Intra-audience effect:

A quantitative exploration of the predictors and outcomes of the social experience of live and digital concerts

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August 2022

i.i Abstract

The focus of this thesis is the social experience of Western art music concerts. Previous research has identified social bonding as one of the primary functions of music, and social interaction is often found to be at the heart of music consumption. However, prior to this work, there was no psychometrically validated method of capturing the social experience in a quantitative way; therefore, the first objective in this thesis was to develop and validate such a tool.

Subsequently this tool was used to explore the social experience of various live concerts in the North of England, and in Berlin, and it was found that the social experience of a concert influences the overall enjoyment of the event, but not specific emotional responses to the musical stimuli. Following the proliferation of digital presentations of music, which burgeoned during the COVID-19 pandemic, we sought to compare the social experience of live and digital concerts, and to explore whether a social experience can be facilitated or enhanced by manipulating certain parameters of the digital mode. The results indicate that while participants perceive a live concert to be more social, it is possible to amplify the social experience of digital concerts through mechanisms such as facilitating interaction between participants. In addition, we found that participants' expectations of the concert moderated the extent to which they rated the experience as social, and that those who reported having a more social experience also experienced an increase in positive mood.

To further develop these results, in a third study, we looked at whether other interindividual characteristics predict the extent to which participants have a social experience at Western art music concerts and found that trait extraversion and agreeableness were significantly influential. This was based on data collected in response to a virtual reality presentation of the same stimuli as the second study. Since there is little previous research on this topic, we also explored participants' experience of the presentation of a concert in this way using a more pragmatic, mixed methods approach, combining both quantitative and qualitative data collection and analysis.

Overall, the findings in this thesis contribute to the understanding of the social experience of the consumption of Western art music in various settings, including the factors that can predict the collective experience, and how it subsequently influences participants' engagement, enjoyment, and responses to concerts in various presentations.

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ii.i Author’s declaration

I declare that this thesis is a presentation of original work, and that I am the sole author. The work has not previously been presented for an award at this, or any other University. All sources are acknowledged as References.

ii.ii Publications and presentations

The publications and presentations listed In Table 1 are based on material from this thesis.

Table 1. The table shows published contributions and the thesis chapter to which they correspond

Publication	**Chapter**
i.vi.i Peer-reviewed publications	
O'Neill, K., & Egermann, H. (2022). Development of the Social Experience of a Concert Scales (SECS): The social experience of a live Western art music concert influences people's overall enjoyment of an event but not their emotional response to the music. *Music & Science.* https://doi.org/10.1177/20592043221106478	Chapter 1
Wald-Fuhrmann, M., Egermann, H., Czepiel, A., O'Neill, K., ... & Tröndle, M. (2021). Music listening in classical concerts: Theory, literature review, and research program. *Frontiers in Psychology*, *12*, 1324. https://doi.org/10.3389/fpsyg.2021.638783	General Project
i.vi.ii Peer-reviewed conferences contributions with published abstracts	
O'Neill, K., & Egermann, H. (2022). Intra-audience effects: The social experience of a live Western art music concert influences people's overall enjoyment of the event but not the emotional response to the music [Paper Presentation]. Musical Togetherness Symposium, University of Music and Performing Arts. Vienna	Chapter 1
O'Neill, K., & Egermann, H. (2021). Intra-audience effects: The social experience of a live Western art music concert influences people's overall enjoyment of the event but not the emotional response to the music [Poster Presentation]. *International Conference on Music*	Chapter 1 and 2

Perception and Cognition (ICMPC) and European Society for the Cognitive Sciences of Music (ESCOM), Sheffield Hub.	
O'Neill, K., & Egermann, H. (2020). *There is safety in numbers: Applying theories of social bonding to a live, Western Art Music concert audience* [Paper Presentation]. SysMus Conference, York Music Psychology Group, University of York	Chapter 1
O'Neill, K., & Egermann, H. (2019). *Testing the influence of intra-audience interaction on emotional responses to a live classical concert* [Paper Presentation]. SysMus Conference, SRH Hochschulen Berlin GmbH	Chapter 1
Egermann, H., O'Neill, K., Kayser, D., Wald-Fuhrmann, M., Tolle, J., Merril, J., Weining, C., Tröndle, M. (2019). *Measuring the audience experience: How can we capture audience experience with quantitative and qualitative methods?* [Panel Presentation]. Audience Research in the Arts conference, University of Sheffield	General Project

i.vi.iii Other conference contributions

O'Neill, K. (2022). Social facilitation in live and digital presentations of a concert [Paper Presentation]. PhD symposium, Experimental Research Project, Berlin	Chapter 2
O'Neill, K. (2021). Validation of Social Experience of a Concert Scale (SECS), Movement Synchrony and Social bonding in a concert [Paper Presentation]. PhD symposium, Experimental Research Project, Berlin	Chapter 1
O'Neill, K. (2020). Can we apply theories of social bonding to a live, Western art music concert audience [Paper Presentation]? Postgraduate Research Forum, Department of Music University of York, York.	Chapter 1

O'Neill, K. (2020) *Experimental concert variations [Poster Presentation].* Postgraduate Research Forum, Department of Music University of York, York.	General Project
O'Neill, K. (2016 – present). Various spoken presentations. York Music Psychology Group research colloquium; Music Education Forum	Various sections of thesis

i.v.iv Media

Egermann, H., O'Neill, K. & Kayser, D. (2019). Music Matter, Lab live! 'Exploring an audience's emotional response to live music in the Music Matters Lab, following an orchestral concert at Sage, Gateshead [Radio Interview]. BBC Radio 3, Free Thinking Festival. Broadcast 30.03.2019.	Chapter 1, Pre-study

ii.iii Preface

This thesis was funded by the *Volkswagon Stiftung*, through the Experimental Concert Research Project, and the Digital Concert Research Project (Egermann, Wald-Fuhrmann, Tschacher & Tröndle, 2018 – 2023). The project was conceived as a way to address the so-called *Classical concert crisis* and the decay of Western art music audiences, and explore novel ways of presenting concerts. To address this, project partners worked in collaboration with the York Music Psychology Group, the Max Plank Institute for Empirical Aesthetics, University of Bern, Zeppelin University, The RadialSystem, Aventis Foundation, and the Pierre Boulez Saal.

The ambitious project sought to apply a multi-method, interdisciplinary approach to studying the concert experience including ethnographical, empirical, and experimental methods. Qualitative and quantitative data at various levels was obtained from a range of high-quality, naturalistic, but carefully constructed and varied concert situations. More specifically, data was collected via quantitative questionnaires, completed before and after the concert, observational data, video-based analysis of movement in the audience, the automated detection of emotional facial expressions, a continuous recording of physiological responses in the audience (including heart rate, skin conductance and respiration), and of acoustic expressions from the audience (i.e., laughing, clapping, fidgeting).

The project commenced in 2018, and the main phase of data collection was due to be pilot tested in April 2020, and completed in June 2020. Of course, this was not possible due to the closure of concert halls and social distancing mandates implemented due to the COVID-19 pandemic. The revised timeline saw the pilot data collection take place in September 2020, albeit with social distancing and enforced mask wearing. This data contributes to Chapter 3 of this thesis. The full series of concerts and data collection occurred in April and May 2022; however, the data from these events does not appear in this thesis.

Due to the uncertainty of when the full series of live concerts would be able to take place, the Digital Concert Experience project was developed in the interim to explore many of the same research questions, but in relation to various digital presentations of the same

Western art music concