positive behaviour in some people towards misinformation.

Remove the post or author from Feed

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants stated they would hide the post so that they did not come across it again. However, it may still be visible to other users who did not choose to hide it:

Moderate Task: *"I will remove the post from my feed." P:3PEA2*

Easy Task: *"I will block [remove] the post from my feed..." P:3PEA2*

This result indicates that some participants was not interested in seeing misinformation posts appearing in their account. Therefore, this behaviour may lead us to consider the danger of such posts appearing, and how the participant responded to them. Therefore, this result may suggest a solution for the social media platforms, where this kind of misinformation posts can be hidden as a 'default choice'. The user could then adjust this option to make this type of post available in their account.

Block the author

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants stated that they would block the author of the post:

Moderate Task: *"I would also block this user, as I don't like to see dissemination of speculation/lies/misinformation/unconfirmed ru'ors in bad English." P:M0RD1*

Easy Task: *"...if the poster is a stranger I will block them." P:3PEA2*

This result suggests that one of the methods used in combating misinformation is to block the post's author. The result also shows that people are uncomfortable reading misinformation written with poor use of language. This result indicates that the participant would act by blocking the account of any person of whom they have no relationship with, if the person is publishing misinformation. From this result, It is believed that blocked accounts on social media platforms may be due to them having published misinformation or for other reasons.

Sigh

Participants who disagreed: As seen in **Error! Reference source not found.**, some participants sighed and recommended looking to the future in an affirmative way:

Easy Task: *"I would sigh. Let us hope for a better future." P:M0RD1*

This result indicates that the participant was not interested in this post. On the contrary, the participant called on people to hope for a bright future.

Laugh

Participants who disagreed: As seen in **Error! Reference source not found.**, one of the participant's reactions was to laugh and belittle t'e post:

Easy Task: *“I will laugh that someone posted such stupidity” P:A5TDI*

This result indicates that the participant expressed dissatisfaction in a mocke’y way, which may be due to the participant's unwillingness to discuss the post with the author because the participant might have found the post funny and difficult to be believed from the participant's viewpoint.

Wait for more info

Participants who were hesitant: As seen in **Error! Reference source not found.**, participants who hesitated with the post would wait for more information. For example:

Difficult Task: *“Wait” P:T81HL*

Easy Task: *“It is hard to say at this point. I will wait for more info.”*

P:T81HL

This result suggests that the participant waited until accurate information was available on this subject. From here, it becomes clear that the new information with no evidence, such as whether the COVID-19 vaccination will be mandatory every ye’r?; the answer to this question was unknown. Some people love to create an image of the future that is a figment of their imagination or expectations that may turn out to be incorrect. The participant's behaviour of waiting for information to prove or refute these rumors may be one of the actions they took to reduce the dissemination of misinformation. It also looks like the participant might found the misinformation post hard to verify.

This result indicates that it is difficult to know the underlying facts about a new topic that may or may not be accurate. This result shows the extent of hesitation between people to believe unfamiliar health information during a health crisis. There is always a challenge during a health crisis regards access to new data, where everything is novel and confirmed information needs to be verified, studied, with the necessary time to do so. some participants who was reluctant to agree to the validity of the information mentioned:

Moderate Task: *“I will do further research and keep up to date with new news on the topic” P:A9MU2*

This indicates that new misinformation may not©ve an easy and definitive ans‘er that is quickly accessible. If the participant does not find any infor’ation, the participant will follow up on any developme’ts related to the post.

Appendix (C) Factors influence Participants ' reactions to misinformation

Hypotheses Development

Information sources' impact on reactions to misinformation

H1: Individuals' reactions to misinformation depends on their preferred sources for news and information.

Due to the highly granular nature of capturing participant preferences of information sources e.g. Government sources, Public Health Agencies (e.g. CDC), conservative/lean republican (e.g. Fox News), and democrats/lean liberal (e.g. CNN, BBC, and New York), and their reactions, this hypothesis is broken down into several sub-hypotheses.

Government information sources:

- **H1.1:** Users who preferred Government information sources would be less likely to share the misinformation post and add their views.
- **H1.2:** Users who preferred Government information sources would be less likely to share the misinformation post separately via other social media platforms.
- **H1.3:** Users who preferred Government information sources would be more likely to report the encountered misinformation posts.
- **H1.4:** Users who preferred Government information sources would be more likely to ignore the misinformation posted on a platform.
- **H1.5:** Users who preferred Government information sources would be more likely to block users who post misinformation.
- **H1.6:** Users who preferred Government information sources would be more likely to request the source of information from the author.
- **H1.7:** Users who preferred Government information sources would be more likely to ask the author to refrain from sharing misinformation.

Public Health Agencies:

- **H1.8:** Users who preferred Centers for Disease Control and Prevention (CDC) would be less likely to share the misinformation post and add their views.
- **H1.9:** Users who preferred Centers for Disease Control and Prevention (CDC) would be less likely to share the misinformation post separately via other social media platform.
- **H1.10:** Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to report the encountered misinformation posts.
- **H1.11:** Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to ignore the misinformation posted on a platform.
- **H1.12:** Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to block users who post misinformation.
- **H1.13:** Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to request the source of information from the author.
- **H1.14:** Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to ask the author to refrain from sharing misinformation.
- **H1.15:** Users who preferred World Health Organization (WHO) would be less likely to share the misinformation post and add their views.
- **H1.16:** Users who preferred World Health Organization (WHO) would be less likely to share the misinformation post separately via other social media platform.

- **H1.17:** Users who preferred World Health Organization (WHO) would be more likely to report the encountered misinformation posts.
- **H1.18:** Users who preferred World Health Organization (WHO) would be more likely to ignore the misinformation posted on a platform.
- **H1.19:** Users who preferred World Health Organization (WHO) would be more likely to block users who post misinformation.
- **H1.20:** Users who preferred World Health Organization (WHO) would be more likely to request the source of information from the author.
- **H1.21:** Users who preferred World Health Organization (WHO) would be more likely to ask the author to refrain from sharing misinformation.

Conservative/lean republican:

- **H1.22:** Users who preferred Fox News would be more likely to share the misinformation post separately via other social media platforms
- **H1.23:** Users who preferred Fox News would be more likely to request the source of information from the author.
- **H1.24:** Users who preferred Fox News would be more likely to block users who post misinformation.
- **H1.25:** Users who preferred Fox News would be more likely to ignore the misinformation posted on a platform.
- **H1.26:** Users who preferred Fox News would be more likely to share the misinformation post and add their views.
- **H1.27:** Users who preferred Fox News would be more likely to ask the author to refrain from sharing misinformation.
- **H1.28:** Users who preferred Fox News would be more likely to report the encountered misinformation posts.

Democrats/lean liberal :

- **H1.29:** Users who preferred BBC would be more likely to share the misinformation post separately via other social media platforms.
- **H1.30:** Users who preferred BBC would be more likely to share the misinformation post separately via other social media platforms.
- **H1.31:** Users who preferred BBC would be more likely to request the source of information from the author.
- **H1.32:** Users who preferred BBC would be more likely to block users who post misinformation.
- **H1.33:** Users who preferred BBC would be more likely to ignore the misinformation posted on a platform.
- **H1.34:** Users who preferred BBC would be more likely to share the misinformation post and add their views.
- **H1.35:** Users who preferred BBC would be more likely to ask the author to refrain from sharing misinformation.
- **H1.36:** Users who preferred BBC would be more likely to report the encountered misinformation posts.
- **H1.37:** Users who preferred CNN would be more likely to share the misinformation post separately via other social media platforms.
- **H1.38:** Users who preferred CNN would be more likely to engage in discussion with the author of the post.
- **H1.39:** Users who preferred CNN would be more likely to request the source of information from the author.
- **H1.40:** Users who preferred CNN would be more likely to block users who post misinformation.
- **H1.41:** Users who preferred CNN would be more likely to ignore the misinformation posted on a platform.

- **H1.42:** Users who preferred CNN would be more likely to share the misinformation post and add their views.
- **H1.43:** Users who preferred CNN would be more likely to ask the author to refrain from sharing misinformation.
- **H1.44:** Users who preferred CNN would be more likely to report the encountered misinformation posts.
- **H1.45:** Users who preferred New York Times would be more likely to report the encountered misinformation posts.
- **H1.46:** Users who preferred New York Times would be more likely to share the misinformation post separately via other social media platforms.
- **H1.47:** Users who preferred New York Times would be more likely to request the source of information from the author.
- **H1.48:** Users who preferred New York Times would be more likely to block users who post misinformation.
- **H1.49:** Users who preferred New York Times would be more likely to ignore the misinformation posted on a platform.
- **H1.50:** Users who preferred New York Times would be more likely to share the misinformation post and add their views.
- **H1.51:** Users who preferred New York Times wo'd be more likely to ask the author to refrain from sharing misinformation.
- **H1.52:** Users who preferred New York Times would be more likely to report the encountered misinformation posts.

H2: Individuals' agreement with misinformation posts depends on the information sources that they rely on to verify information that they see on social media platforms.

- **H2.1:** individuals relying on Newspapers to verify information on social media platforms more likely to be able to identify misinformation they encounter on social media.
- **H2.2:** individuals relying on academic journals to verify information on social media platforms are more likely to be able to identify misinformation they encounter on social media.
- **H2.3:** individuals relying on Books to verify information on social media platforms more likely to be able to identify misinformation they encounter on social media.
- **H2.4:** individuals relying on Aggregated news websites (e.g. Google News) to verify information on social media platforms more likely to be able to identify misinformation they encounter on social media.
- **H2.5:** individuals relying on Magazines to verify information on social media platforms more likely to be able to identify misinformation they encounter on socia' media.
- **H2.6:** individuals relying on Government websites to verify information on social media platforms more likely to be able to identify misinformation they encounter on social media.

H3: Individuals' reactions to misinformation depends on their level of agreement with misinformation.

- **H3.1** Individuals are more likely to engage in a discussion with the author if they agree with the post.
- **H3.2** Individuals are more likely to share the post and add their view if they agree with the post.
- **H3.3** Individuals are more likely to ask the author for the information source if they disagree with the post.
- **H3.4** Individuals are more likely to ask the author of the post not to share it if they disagree with the post.

- H3.5 Individuals are more likely to tag an expert or friend to make them aware of this post if they agree with the post.
- H3.6 Individuals are more likely to share the post separately via other social media platforms if they agree with the post.
- H3.7 Individuals are more likely to report misinformation post to the social media platform if they disagree with the post.
- H3.8 Individuals are more likely to block the user who shared the misinformation post if they disagree with the post.
- H3.9 Individuals are more likely to use the snooze option to snooze the user who shared the misinformation post if they disagree with the post.
- H3.10 Individuals are more likely to ignore a post if they agree with it.

The impact of attitudes on identifying and reacting to misinformation

H4: Individuals' personal attitudes towards social media can affect how they respond to misinformation.

- **H4.1:** Individuals' perceptions of social media's trustworthiness during COVID-19 affect their likelihood of sharing the misinformation post and adding their views.
- **H4.2:** Individuals' views on social media's capability to handle COVID-19 affect their likelihood of reporting the misinformation posts encountered on the platform.
- **H4.3:** Individuals' perceptions of social media's trustworthiness during COVID-19 affect their likelihood of tagging a friend or expert to inform them about a false post.
- **H4.4:** Individuals' agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic affects their inclination to use the snooze feature to mute users who posted misinformation on the platform.
- **H4.5:** Individuals' views on social media's capability to handle COVID-19 affect their willingness to discuss with authors of misinformation posts.
- **H4.6:** Individuals' perceptions of social media's trustworthiness during COVID-19 affect their inclination to ignore the posted misinformation on the platform.
- **H4.7:** Individuals' agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic affects an individual's likelihood of tagging a friend or expert to inform them about a false post.
- **H4.8:** Individuals' views on social media's capability to handle COVID-19 affect their inclination to use the snooze feature to mute users who posted misinformation on the platform.
- **H4.9:** Individuals' views on social media's capability to handle COVID-19 affect their willingness to ask the author of the misinformation post for the information source.
- **H4.10:** Individuals who believe social media platforms intentionally provide misinformation during the pandemic are less likely to report misinformation posts encountered on the platform.
- **H4.11:** Individuals who perceive social media as trustworthy during COVID-19 are more likely to use the snooze feature to mute users who posted misinformation.
- **H4.12:** Individuals who agree with the notion that social media platforms intentionally provide misinformation during the pandemic are more likely to block users who post misinformation on the platform.

H5: Individuals' personal attitudes towards social media can affect their ability to identify misinformation

- **H5.1:** Individual's perception of social media's trustworthiness during COVID-19 affect their ability to identify misinformation.

- **H5.2:** Individuals who agree that social media platforms serve as a hub for COVID-19 news from reputable sources but fail to provide the information they need may struggle to identify misinformation.
- **H5.3:** Individual's perception of social media platforms' capability to deal with COVID-19 pandemic affect their ability to identify misinformation.
- **H5.4:** Individual's agreement with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic affect their ability to identify misinformation.
- **H5.5:** Individuals' agreement with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 affect an individual's ability to identify misinformation.
- **H5.6:** Individual's agreement with the notion that social media platform do not really enforce their policy for sharing misinformation with violators affect an individual's ability to identify misinformation.

The impact of background factors on to misinformation reaction and the ability to identify misinformation

H6: Individuals' background factors affect their ability to identify misinformation

- **H6.1:** Individuals' age affect their ability to identify misinformation
- **H6.2:** Individuals' education levels affect their ability to identify misinformation

H6.3: Individuals' employment status affect their ability to identify misinformation'

H7: Individuals' background factors affect their reactions to misinformation.

- **H7.1:** Individuals' age affects their likelihood of sharing the misinformation post and adding their views.
- **H7.2:** Individuals' age affects their likelihood of reporting the misinformation posts encountered on the platform.
- **H7.3:** Individuals' age affect their willingness to discuss with authors of misinformation posts.
- **H7.4:** Individuals' education levels affect their willingness to discuss with authors of misinformation posts.
- **H7.5:** Individuals' age affects their willingness to ask the author of the misinformation post for the information source.
- **H7.6:** Individuals' education levels affect their willingness to block users who post misinformation on the platform.
- **H7.7:** Individuals' employment status affect their willingness to ignore the posted misinformation on the platform.

The previous section covered how background factors and proposed hypotheses can contribute to misinformation. The following section will focus on identifying and verifying misinformation.

The impact of the verification approaches used on the ability to identify misinformation

H8: The way individuals verify information affects their ability to identify misinformation

- **H8.1:** Individuals who generally verify information by checking if the information conforms their understanding of the topic will be more likely to identify misinformation
- **H8.2:** Individuals who generally verify information by looking at the user original profile to see if they can trust the information will be more likely to identify misinformation.
- **H8.3:** Individuals who generally verify information by searching to see whether the post has been shared or mentioned on other posts or social media platforms will be more likely to identify misinformation.
- **H8.4:** Individuals who generally verify information by looking at the number of shares that the post obtained will be more likely to identify misinformation.

- **H8.5:** Individuals who generally verify information by looking at the quality of the picture will be more likely to identify misinformation.
- **H8.6:** Individuals who generally verify information by looking at the number of likes that the post will be more likely to identify misinformation.
- **H8.7:** Individuals who generally verify information by looking at other people's replies and discussions about the post to see whether they make valid arguments will be more likely to identify misinformation.
- **H8.8:** Individuals who generally verify information by one of their trusted experts will be more likely to identify misinformation.
- **H8.9:** Individuals who generally verify information by using search engines to conduct some basic research will be more likely to identify misinformation.
- **H8.10:** Individuals who generally verify information by looking at peer-reviewed research papers will be more likely to identify misinformation.
- **H8.11:** Individuals who generally verify information with one of their trusted friends will be more likely to identify misinformation.

The impact of encountering misinformation on attitudes towards the social media

H9: Encountering misinformation on social media affects individuals' attitudes towards the platforms.

- **H9.1:** Encountering misinformation on social media can make individuals feel uncomfortable on these platforms.
- **H9.2:** Individual's perception of social media's trustworthiness during COVID-19 will be affected when they are encountering misinformation on social media.
- **H9.3:** Individual's perception of social media platforms' capability to deal with COVID-19 pandemic will be affected when they are encountering misinformation on social media.
- **H9.4:** Individual will be more likely to agree with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic when they are encountering misinformation on social media.
- **H9.5:** Individual will be more likely to agree with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 when they are less encountering misinformation on social media.
- **H9.6:** Individual will be more likely to agree with the notion that social media platform do not really enforce their policy for sharing misinformation with violators when they are encountering misinformation on social media.

Inferential Analysis

This section is the Inferential Analysis, which is a formal statistical analysis process used for Hypothesis testing. Hypothesis testing aims to evaluate relationships between variables using Chi-square, which help test the hypotheses put forth in the study. For data that undergoes goodness of fit (chi-square) test, significance at 5% ($P < 0.05$) results in the rejection of the NULL hypothesis (Rejected), while non-significance at 0.05 ($P > 0.05$) leads to acceptance of the NULL hypothesis (Accepted). However, if the sample violates any assumptions of the goodness of fit (chi-square) test, the results of the analysis may be incorrect or misleading (Violated). To better understand the tables that follow, it's important to read and familiarize yourself with the terms listed below.

- ***a:** Significant at 5% ($P < 0.05$)- **Rejected**, Non Significant at 0.05 ($P > 0.05$) - **Accepted**, data to be analyzed by a goodness of fit (chi-square) test were sampled

violate one or more of the goodness of fit (chi-square) test assumptions, the results of the analysis may be incorrect or misleading- **Violated**.

- *b: Interpreting the Phi Coefficient, the phi coefficient is a symmetrical statistic³⁰, which means the independent variable³¹ and dependent variables³² are interchangeable. The interpretation for the phi coefficient is similar to the Pearson Correlation Coefficient³³. The range is from -1 to 1, where:
 - Very strong positive association at +.70 or higher
 - Strong positive relationship at +.40 to +.69
 - Moderate positive relationship at > +.30 to +.39
 - weak positive relationship at +.20 to +.29
 - No or negligible relationship at +.01 to +.19
 - No relationship at 0.
 - Very strong negative association at -.70 or higher
 - Strong negative relationship at -.40 to -.69
 - Moderate negative relationship at -.30 to -.39
 - weak negative relationship at' -.20 to -.29
 - No or negligible relationship at -.01 to -.19
 - No relationship at 0.
 - Hypothesis testing **highlighted with green** are considered the most strong association as they are rejected in all scenarios.
 -

The tables shows the Hypothesis Test for the associations and how strong the associations are.

³⁰ <https://www.statisticshowto.com/symmetry-of-a-function/>

³¹ <https://www.statisticshowto.com/independent-variable-definition/>

³² <https://www.statisticshowto.com/dependent-variable-definition/>

³³ <https://www.statisticshowto.com/probability-and-statistics/correlation-coefficient-formula/>

Information sources' impact on reactions to misinformation

H1: The type of interaction individuals exhibit towards misinformation depends on their preferred sources of information.

Table 52: Government information sources (Hypothesis 1)

H1: The type of interaction individuals exhibit towards misinformation depends on their preferred sources of information.								
Hypothesis	NULL Hypothesis Test	Test	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significance Level	Interpretation
H1.1: Users who preferred Government information sources would be less likely to share the misinformation post and add their views.	H1.1.0: There are no association between users who preferred Government information sources and their reaction to share the misinformation post and add their views.	Chi-Square	Accepted 0.064362	Rejected 0.042204	Accepted 0.673664	Difficult Task: -0.095772 Moderate Task: -0.092151 Easy Task: -0.015872	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred Government information sources were less likely to share misinformation posts and add their views. The NULL Hypothesis was accepted for difficult and easy task but rejected for a moderate task. The relationship a statistically significant only on case of moderate task.

H1.2: Users who preferred Government Website would be less likely to share the misinformation post separately via other social media platform.	H1.2.0: There are no association between users who preferred Government Website and their reaction to share the misinformation post separately via other social media platform.	Chi-Square	Violated 0.255317	Rejected 0.114027	Accepted 0.082250	Difficult Task: -0.058899 Moderate Task : -0.071686 Easy Task: -0.065495	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred Government websites were less likely to share misinformation separately on other social media platforms. The test was violated for a difficult task, and the NULL Hypothesis accepted for an easy task and rejected for moderate task. The relationship a statistically significant only on case of moderate task.
H1.3: Users who preferred Government information sources would be more likely to report the encountered misinformation posts.	H1.3.0: There are no association between users who preferred Government information sources and their reaction to report the encountered misinformation posts.	Chi-Square	Accepted 0.749110	Rejected 0.008730	Rejected 0.000022	Difficult Task: 0.016559 Moderate Task : 0.118958 Easy Task: 0.159880	Difficult Task : No relationship Moderate Task : No or negligible relationship Easy Task :	Users who preferred Government information sources were more likely to report encountered misinformation. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship a statistically significant on case of

							No or negligible relationship	moderate task and easy task.
H1.4: Users who preferred Government information sources would be more likely to ignore the misinformation posted on a platform.	H1.4.0: There are no association between users who preferred Government information sources and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Accepted 0.793950	Accepted 0.676508	Rejected 0.027735	Difficult Task: -0.013524 Moderate Task : -0.018926 Easy Task: -0.082954	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred Government information sources were more likely to ignore misinformation on a platform. The NULL Hypothesis was accepted for difficult and moderate tasks but rejected for an easy task. The relationship a statistically significant on case of easy task.
H1.5: Users who preferred Government information sources would be more likely to block users who post misinformation.	H1.5.0: There are no association between users who preferred Government information sources and their reaction to block users who post misinformation.	Chi-Square	Accepted 0.848998	Rejected 0.464460	Accepted 0.077913	Difficult Task: 0.009858 Moderate Task : 0.033183 Easy Task: 0.066443	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred Government information sources were more likely to block users posting misinformation. The NULL Hypothesis was accepted for a difficult task, rejected for a moderate task, and accepted for an easy task. The relationship a

								statistically significant on case of moderate task.
H1.6: Users who preferred Government information sources would be more likely to request the source of information from the author.	H1.6.0: There are no association between users who preferred who preferred Government information sources and their reaction to request the source of information from the author.	Chi-Square	Accepted 0.064145	Accepted 0.804331	Accepted 0.695540	Difficult Task: 0.095850 Moderate Task : 0.011238 Easy Task: -0.014750	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	There are no association between users who preferred who preferred Government information sources and their reaction to request the source of information from the author. The NULL Hypothesis was accepted for all tasks.
H1.7: Users who preferred Government information sources would be more likely to ask the author to refrain from sharing misinformation.	H1.7.0: There are no association between users who preferred Government information sources and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Rejected 0.423271	Rejected 0.139516	Accepted 0.841763	Difficult Task: 0.041462 Moderate Task : -0.067025 Easy Task: -0.095772	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred Government information sources were more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was rejected for a difficult and moderate task but accepted for an easy task. . The relationship a statistically significant on

								case of difficult and moderate tasks.

Table 53: Public Health Agencies (Hypothesis 1)

Hypothesis	NULL Hypothesis Test	Test	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significance Level	Interpretation
H1.8: Users who preferred Centers for Disease Control and Prevention (CDC) would be less likely to share the misinformation post and add their views.	H1.8.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to share the misinformation post and add their views.	Chi-Square	Accepted <i>0.065190</i>	Rejected 0.102395	Accepted 0.853886	Difficult Task: -0.095476 Moderate Task : -0.074090 Easy Task: -0.006941	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were less likely to share misinformation posts and add their views. The NULL Hypothesis was accepted for difficult and easy task but rejected for a moderate task. The relationship a statistically significant only on case of moderate task.
H1.9: Users who preferred Centers for Disease Control and Prevention (CDC) would be less likely to share the misinformation post separately via other social media platform.	H1.9.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to share the misinformation post separately via other social media platform.	Chi-Square	Violated <i>0.139429</i>	Rejected 0.074070	Rejected 0.074107	Difficult Task: -0.076524 Moderate Task : -0.081023 Easy Task: -0.067311	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were less likely to share misinformation separately on other social media platforms. The test was violated in the difficult task. The test was violated in the difficult task because some cells had expected counts of less

								than 5. The NULL Hypothesis was rejected for the moderate and easy tasks. The relationship was statistically significant in the case of moderate and easy tasks.
H1.10: Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to report the encountered misinformation posts.	H1.10.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to report the encountered misinformation posts.	Chi-Square	Rejected <i>0.468213</i>	Rejected 0.085563	Rejected 0.000040	Difficult Task: 0.037559 Moderate Task : 0.077988 Easy Task: 0.154907	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were more likely to report encountered misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.11: Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to ignore the misinformation posted on a platform.	H1.11.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Accepted <i>0.935740</i>	Accepted 0.984030	Rejected 0.049243	Difficult Task: -0.004175 Moderate Task : 0.000908 Easy Task: -0.074115	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were more likely to ignore misinformation on a platform. The NULL Hypothesis was accepted for a difficult and moderate task but rejected for an easy task. The relationship a statistically significant on case of easy task.

H1.12: Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to block users who post misinformation.	H1.12.o: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to block users who post misinformation.	Chi-Square	Accepted 0.567976	Rejected 0.343205	Rejected 0.272880	Difficult Task: 0.029567 Moderate Task : 0.042995 Easy Task: 0.041324	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were more likely to block users posting misinformation. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship a statistically significant on case of moderate task and easy task.
H1.13: Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to request the source of information from the author.	H1.13.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to request the source of information from the author.	Chi-Square	Rejected 0.457202	Accepted 0.555109	Accepted 0.852175	Difficult Task: 0.038495 Moderate Task : 0.026768 Easy Task: -0.007023	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were more likely to request the source of information from the author. The relationship was rejected for all tasks. The NULL Hypothesis was rejected for difficult task and accepted for moderate task and easy task. The relationship a statistically significant on case of difficult task.

H1.14: Users who preferred Centers for Disease Control and Prevention (CDC) would be more likely to ask the author to refrain from sharing misinformation.	H1.14.0: There are no association between users who preferred Centers for Disease Control and Prevention (CDC) and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Accepted 0.884409	Rejected 0.037111	Accepted 0.972461	Difficult Task: 0.007528 Moderate Task : -0.094557 Easy Task: -0.001301	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users preferring CDC were more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was accepted for difficult and easy task but rejected for a moderate task. The relationship a statistically significant only on case of moderate task.
H1.15: Users who preferred World Health Organization (WHO) would be less likely to share the misinformation post and add their views.	H1.15.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to share the misinformation post and add their views.	Chi-Square	Rejected 0.098976	Rejected 0.313217	Accepted 0.954927	Difficult Task : -0.085425 Moderate Task : -0.045746 Easy Task: 0.002130	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users preferring WHO were less likely to share misinformation posts and add their views. The NULL Hypothesis was rejected for a difficult and moderate task but accepted for an easy task. The relationship a statistically significant on case of difficult and moderate tasks.

H1.16: Users who preferred World Health Organization (WHO) would be less likely to share the misinformation post separately via other social media platform.	H1.16.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to share the misinformation post separately via other social media platform.	Chi-Square	Violated 0.925780	Violated 0.965898	Violated 0.343209	Difficult Task : -0.004823 Moderate Task : 0.001939 Easy Task: -0.035723	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users preferring WHO violated the relationship for sharing on other platforms. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H1.17: Users who preferred World Health Organization (WHO) would be more likely to report the encountered misinformation posts.	H1.17.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to report the encountered misinformation posts.	Chi-Square	Rejected 0.014699	Rejected 0.000010	Rejected 1.1927E-8	Difficult Task : 0.126323 Moderate Task : 0.200160 Easy Task: 0.214856	Difficult Task: No or negligible relationship Moderate Task : Weak positive relationship Easy Task: Weak positive relationship	Users preferring WHO were more likely to report encountered misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.18: Users who preferred World Health Organization (WHO) would be more likely to ignore	H1.18.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to ignore the	Chi-Square	Rejected 0.004916	Rejected 0.006421	Rejected 0.000231	Difficult Task : -0.145624 Moderate Task : -0.123630	Difficult Task: No or negligible relationship	Users preferring WHO were more likely to ignore misinformation on a platform. The NULL Hypothesis was rejected for all

the misinformation posted on a platform.	misinformation posted on a platform.					Easy Task: -0.138770	Moderate Task : No or negligible relationship Easy Task: No or negligible relationship	three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.19: Users who preferred World Health Organization (WHO) would be more likely to block users who post misinformation.	H1.19.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to block users who post misinformation.	Chi-Square	Rejected 0.282873	Rejected 0.230972	Rejected 0.270402	Difficult Task : 0.055604 Moderate Task : 0.054336 Easy Task: 0.041538	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users preferring WHO were more likely to block users posting misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.20: Users who preferred World Health Organization (WHO) would be more likely to request the source of information from the author.	H1.20.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to request the source of information from the author.	Chi-Square	Rejected 0.083619	Rejected 0.222015	Rejected 0.067980	Difficult Task : 0.089579 Moderate Task : 0.055394 Easy Task: 0.068788	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred World Health Organization (WHO) would be more likely to request the source of information from the author. T The NULL Hypothesis was rejected for all three tasks. The relationship is statistically

								significant for all three tasks difficult, moderate and easy tasks.
H1.21: Users who preferred World Health Organization (WHO) would be more likely to ask the author to refrain from sharing misinformation.	H1.21.0: There are no association between users who preferred World Health Organization (WHO) and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Violated 0.151323	Rejected 0.357840	Rejected 0.000626	Difficult Task: 0.151323 Moderate Task : 0.041709 Easy Task: 0.128900	Difficult Task: Moderate Task : No relationship Easy Task: No or negligible relationship	Users who preferred World Health Organization (WHO) would be more likely to ask the author to refrain from sharing misinformation. The test was violated in the difficult task because some cells had expected counts of less than 5. The NULL Hypothesis was rejected for the moderate and easy tasks. The relationship was statistically significant in the case of moderate and easy tasks.

Table 54: **Conservative/lean republican (Hypothesis 1)**

Hypothesis	NULL Hypothesis Test	Test	<i>P</i> Value*a Difficult Task	<i>P</i> Value*a Moderate Task	<i>P</i> Value*a Easy Task	Phi-coefficient*b	Significance Level	Interpretation

H1.22: Users who preferred Fox News would be more likely to share the misinformation post separately via other social media platforms	H1.22.0: There are no association between users who preferred Fox News and their reaction to share the misinformation post separately via other social media platforms	Chi-Square	Violated 0.163574	Violated 0.328012	Violated 0.111640	Difficult Task: 0.072135 Moderate Task : 0.044369 Easy Task: 0.059958	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Users who preferred Fox News would be more likely to share the misinformation post separately via other social media platforms. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H1.23: Users who preferred Fox News would be more likely to request the source of information from the author.	H1.23.0: There are no association between users who preferred Fox News and their reaction to request the source of information from the author.	Chi-Square	Accepted 0.747345	Rejected 0.449790	Rejected 0.022469	-0.016680 Moderate Task: 0.034282 Easy Task: 0.086019	Difficult Task: No relationship Moderate Task : No relationship Easy Task: Difficult Task : No relationship	Users who preferred Fox News were more likely to request the source of information from the author. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The

								relationship a statistically significant on case of moderate task and easy task.
H1.24: Users who preferred Fox News would be more likely to block users who post misinformation.	H1.24.0: There are no association between users who preferred Fox News and their reaction to block users who post misinformation.	Chi-Square	Accepted 0.978338	Accepted 0.805256	Rejected 0.019343	Difficult Task : 0.001406 Moderate Task: -0.011184 Easy Task: -0.088149	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred Fox News were more likely to block users posting misinformation. The NULL Hypothesis was accepted for a difficult and moderate task but rejected for an easy task. The relationship a statistically significant on case of easy task.
H1.25: Users who preferred Fox News would be more likely to ignore the misinformation posted on a platform.	H1.25.0: There are no association between users who preferred Fox News and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Accepted 0.545958	Rejected 0.245462	Rejected 0.424370	Difficult Task : -0.031265 Moderate Task: -0.052684 Easy Task: 0.030108	Difficult Task: No relationship Moderate Task : No relationship Easy Task:	Users who preferred Fox News were more likely to ignore misinformation on a platform. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and

							No relationship	easy task. The relationship a statistically significant on case of moderate task and easy task.
H1.26: Users who preferred Fox News would be more likely to share the misinformation post and add their views.	H1.26.0: There are no association between users who preferred Fox News and their reaction to share the misinformation post and add their views.	Chi-Square	Rejected 0.019299	Rejected 0.003157	Rejected 0.111904	Difficult Task : 0.121146 Moderate Task: 0.133906 Easy Task: 0.059914	Difficult Task: No or negligible relationship Moderate Task : No or negligible relationship Easy Task: No relationship	Users who preferred Fox News would be more likely to share the misinformation post and add their views. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.27: Users who preferred Fox News would be more likely to ask the author to refrain from sharing misinformation.	H1.27.0: There are no association between users who preferred Fox News and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Rejected 0.337036	Rejected 0.431998	Rejected 0.187805	Difficult Task : -0.049709 Moderate Task: 0.035644 Easy Task: 0.049640	Difficult Task: No relationship Moderate Task : No relationship Easy Task:	Users who preferred Fox News would be more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was

							No relationship	rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.28: Users who preferred Fox News would be more likely to report the encountered misinformation posts.	H1.28.0: There are no association between users who preferred Fox News and their reaction to report the encountered misinformation posts.	Chi-Square	Accepted 0.955617	Accepted 0.975049	Rejected 0.001681	Difficult Task : -0.002882 Moderate Task: -0.001419 Easy Task: -0.118398	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No or negligible relationship	Users who preferred Fox News were more likely to report encountered misinformation. The NULL Hypothesis was accepted for a difficult and moderate task but rejected for an easy task. The relationship a statistically significant on case of easy task.

Table 55: Democrats/lean liberal (Hypothesis 1)

Hypothesis	NULL Hypothesis Test	Test	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significance Level	Interpretation

H1.29: Users who preferred BBC would be more likely to share the misinformation post separately via other social media platforms.	H1.29.0: There are no association between users who preferred BBC and their reaction to share the misinformation post separately via other social media platforms.	Chi-Square	Violated 0.884038	Violated 0.899201	Violated 0.168224	Difficult Task: -0.007552 Moderate Task : 0.005746 Easy Task: 0.051933	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Users who preferred BBC would be more likely to share the misinformation post separately via other social media platforms. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H1.30: Users who preferred BBC would be more likely to request the source of information from the author.	H1.30.0: There are no association between users who preferred BBC and their reaction to request the source of information from the author.	Chi-Square	Rejected 0.068447	Rejected 0.400258	Accepted 0.839971	Difficult Task: 0.094342 Moderate Task: -0.038156 Easy Task: 0.007611	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred BBC were more likely to request the source of information from the author. The NULL Hypothesis was rejected for a difficult and moderate tasks but accepted for easy tasks. The relationship is statistically significant for

								difficult and moderate tasks.
H1.32: Users who preferred BBC would be more likely to block users who post misinformation.	H1.32.0: There are no association between users who preferred BBC and their reaction to block users who post misinformation.	Chi-Square	Rejected <i>0.015109</i>	Rejected <i>0.360777</i>	Rejected <i>0.034839</i>	Difficult Task: 0.125808 Moderate Task: 0.041455 Easy Task: 0.079532	Difficult Task : Moderate Task : No relationship Easy Task : No relationship	: Users who preferred BBC would be more likely to block users who post misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.33: Users who preferred BBC would be more likely to ignore the misinformation posted on a platform.	H1.33.0: There are no association between users who preferred BBC and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Rejected <i>0.135484</i>	Accepted <i>0.563303</i>	Rejected <i>0.045086</i>	Difficult Task: -0.077295 Moderate Task: -0.026216 Easy Task: -0.075523	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred BBC would be more likely to ignore the misinformation posted on a platform. The NULL Hypothesis was rejected for difficult and easy tasks and accepted for moderate task. The relationship a statistically significant on case of difficult and easy tasks.

H1.34: Users who preferred BBC would be more likely to share the misinformation post and add their views.	H1.34.0: There are no association between users who preferred BBC and their reaction to share the misinformation post and add their views.	Chi-Square	Rejected <i>0.149115</i>	Rejected 0.150052	Accepted 0.537245	Difficult Task: 0.074698 Moderate Task : 0.065290 Easy Task: 0.023253	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred BBC would be more likely to share the misinformation post and add their views. The NULL Hypothesis was rejected for a difficult and moderate tasks but accepted for easy tasks. The relationship is statistically significant for difficult and moderate tasks.
H1.35: Users who preferred BBC would be more likely to ask the author to refrain from sharing misinformation.	H1.35.0: There are no association between users who preferred BBC and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Rejected 0.068447	Rejected 0.054834	Rejected 0.485752	Difficult Task : 0.068447 Moderate Task : 0.087102 Easy Task : 0.026272	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred BBC would be more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically

								significant for all three tasks difficult, moderate and easy tasks.
H1.36: Users who preferred BBC would be more likely to report the encountered misinformation posts.	H1.36.0: There are no association between users who preferred BBC and their reaction to report the encountered misinformation posts.	Chi-Square	Accepted 0.955812	Accepted 0.644453	Accepted 0.720786	Difficult Task : -0.002869 Moderate Task : -0.020933 Easy Task : 0.013470	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred BBC were more likely to report encountered misinformation. The NULL Hypothesis was accepted for all tasks.
H1.38: Users who preferred CNN would be more likely to engage in discussion with the author of the post.	H1.38.0: There are no association between users who preferred CNN and their reaction to engage in discussion with the author of the post.	Chi-Square	Rejected 0.114417	Rejected 0.114417	Rejected 0.126589	Difficult Task: 0.081739 Moderate Task: 0.081739 Easy Task: 0.057577	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Users who preferred CNN would be more likely to engage in discussion with the author of the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

H1.37: Users who preferred CNN would be more likely to share the misinformation post separately via other social media platforms.	H1.37.0: There are no association between users who preferred CNN and their reaction to share the misinformation post separately via other social media platforms.	Chi-Square	Violated 0.906706	Accepted 0.708337	Accepted 0.560002	Difficult Task: -0.006068 Moderate Task : 0.016969 Easy Task: -0.021967	Difficult Task : Some cells have expected count less than 5. Moderate Task : No relationship Easy Task : No relationship	Users who preferred CNN would be more likely to share the misinformation post separately via other social media platforms. The test was violated for a difficult task, and the NULL Hypothesis accepted for an easy and moderate task.
H1.39: Users who preferred CNN would be more likely to request the source of information from the author.	H1.39.0: There are no association between users who preferred CNN and their reaction to request the source of information from the author.	Chi-Square	Rejected 0.230193	Accepted 0.674798	Accepted 0.903452	Difficult Task : 0.062126 Moderate Task: -0.019032 Easy Task: 0.004572	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred CNN would be more likely to request the source of information from the author. The NULL Hypothesis was rejected for difficult task and accepted for moderate task and easy task. The relationship is statistically significant on case of difficult task.
H1.40: Users who preferred CNN would be more likely to block users who post misinformation.	H1.40.0: There are no association between users who preferred CNN and their reaction to block users who post misinformation.	Chi-Square	Rejected 0.245598	Accepted 0.650538	Accepted 0.067706	Difficult Task : 0.060120 Moderate Task:	Difficult Task: No relationship Moderate Task :	Users who preferred CNN would be more likely to block users who post misinformation. The

						0.020549 Easy Task: 0.068856	No relationship Easy Task: No relationship	NULL Hypothesis was rejected for difficult task and accepted for moderate task and easy task. The relationship a statistically significant on case of difficult task.
H1.41: Users who preferred CNN would be more likely to ignore the misinformation posted on a platform.	H1.41.0: There are no association between users who preferred CNN and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Rejected 0.015480	Accepted 0.817039	Rejected 0.043374	Difficult Task : -0.125352 Moderate Task: -0.010494 Easy Task: -0.076135	Difficult Task: Moderate Task : No relationship Easy Task: No relationship	Users who preferred CNN would be more likely to ignore the misinformation posted on a platform. The NULL Hypothesis was rejected for difficult and easy tasks and accepted for moderate task. The relationship a statistically significant on case of difficult and easy tasks.
H1.42: Users who preferred CNN would be more likely to share the misinformation post and add their views.	H1.42.0: There are no association between users who preferred CNN and their reaction to share the misinformation post and add their views.	Chi-Square	Accepted 0.913816	Accepted 0.762731	Rejected 0.199358	Difficult Task : -0.005604 Moderate Task: 0.013694 Easy Task: 0.048369	Difficult Task: No relationship Moderate Task : No relationship	Users who preferred CNN would be more likely to share the misinformation post and add their views. The NULL Hypothesis was accepted for a difficult and

							Easy Task: No relationship	moderate task but rejected for an easy task. The relationship a statistically significant on case of easy task.
H1.43: Users who preferred CNN would be more likely to ask the author to refrain from sharing misinformation.	H1.43.0: There are no association between users who preferred CNN and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Rejected 0.345458	Rejected 0.131530	Accepted 0.835931	Difficult Task : 0.048849 Moderate Task: 0.068409 Easy Task: 0.007805	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred CNN would be more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was rejected for a difficult and moderate tasks but accepted for easy tasks. The relationship is statistically significant for difficult and moderate tasks.
H1.44: Users who preferred CNN would be more likely to report the encountered misinformation posts.	H1.44.0: There are no association between users who preferred CNN and their reaction to report the encountered misinformation posts.	Chi-Square	Rejected 0.022776	Rejected 0.370287	Rejected 0.194221	Difficult Task : 0.117907 Moderate Task: 0.040641 Easy Task: 0.048927	Difficult Task: Moderate Task : No relationship Easy Task: No relationship	Users who preferred CNN would be more likely to report the encountered misinformation posts. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically

								significant for all three tasks difficult, moderate and easy tasks.
H1.46: Users who preferred New York Times would be more likely to share the misinformation post separately via other social media platforms	H1.46.0: There are no association between users who preferred New York Times and their reaction to share the misinformation post separately via other social media platforms	Chi-Square	Violated <i>0.143719</i>	Violated 0.262352	Accepted 0.935898	Difficult Task: -0.075704 Moderate Task : Easy Task: 0.003031	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : No relationship	Users who preferred New York Times would be more likely to share the misinformation post separately via other social media platforms. The test was violated in the difficult and moderate tasks because some cells had expected counts of less than 5. The NULL Hypothesis was Accepted for the easy task.
H1.47: Users who preferred New York Times would be more likely to request the source of information from the author.	H1.47.0: There are no association between users who preferred New York Times and their reaction to request the source of information from the author.	Chi-Square	Rejected 0.474461	Rejected 0.168719	Rejected 0.077421	Difficult Task : 0.037034 Moderate Task: 0.062432 Easy Task: 0.066553	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to request the source of information from the author. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H1.48: Users who preferred New York Times would be more likely to block users who post misinformation.	H1.48.0: There are no association between users who preferred New York Times and their reaction to block users who post misinformation.	Chi-Square	Rejected 0.066072	Rejected 0.222181	Rejected 0.291115	Difficult Task : 0.095164 Moderate Task: 0.055374 Easy Task: 0.039787	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to block users who post misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H1.49: Users who preferred New York Times would be more likely to ignore the misinformation posted on a platform.	H1.49.0: There are no association between users who preferred New York Times and their reaction to ignore the misinformation posted on a platform.	Chi-Square	Rejected 0.073604	Rejected 0.422227	Rejected 0.073955	Difficult Task : -0.092634 Moderate Task: -0.036405 Easy Task: -0.067346	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to ignore the misinformation posted on a platform. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

H1.50: Users who preferred New York Times would be more likely to share the misinformation post and add their views.	H1.50.0: There are no association between users who preferred New York Times and their reaction to share the misinformation post and add their views.	Chi-Square	Rejected 0.174202	Rejected 0.230590	Accepted 0.798955	Difficult Task : -0.070357 Moderate Task: -0.054381 Easy Task: -0.009599	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to share the misinformation post and add their views. The NULL Hypothesis was rejected for a difficult and moderate tasks but accepted for easy tasks. The relationship is statistically significant for difficult and moderate tasks.
H1.51: Users who preferred New York Times would be more likely to ask the author to refrain from sharing misinformation.	H1.51.0: There are no association between users who preferred New York Times and their reaction to ask the author to refrain from sharing misinformation.	Chi-Square	Rejected 0.251919	Rejected 0.472352	Rejected 0.147180	Difficult Task : -0.059322 Moderate Task: -0.032599 Easy Task: 0.054632	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to ask the author to refrain from sharing misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

H1.52: Users who preferred New York Times would be more likely to report the encountered misinformation posts.	H1.52.0: There are no association between users who preferred New York Times and their reaction to report the encountered misinformation posts.	Chi-Square	Accepted 0.719807	Accepted 0.861609	Rejected 0.135906	Difficult Task : 0.018574 Moderate Task: -0.007908 Easy Task: 0.056202	Difficult Task: No relationship Moderate Task : No relationship Easy Task: No relationship	Users who preferred New York Times would be more likely to report the encountered misinformation posts. The NULL Hypothesis was accepted for a difficult and moderate task but rejected for an easy task. The relationship a statistically significant on case of easy task. '

H2: Individuals' agreement with misinformation posts depends on the type of information sources they rely on.

Table 56 : Individuals' agreement with misinformation posts depends on the type of information sources they rely on (Hypothesis 2)

H2: Individuals' agreement with misinformation posts depends on the type of information sources they rely on.								
Hypothesis	NULL Hypothesis Test	Test Statistics	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretation

H2a: individuals relying on Newspapers to verify information on social media platforms more likely to be able to identify misinformation.	H2a: There are no association between individuals relying on Newspapers to verify information on social media platforms and their ability to identify misinformation.	Chi-Square	Rejected 0.000287	Rejected 0.444224	Rejected 0.000007	Difficult Task: 0.144638 Moderate Task: 0.060626 Easy Task: 0.170054	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	individuals relying on Newspapers to verify information on social media platforms more likely to be able to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H2b: individuals relying on academic journals to verify information on social media platforms more likely to be able to identify misinformation.	H2b: There are no association between individuals relying on academic journals to verify information on social media platforms and their ability to identify misinformation.	Chi-Square	Rejected 0.284189	Rejected 0.267666	Rejected 0.418863	Difficult Task: 0.070434 Moderate Task: 0.071591 Easy Task: 0.062066	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	individuals relying on academic journals to verify information on social media platforms more likely to be able to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H2c: individuals relying on Books to verify information on social media platforms more likely to be able to identify misinformation.	H2c: There are no association between individuals relying on Books to verify information on social media platforms and their ability to identify misinformation.	Chi-Square	Rejected 0.212216	Rejected 0.043493	Rejected 0.000285	Difficult Task: 0.075825 Moderate Task: 0.098431 Easy Task: 0.144700	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No or negligible relationship	individuals relying on Books to verify information on social media platforms more likely to be able to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H2d: individuals relying on Aggregated news websites (e.g. Google News) to verify information on social media platforms more likely to be able to identify misinformation.	H2d: There are no association between individuals relying on Aggregated news websites (e.g. Google News) to verify information on social media platforms and their ability to identify misinformation.	Chi-Square	Rejected 0.190091	Rejected 0.162922	Rejected 0.000037	Difficult Task: 0.077713 Moderate Task: 0.080247 Easy Task: 0.159042	Difficult Task : No relationship Moderate Task : No relationship Easy Task :	individuals relying on Aggregated news websites (e.g. Google News) to verify information on social media platforms more likely to be able to identify misinformation. The NULL Hypothesis was

							No or negligible relationship	rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H2e: individuals relying on Magazines to verify information on social media platforms more likely to be able to identify misinformation.	H2e: There are no association between individuals relying on Magazines to verify information on social media platforms and their ability to identify identify misinformation.	Chi-Square	Accepted 0.932288	Rejected 0.000294	Rejected 0.000004	Difficult Task: 0.028871 Moderate Task: 0.144476 Easy Task: 0.173604	Difficult Task : No relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	individuals relying on Magazines to verify information on social media platforms more likely to be able to identify misinformation. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship a statistically significant on case of moderate task and easy task.
H2f: individuals relying on Government websites to verify information on social media platforms more likely to be able to identify misinformation.	H2f: There are no association between individuals relying on Government websites to verify information on social media platforms and their ability to identify misinformation.	Chi-Square	Rejected 0.315173	Rejected 0.002037	Rejected 0.000313	Difficult Task: 0.068361 Moderate Task: 0.129033 Easy Task: 0.144003	Difficult Task : No relationship Moderate Task :	individuals relying on Government websites to verify information on social media platforms more likely to be able to identify

							No or negligible relationship Easy Task : No or negligible relationship	misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

H3: Individuals' reactions to misinformation depends on their level of agreement with misinformation.

Table 57 : Individuals' reactions to misinformation depends on their level of agreement with misinformation (Hypothesis 3)

H3: Individuals' reactions to misinformation depends on their level of agreement with misinformation.									
Hypothesis	NULL Hypothesis Test	Test Statistics	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretation	
H3.1 Individuals are more likely to engage in a discussion with the author if they agree with the post.	There is no association between individuals' agreement with a post and their reaction to engaging in a discussion with the author.	Chi-Square	Rejected 0.036928	Rejected 0.000014	Rejected 0.000090	Difficult Task: 0.100379 Moderate Task: 0.165328 Easy Task: 0.153044	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals are more likely to engage in a discussion with the author if they agree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,	

								moderate and easy tasks.
H3.2 Individuals are more likely to share the post and add their view if they agree with the post.	There is no association between individuals' agreement with a post and their reaction to share the post and add their view.	Chi-Square	Rejected 5.6756E-18	Rejected 1.1262E-14	Rejected 3.4297E-31	Difficult Task: 0.292935 Moderate Task: 0.265434 Easy Task: 0.383258	Difficult Task : Weak positive relationship Moderate Task : Weak positive relationship Easy Task : Moderate positive relationship	Individuals are more likely to share the post and add their view if they agree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H3.3 Individuals are more likely to ask the author for the information source if they disagree with the post.	There is no association between individuals' agreement with a post and their reaction to ask the author for the information source.	Chi-Square	Accepted 0.771812	Rejected 0.002576	Rejected 2.5724E-7	Difficult Task: 0.042175 Moderate Task: 0.127007 Easy Task: 0.189071	Difficult Task : No relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals are more likely to ask the author for the information source if they disagree with the post. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship is statistically significant on the case of

								moderate task and easy task.
H3.4 Individuals are more likely to ask the author of the post not to share it if they disagree with the post.	There is no association between individuals' agreement with a post and their reaction to ask the author of the post not to share it.	Chi-Square	Rejected 0.069963	Rejected 0.000282	Rejected 0.001704	Difficult Task: 0.069963 Moderate Task: 0.144790 Easy Task: 0.130547	Difficult Task : No relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals are more likely to ask the author of the post not to share it if they disagree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H3.5 Individuals are more likely to tag an expert or friend to make them aware of this post if they agree with the post.	There is no association between individuals' agreement with a post and their reaction to tag an expert or friend to make them aware of this post.	Chi-Square	Rejected 0.000377	Rejected 4.321E-8	Rejected 7.2774E-16	Difficult Task: 0.142585 Moderate Task: 0.198624 Easy Task: 0.275687	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	Individuals are more likely to tag an expert or friend to make them aware of this post if they agree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H3.6 Individuals are more likely to share the post separately via other social media platforms if they agree with the post.	There is no association between individuals' agreement with a post and their reaction to share the post separately via other social media platforms.	Chi-Square	Rejected 7.3949E-16	Rejected 7.4971E-17	Rejected 2.5842E-35	Difficult Task: 0.275628 Moderate Task: 0.283900 Easy Task: 0.407244	Difficult Task : Weak positive relationship Moderate Task : Weak positive relationship Easy Task : Strong positive relationship	Individuals are more likely to share the post separately via other social media platforms if they agree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H3.7 Individuals are more likely to report misinformation post to the social media platform if they disagree with the post.	There is no association between individuals' agreement with a post and their reaction to report misinformation post to the social media platform.	Chi-Square	Rejected 0.000004	Rejected 3.8522E-11	Rejected 2.8504E-16	Difficult Task: 0.173411 Moderate Task: 0.232148 Easy Task: 0.279105	Difficult Task : No or negligible relationship Moderate Task : Weak positive relationship Easy Task : Weak positive relationship	Individuals are more likely to report misinformation post to the social media platform if they disagree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H3.8 Individuals are more likely to block the user who shared the misinformation post if they disagree with the post.	There is no association between individuals' agreement with a post and their reaction to block the user who shared the misinformation post.	Chi-Square	Rejected 0.000239	Rejected 2.1333E-21	Rejected 3.5459E-20	Difficult Task: 0.146006 Moderate Task: 0.318894 Easy Task: 0.309901	Difficult Task : No or negligible relationship Moderate Task : Moderate positive relationship Easy Task : Moderate positive relationship	Individuals are more likely to block the user who shared the misinformation post if they disagree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy t'sks.
H3.9 Individuals are more likely to use the snooze option to snooze the user who shared the misinformation post if they disagree with the post.	There is no association between individuals' agreement with a post and their reaction to snooze the user who shared the misinformation post.	Chi-Square	Rejected 0.002376	Rejected 7.3777E-8	Rejected 0.002243	Difficult Task: 0.127709 Moderate Task: 0.195813 Easy Task: 0.128209	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals are more likely to use the snooze option to snooze the user who shared the misinformation post if they disagree with the post. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy t'sks.

								significant for all three tasks difficult, moderate and easy tasks.
H3.10 Individuals are more likely to ignore a post if they agree with it.	There is no association between individuals' agreement with a post and their reaction to ignore a post.	Chi-Square	Rejected 0.004989	Rejected 1.1659E-7	Rejected 3.7411E-7	Difficult Task: 0.121078 Moderate Task: 0.193373 Easy Task: 0.186997	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals are more likely to ignore a post if they agree with it. 'The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

The impact of attitudes on identifying and reacting to misinformation

H4: Individuals' personal attitudes towards social media can affect how they respond to misinformation.

Table 58: Individuals' personal attitudes toward's social media can affect how they respond to misinformation (Hypothesis 4)

H4: Individuals' personal attitudes towards social media can affect how they respond to m'sinformation.								
Hypothesis	NU'L Hypothesis Test	Test Statistics	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretation
H4.1: Individuals' perceptions of social media's trustworthiness during COVID-19 affect their likelihood of sharing the	H4.1.0: There is no association between Individuals' perceptions of	Chi-Square	<i>Violated</i> 0.672193	<i>Violated</i> 0.024476	<i>Violated</i> 0.058784	Difficult Task: 0.079327 Moderate Task:	Difficult Task : Some cells have expected	Individuals' perceptions of social media's trustworthiness during COVID-19

misinformation post and adding their views.	social media's trustworthiness during COVID-19 and sharing the misinformation post and adding their views.					0.151761 Easy Task: 0.113658 General Reactio': 0.228604	count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	affect their likelihood of sharing the misinformation post and adding their views. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H4.2: Individual's views on social media's capability to handle COVID-19 affect their likelihood of reporting the misinformation posts encountered on the platform.	H4.2.0: There is no association between individuals' views on social media's capability to handle COVID-19 and reporting the misinformation posts encountered on the platform.	Chi-Square	Violated 0.066031	Violated 0.477340	Accepted 0.118939	Difficult Task: 0.153685 Moderate Task: 0.084905 Easy Task: 0.12114 General Reaction: 0.109533	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected	Individuals' views on social media's capability to handle COVID-19 affect their likelihood of reporting the misinformation posts encountered on the platform. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks' This is because the test is

							count less than 5. Easy Task :	violated across all tasks, due to some cells having expected counts of less than 5. NULL Hypothesis was accepted for easy task.
H4.3: Individuals' perceptions of social media's trustworthiness during COVID-19 affect their likelihood of tagging a friend or expert to inform them about a false post.	H4.3.0: There is no association between individuals' perceptions of social media's trustworthiness during COVID-19 and tagging a friend or expert to inform them about a false post.	Chi-Square	Violated 0.028967	Violated 0.000060	Violated 0.254239	Difficult Task: 0.170121 Moderate Task: 0.225056 Easy Task: 0.087086 General Reaction: 0.226735	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Individuals' perceptions of social media's trustworthiness during COVID-19 affect their likelihood of tagging a friend or expert to inform them about a false post. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H4.4: Individuals' agreement with the notion that social media platforms intentionally provide	H4.4.0: There is no association between individuals'	Chi-Square	Violated 0.233534	Violated 0.024437	Violated 0.062345	Difficult Task: 0.122215 Moderate Task:	Difficult Task : Some 'ells have	Individuals' agreement with the notion that social media p'atforms

mi'information during the COVID-19 pandemic affects their inclination to use the snooze feature to mute users who posted misinformation on the platform.	agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic and using the snooze feature to mute users who posted misinformation on the platform.					0.151786 Easy Task: 0.112756 General Reaction: 0.094624	expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5. General Reaction: No relationship	intentionally 'rovide misinformation during the COVID-19 pandemic affects their inclination to use the snooze feature to mute users who posted misinformation on the platform.'
H4.5: Individuals' 'iews on social media's capability to handle COVID-19 affect their willingness to discuss with authors of misinformation posts.	H4.5.0: There is no association between Individuals' views on social media's capability to handle COVID-19 and discuss with authors of	Chi-Square	Violated 0.016087	Violated 0.016692	Violated 0.000279	Difficult Task: 0.180677 Moderate Task: 0.157725 Easy Task: 0.173838 General Reacti'n:	Difficult 'ask :	Individuals' views on social media's capability to handle COVID-19 affect their willingness to discuss with authors of misinformation posts. The relationship can not 'e determined for all

	misinformation posts.					0.223811	Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H4.6: Individuals' perceptions of social media's trustworthiness during COVID-19 affect their inclination to ignore the posted misinformation on the platform.	H4.6.0: There is no association between individuals' perceptions of social media's trustworthiness during COVID-19 and their ignoring the posted misinformation on the platform.	Chi-Square	Violated 0.004472	Rejected 0.029574	Violated 0.114581	Difficult Task: 0.201290 Moderate Task: 0.148697 Easy Task: 0.102772 General Reaction: 0.239535	Difficult Task : Some cells have expected count less than 5. Moderate Task : No or negligible relationship Easy Task : Some cells have expected	Individuals' perceptions of social media's trustworthiness during COVID-19 affect their inclination to ignore the posted misinformation on the platform. The relationship can not be determined for: difficult, and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5. The

							count less than 5.	NULL Hypothesis was rejected for moderate task. The relationship is statistically significant for moderate task.
H4.7: Individuals' agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic affects an individual's likelihood of tagging a friend or expert to inform them about a false post.	H4.7.0: There is no association between individuals' agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic and tagging a friend or expert to inform them about a false post.	Chi-Square	Violated 0.196947	Violated 0.303504	Violated 0.759143	Difficult Task: 0.127142 Moderate Task: 0.099852 Easy Task: 0.051577 General Reaction: 0.131444	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Individuals' agreement with the notion that social media platforms intentionally provide misinformation during the COVID-19 pandemic affects an individual's likelihood of tagging a friend or expert to inform them about a false post. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H4.8: Individuals' views on social media's capability to handle COVID-19 affect	H4.8.0: There is no association between	Chi-Square	Violated 0.317652	Violated 0.095239	Accepted 0.988421	Difficult Task: 0.112448	Difficult Task :	Individuals' views on social media's capability to handle

their inclination to use the snooze feature to mute users who posted misinformation on the platform.	individuals' views on social media's capability to handle COVID-19 and using the snooze feature to mute users who posted misinformation on the platform.					Moderate Task: 0.12751' Easy Task: General 'eaction: 0.086155	Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : No relationship	COVID-19 affect their inclination to use the snooze feature to mute users who posted misinformation on the platform. The relationship can not be determined for di'ficult and moderate ta'ks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5. NULL Hypothesis was accepted for easy task.
H4.9: Individuals' v'ews on social media's 'apability to handle COVID-19 affect their willingness to ask the author of the misinformation post for the information source.	H4.9.0: There is no association between individuals' views on social media's capability to handle COVID-19 and asking the author of the misinformation post for the information source.	Chi-Square	Violated 0.767485	Violated 0.377873	Violated 0.148590	Difficult Task: 0.069992 Moderate Task: 0.093112 Easy Task: 0.098059 General Reaction:'0.206447	Difficult Tas' : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5.	Individuals' views on social media's capability to handle COVID-19 affect their willingness to ask the author of the misinformation post for the information source. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all

							Easy Task : Some cells have expected count less than 5.	tasks, due to some cells having expected counts of less than 5.
H4.10: Individuals who believe social media platforms intentionally provide misinformation during the pandemic are less likely to report misinformation posts encountered on the platform.	H4.10.0: There is no association between individuals who believe social media platforms intentionally provide misinformation during COVID-19 and reporting misinformation posts encountered on the platform.	Chi-Square	<i>Violated</i> 0.598154	<i>Violated</i> 0.531085	<i>Violated</i> 0.199885	Difficult Task: 0.086074 Moderate Task: 0.080661 Easy Task: 0.092243 General Reaction: 0.094713	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Individuals who believe social media platforms intentionally provide misinformation during the pandemic are less likely to report misinformation posts encountered on the platform.
H4.11: Individuals who perceive social media as trustworthy during COVID-	H4.11.0: There is no association between	Chi-Square	<i>Violated</i> 0.669009	<i>Violated</i> 0.496814	<i>Violated</i> 0.957255	Difficult Task: 0.079623	Difficult Task :	Individuals who perceive social media as

19 are more likely to use the snooze feature to mute users who posted misinformation.	individuals who perceive social media as trustworthy during COVID-19 and using the snooze feature to mute users who posted misinformation.					Moderate Task: 0.083359 Easy Task: 0.030404 General Reaction: 0.103750	Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	trustworthy during COVID-19 are more likely to use the snooze feature to mute users who posted misinformation. The relationship can not be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.

H4.12: Individuals who agree with the notion that social media platforms intentionally provide misinformation during the pandemic are more likely to block users who post misinformation on the platform.	H4.12.0: There is no association between individuals who agree with the notion that social media platforms intentionally provide misinformation during COVID-19 and blocking users who post misinformation on the platform.	Chi-Square	Violated 0.399330	Violated 0.754197	Accepted 0.706681	Difficult Task: 0.104197 Moderate Task: 0.062521 Easy Task: 0.055369 General Reaction: 0.025791	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : No relationship	Individuals who agree with the notion that social media platforms intentionally provide misinformation during the pandemic are more likely to block users who post misinformation on the platform. The relationship can not be determined for difficult and moderate tasks' This is because the test is violated across all tasks, due to some cells having expected counts of less than 5. NULL H'pothesis was accepted for easy task.

H5: Individuals' personal attitudes towards social media can affect their ability to identify misinformation

Table 59: Individuals' personal attitudes towards 'ocial media can affect their ability to identify misinformation (Hypothesis 5)

H5: Individuals' personal attitudes towards social media can affect their ability to identif' misinformation								
Hypothesis	'ULL Hypothesis Test	Test Statistics	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretat'on

H5a: Individual's perception of social media's trustworthiness during COVID-19 affect their ability to identify misinformation .	There is no association between individuals perception of social media's trustworthiness during COVID-19 and their ability to identify misinformation .	Chi-Square	Rejected 1.4749E-9	Rejected 3.1036E-0	Rejected 2.5557E-29	Diffic'lt Task: 0.271430 Moderate Task: 0.278229 Easy Task: 0.418500	Difficult Task : Weak positive relationship Moderate Task : Weak positive relationship Easy Task :	Individual's perception of social media's trustworthiness during COVID-19 affect their ability to identify misinformation . The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H5b: Individuals who agree that social media platforms serve as a hub for COVID-19 news from reputable sources but fail to provide the information they need may struggle to identify misinformation.	There is no association between individuals who agree that social media platforms serve as a hub for COVID-19 news from reputable sources but fail to provide the information they need and their ability to identify misinformation .	Chi-Square	Rejected 0.049821	Rejected 0.000735	Rejected 9.6672E-8	Difficult Task: 0.161079 Moderate Task: 0.199034 Easy Task: 0.251843	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	Individuals who agree that social media platforms serve as a hub for COVID-19 news from reputable sources but fail to provide the information they need may struggle to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H5c: Individual's perception of social media platforms' capability to deal with COVID-19 pandemic affect their ability to identify misinformation.	There is no association between individuals' perception of social media platforms' capability to deal with COVID-19 pandemic and their ability to identify misinformation.	Chi-Square	Rejected <i>0.000047</i>	Rejected <i>1.3009E'10</i>	Rejected <i>2.4181E-20</i>	Difficult Task: 0.217616 Moderate Task: 0.281922 Easy Task: 0.361049	Difficult Task : Weak positive relationship Moderate Task : Weak positive relationship Easy Task :	Individual's perception of social media platforms' capability to deal with COVID-19 pandemic affect their ability to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H5d: Individual's agreement with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic affect their ability to identify misinformation.	There is no association between individual's agreement with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic and their ability to identify misinformation.	Chi-Square	Rejected <i>0.000331</i>	Rejected <i>9.4828E'12</i>	Rejected <i>1.0325E-22</i>	Difficult Task: 0.204754 Moderate Task: 0.292660 Easy Task: 0.377241	Difficult Task : Weak positive relationship Moderate Task : Weak positive relationship Easy Task :	Individual's agreement with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic affect their ability to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically

								significant for all three tasks difficult, moderate and easy tasks.
H5e: Individual's agreement with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 affect an individual's ability to identify misinformation.	There is no association between individual's agreement with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 and their ability to identify misinformation.	Chi-Square	Rejected 0.000740	Rejected 7.4554E-7	Rejected 1.4569E-7	Difficult Task: 0.198992 Moderate Task: 0.241392 Easy Task: 0.249798	Difficult Task : No or negligible relationship Moderate Task : Weak positive relationship Easy Task : Weak positive relationship	Individual's agreement with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 affect an individual's ability to identify misinformation.'The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.

Th' impact of background factors on to misinformation reaction and the ability to identify misinformation

H6: Individuals' background factors affect their ability to identify misinformation

H6: Individuals' background factors affect their ability to identify 'isinformation								
Hypothesis	NULL Hypothesis Test	Test Statistics	P Value*a	P Value*a	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretation

			Difficult Task	Mod'rate Task				
H6.1: Individuals' age affect their ability to identify misinformation	H6.1.0: There is no association between individual's age and their ability to identify misinformation.	Chi-Square	Rejected <i>0.240607</i>	Rejected <i>0.665266</i>	Rejected <i>0.842177</i>	Difficult Task' 0.180042 Moderate Task: 0.154825 Easy Task: 0.142484	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	Individuals' age affect their ability'to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically'significant for all three tasks difficult, moderate and easy tasks.
H6.2: Individuals' education levels affect their ability to identify misinformation	H6.2.0: There is no association between individual's education and their ability to identify misinformation.	Chi-Square	Rejected <i>0.026808</i>	Rejected <i>0.265523</i>	Rejected <i>0.000211</i>	Difficul' Task: 0.220187 Moderate Task: 0.189858 Easy Task: 0.258999	Difficult Task : Weak positive relationship Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	Individuals' education levels affect their ability'to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically 'ignificant for all three tasks difficult, moderate and easy tasks.
H6.3: Individuals' employment status affect their ability to identify misinformation	H6.3.0: There is no association between individual's employment status and their ability to identify misinformation.	Chi-Square	Rejected <i>0.282484</i>	Rejected <i>0.020651</i>	Rejected <i>0.015400</i>	Difficult T'sk: 0.164629 Moderate Task: 0.198965	Difficult Task : No or negligible relationship	Individuals' employment status affect their ability to identify misinformation.'The NULL Hypothesis was

						Easy Task: 0.201840	Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	rejected for all three tasks. The relationship is statistically significant f'r all three tasks difficult, moderate and easy tasks.
Table Error! Unknown switch argument.: Individuals' background factors affect their ability to identify misinformation (Hypothesis 6)								

H7: Individuals' background factors affect their reactions to misinformation.

Table 61: Individuals' background factors affect their reactions to misinformation (Hypothesis 7)

H7: Individuals' background factors affect their reactions to misinformation.										
Hypothesis	N'LL Hypothesis Test	Test Statistics	P Value*a General Reaction	P Value*a Difficult Task	P Value*a Moderate Task	P Value*a Easy Task	Phi-c'efficient*b	Significant Level	Interpretation	
H7.1: Individuals' age affects their likelihood of sharing the misinformation post and adding their views.	H7.1.0: There is no association between individual's age and sharing the misinformation post and adding their views.	Chi-Square	0.142013	Violated 0.828798	Violated 0.734183	Violated 0.984023	General Reaction: 0.103789 Difficult Task: 0.097699 Moderate Task: 0.734183 Easy Tas': 0.045368	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task :	Individuals' age affects their likelihood of sharing the misinformation post and adding their views. The relationship can n't be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells h'ving	

								Some cells have expected count less than 5.	expected counts of less than 5.
H7.2: Individuals' age affects their likelihood of reporting the misinformation posts encountered on the platform.	H7.2.0: There is no association between individual's age and reporting the misinformation posts encountered on the platform.	Chi-Square	<i>0.206818</i>	<i>Violated</i> <i>0.646716</i>	<i>Violated</i> <i>0.327947</i>	<i>Violated</i> <i>0.823194</i>	General Reaction: 0.097757 Difficult Task: 0.117029 Moderate Task: 0.128724 Easy Task: 0.071632	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5. No relationship	Individuals' age affects their likelihood of reporting the misinformation posts encountered on the platform. The relationship can n't be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H7.3: Individuals' age affect their willingness to discuss with authors of misinformation posts.	H7.3.0: There is no association between individual's age and discussing with authors of misinformation posts.		<i>0.000032</i>	<i>Violated</i> <i>0.807606</i>	<i>Violated</i> <i>0.901806</i>	<i>Violated</i> <i>0.266460</i>	General Reaction: 0.179242 Difficult Task: 0.100325	Difficult Task : Some cells have expected count less than 5.	Individuals' age affect their willingness to discuss with authors of misinformation posts. The relationship can n't be determined for all three tasks:

							Moderate Task: 0.076070 Easy Task: 0.111878	Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.
H7.4: Individuals' education levels affect their willingness to discuss with authors of misinformation posts.	H7.4.0: There is no association between individual's education levels and discussing with authors of misinformation posts.	Chi-Square	0.012411	Violated 0.623124	Violated 0.323882	Violated 0.832637	General Reaction: 0.138669 Difficult Task: 0.129086 Moderate Task: 0.137754 Easy Task: 0.077818	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Individuals' education levels affect their willingness to discuss with authors of misinformation posts. The relationship can n't be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.

H7.5: Individuals' age affects their willingness to ask the author of the misinformation post for the information source.	H7.5.0: There is no association between individual's age and asking the author of the misinformation post for the information source.	Chi-Square	0.040012	Violated 0.575990	Violated 0.779538	Violated 0.457048	General Reaction: 0.120413 Difficult Task: 0.123545 Moderate Task: 0.090745 Easy Task: 0.097805	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5. Easy Task : Some cells have expected count less than 5.	Individuals' age affects their willingness to ask the author of the misinformation post for the information source. The relationship can n't be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells hav'ng expected counts of less than 5.
H7.6: Individuals' education levels affect their willingness to block users who post misinformation on the platform.	H7.6.0: There is no association between individual's education levels and blocking users who post misinformation on the platform.	Chi-Square	0.719040	Violated 0.860795	Violated 0.148067	Violated 0.950687	General Reaction: 0.072671 Difficult Task: 0.103025 Moderate Task: 0.148999 Easy Task: 0.062157	Difficult Task : Some cells have expected count less than 5. Moderate Task : Some cells have expected count less than 5.	Individuals' education levels affect their willingness to block users who post misinformation on the platform. The relationship can n't be determined for all three tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some

								Easy Task : Some cells have expected count less than 5.	cells h'ving expected counts of less than 5.
H7.7: Individuals' employment status affect their willingness to ignore the posted misinformation on the platform.	H7.7.0: There is no association between individual's employment status and ignoring the posted misinformation on the platform.	Chi-Square	0.002307	Viol'ted 0.871097	Violated 0.554428	Violated 0.663675	General Reaction: 0.141996 Difficult Task: 0.081481 Moderate Task: 0.100591 Easy Task: 0.076278	Difficult Task : Moderate Task : Easy Task :	Individuals' employment status affect their willingness to ignore the posted misinformation on the platform. The relationship can not be determined for all thr'e tasks: difficult, moderate and easy tasks. This is because the test is violated across all tasks, due to some cells having expected counts of less than 5.

The mpact of the verfication approaches used on the ability to identify misinformation

H8: The way individuals verify information affects their ability to identify misinformation

Table 62: The way individuals verify information affects th'ir ability to identify misinformation (Hypothesis 8)

H8: The way individuals verify information affects their ability to identify misinformation									
Hypothesis	NULL Hypothesis Test	Test Statistics	P Value*a	P Value*a	P Value*a Easy Task	Phi-coefficient*b	Significant Level	Interpretation	

			Difficult Task	Moderate Task				
H8.1: Individuals who generally verify information by checking if the information conforms their understanding of the topic will be more likely to identify misinformation.	H8.1.0: There is no association between verifying the information by checking if the information conforms to the understanding of the topic and the ability to identify misinformation.	Chi-Square	Rejected <i>0.003121</i>	Rejected <i>0.036348</i>	Rejected <i>0.390135</i>	Difficult Task: <i>0.125321</i> Moderate Task: <i>0.100564</i> Easy Task: <i>0.063735</i>	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No relationship	Individuals who generally verify information by checking if the information conforms their understanding of the topic will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.2: Individuals who generally verify information by looking at the user original profile to see if they can trust the information will be more likely to identify misinformation.	H8.2.0: There is no association between verifying the information by looking at the user original profile to see if the information can be trusted and the ability to identify misinformation.	Chi-Square	Accepted <i>0.768718</i>	Accepted <i>0.706156</i>	Rejected <i>0.059789</i>	Difficult Task: <i>0.042373</i> Moderate Task: <i>0.046166</i> Easy Task: <i>0.094488</i>	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Individuals who generally verify information by looking at the user original profile to see if they can trust the information will be more likely to identify misinformation. The NULL Hypothesis was accepted for difficult task and

								rejected for moderate task and easy task. The relationship a statistically significant on case of moderate task and easy task
H8.3: Individuals who generally verify information by searching to see whether the post has been shared or mentioned on other posts or social media platforms will be more likely to identify misinformation.	H8.3.0: There is no association between verifying the information by searching to see whether the post has been shared or mentioned on other posts or social media platforms and the ability to identify misinformation.	Chi-Square	Rejected <i>0.075678</i>	Rejected <i>0.312237</i>	Rejected <i>0.000561</i>	Difficult Task: 0.091417 Moderate Task: 0.068553 Easy Task: 0.139541	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No or negligible relationship	Individuals who generally verify information by searching to see whether the post has been shared or mentioned on other posts or social media platforms will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.4: Individuals who generally verify information by looking at the number of shares that the post obtained will be more likely to identify misinformation.	H8.4.0: There is no association between verifying the information by looking at the number of shares that the post obtained and the ability to identify misinformation.	Chi-Square	Rejected <i>0.020599</i>	Rejected <i>0.000003</i>	Rejected <i>5.5965E-14</i>	Difficult Task: 0.106951 Moderate Task: 0.176037	Difficult Task : No or negligible relationship	Individuals who generally verify information by looking at the number of shares that the post

						Easy Task: 0.259234	Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	obtained will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.5: Individuals who generally verify information by looking at the quality of the picture will be more likely to identify misinformation.	H8.5.0: There is no association between verifying the information by looking at the quality of the picture and the ability to identify misinformation.	Chi-Square	Rejected 0.236734	Rejected 0.209920	Rejected 0.002225	Difficult Task: 0.073877 Moderate Task: 0.076015 Easy Task: 0.128278	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No or negligible relationship	Individuals who generally verify information by looking at the quality of the picture will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.6: Individuals who generally verify information by looking at the number of likes that the post obtained	H8.6.0: There is no association between verifying the information by looking at the number of likes that the	Chi-Square	Rejected 0.036975	Rejected 0.032663	Rejected 1.8397E-7	Difficult Task: 0.100364	Difficult Task :	Individuals who generally verify information by looking at the

will be more likely to identify misinformation.	post obtained and the ability to identify misinformation.					Moderate Task: 0.101807 Easy Task: 0.190906	No or negligible relationship Moderate Task : No or negligible relationship Easy Task : No or negligible relationship	number of likes that the post obtained will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.7: Individuals who generally verify information by looking at other people's replies and discussions about the post to see whether they make valid arguments will be more likely to identify misinformation.	H8.7.0: There is no association between verifying the information by looking at other people's replies and discussions about the post to see whether they make valid arguments and the ability to identify misinformation.	Chi-Square	Accepted 0.608826	Rejected 0.042244	Rejected 0.230021	Difficult Task: 0.051623 Moderate Task: 0.098782 Easy Task: 0.074397	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Individuals who generally verify information by looking at other people's replies and discussions about the post to see whether they make valid arguments will be more likely to identify misinformation. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship a statistically significant on case

								of moderate task and easy task.
H8.8: Individuals who generally verify information by one of their trusted experts will be more likely to identify misinformation.	H8.8.0: There is no association between verifying the information by one of their trusted experts and the ability to identify misinformation.	Chi-Square	Rejected <i>0.000027</i>	Rejected <i>0.000001</i>	Rejected <i>1.7172E-13</i>	Difficult Task: 0.161284 Moderate Task: 0.181304 Easy Task: 0.254803	Difficult Task : No or negligible relationship Moderate Task : No or negligible relationship Easy Task : Weak positive relationship	Individuals who generally verify information by one of their trusted experts will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.9: Individuals who generally verify information by using search engines to conduct some basic research will be more likely to identify misinformation.	H8.9.0: There is no association between verifying the information by using search engines to conduct some basic research and the ability to identify misinformation.	Chi-Square	Rejected <i>0.000183</i>	Rejected <i>4.3848E-9</i>	Rejected <i>1.14E-26</i>	Difficult Task: 0.147956 Moderate Task: 0.210183 Easy Task: 0.355040	Difficult Task : No or negligible relationship Moderate Task : Weak positive relationship Easy Task : Moderate positive relationship	Individuals who generally verify information by using search engines to conduct some basic research will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult,

								moderate and easy tasks.
H8.10: Individuals who generally verify information by looking at peer-reviewed research papers will be more likely to identify misinformation.	H8.10.0: There is no association between verifying the information by looking at peer-reviewed research papers and the ability to identify misinformation.	Chi-Square	Rejected 0.469447	Rejected 0.172769	Rejected 0.104783	Difficult Task: 0.059217 Moderate Task: 0.079297 Easy Task: 0.086925	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Individuals who generally verify information by looking at peer-reviewed research papers will be more likely to identify misinformation. The NULL Hypothesis was rejected for all three tasks. The relationship is statistically significant for all three tasks difficult, moderate and easy tasks.
H8.11: Individuals who generally verify information with one of their trusted friends will be more likely to identify misinformation.	H8.11.0: There is no association between verifying the information with one of trusted friends and the ability to identify misinformation.	Chi-Square	Accepted 0.616140	Rejected 0.399165	Rejected 0.108108	Difficult Task: 0.051223 Moderate Task: 0.063206 Easy Task: 0.086477	Difficult Task : No relationship Moderate Task : No relationship Easy Task : No relationship	Individuals who generally verify information with one of their trusted friends will be more likely to identify misinformation. The NULL Hypothesis was accepted for difficult task and rejected for moderate task and easy task. The relationship a statistically

								significant on case of moderate task and easy task.

The impact of encountering misinformation on 'titudes towards the social media

H9: Encountering misinformation on social media affects individuals' attitudes towards the platforms.

Table 63: Encountering misinformation on social media affects individuals' attitudes towards the platforms (Hypothesis 10)

H9: Encountering misinformation on social media affects individuals' attitudes towards the platforms.						
Hypothesis	NULL Hypothesis Test	Test Statistics	P Value*a	Phi-coefficient*b	Significant Level	Interpretation
H9.1: Encountering misinformation on social media can make individuals feel uncomfortable on these platforms.	H9.1.0: There is no association between encountering misinformation on social media and feeling uncomfortable on these platforms.	Chi-Square	Violated 1.0173E-16	0.334556	Some cells have expected count less than 5.	Encountering misinformation on social media can make individuals feel uncomfortable on these platforms. The relationship can not be determined because the test is violated, due to some cells having expected counts of less than 5.
H9.2: Individual's perception of social media's trustworthiness during COVID-19 will be affected when they are encountering misinformation on social media.	H9.2.0: There is no association between individual's perception of social media's trustworthiness during COVID-19 and encountering misinformation on social media.	Chi-Square	Violated 3.4286E-31	0.429566	Some cells have expected count less than 5.	Individual's perception of social media's trustworthiness during COVID-19 will be affected when they are encountering misinformation on social media. The

						relationship can not be determined because the test is violated, due to some cells having expected counts of less than 5.
H9.3: Individual's perception of social media platforms' capability to deal with COVID-19 pandemic will be effected when they are encountering misinformation on social media.	H9.3.0: There is no association between individual's perception of social media platforms' capability to deal with COVID-19 and encountering misinformation on social media.	Chi-Square	Violated 1.2291E-20	0.363285	Some cells have expected count less than 5.	Individual's perception of social media platforms' capability to deal with COVID-19 pandemic will be effected when they are encountering misinformation on social media. The relationship can not be determined because the test is violated, due to some cells having expected counts of less than 5.
H9.4: Individual will be more likely to agree with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic when they are encountering misinformation on social media.	H9.4.0: There is no association between individuals who agree with the notion that social media platform intentionally provide misinformation during the COVID-19 and encountering misinformation on social media.	Chi-Square	Violated 1.4936E-26	0.402030	Some cells have expected count less than 5.	Individual will be more likely to agree with the notion that social media platform intentionally provide misinformation during the COVID-19 pandemic when they are encountering misinformation on

						social media. The relationship can not be determined because the test is violated, due to some cells having expected counts of less than 5.
H9.5: Individual will be more likely to agree with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 when they are less encountering misinformation on social media.	H9.5.0: There is no association between individuals who agree with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 and encountering misinformation on social media.	Chi-Square	Violated <i>7.6562E-7</i>	0.241371	Some cells have expected count less than 5.	Individual will be more likely to agree with the notion that social media platform makes efforts to correct or remove misinformation during COVID-19 when they are less encountering misinformation on social media. The relationship can not be determined because the test is violated, due to some cells having expected counts of less than 5.
H9.6: Individual will be more likely to agree with the notion that social media platform do not really enforce their policy for sharing misinformation with violators when they are encountering misinformation on social media.	H9.6.0: There is no association between individuals who agree with the notion that social media platform do not really enforce their policy for sharing misinformation with violators and encountering misinformation on social media.	Chi-Square	Rejected <i>0.006848</i>	0.181171	No or negligible relationship	Individual will be more likely to agree with the notion that social media platform do not really enforce their policy for sharing misinformation with violators when they

						are encountering misinformation on social media. The NULL Hypothesis was rejected. The relationship a statistically significant.

Appendix (D) Ethics Approval Letters



Downloaded: 02/08/2021
Approved: 02/08/2021

Ahmed Alnuhayt
Registration number: 190198295
Information School
Programme: PhD in Information studies

Dear Ahmed

PROJECT TITLE: Understanding Interactions between Social Networks with Misinformation during Health Crises
APPLICATION: Reference Number 040023

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 02/08/2021 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 040023 (form submission date: 20/07/2021); (expected project end date: 10/01/2023).
- Participant information sheet 1091451 version 3 (15/07/2021).
- Participant consent form 1091447 version 3 (20/07/2021).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Paul Reilly
Ethics Administrator
Information School

Please note the following responsibilities of the researcher in delivering the research project:

- The project must abide by the University's Research Ethics Policy:
<https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/approval-procedure>
- The project must abide by the University's Good Research & Innovation Practices Policy:
https://www.sheffield.ac.uk/polopoly_fs/1.6710661/file/GRIPPolicy.pdf
- The researcher must inform their supervisor (in the case of a student) or Ethics Administrator (in the case of a member of staff) of any significant changes to the project or the approved documentation.
- The researcher must comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.
- The researcher is responsible for effectively managing the data collected both during and after the end of the project in line with best practice, and any relevant legislative, regulatory or contractual requirements.



Downloaded: 10/01/2022
Approved: 10/01/2022

Ahmed Alnuhayt
Registration number: 190198295
Information School
Programme: PhD in Information studies

Dear Ahmed

PROJECT TITLE: Understanding Interactions between Social Networks with Misinformation during Health Crises
APPLICATION: Reference Number 044062

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 10/01/2022 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 044062 (form submission date: 03/01/2022); (expected project end date: 10/01/2023).

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Peter Bath
Ethics Administrator
Information School

Please note the following responsibilities of the researcher in delivering the research project:

- The project must abide by the University's Research Ethics Policy: <https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/approval-procedure>
- The project must abide by the University's Good Research & Innovation Practices Policy: https://www.sheffield.ac.uk/po/po/poly_fs/1.6710661/file/GRIIPPolicy.pdf
- The researcher must inform their supervisor (in the case of a student) or Ethics Administrator (in the case of a member of staff) of any significant changes to the project or the approved documentation.
- The researcher must comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.
- The researcher is responsible for effectively managing the data collected both during and after the end of the project in line with best practice, and any relevant legislative, regulatory or contractual requirements.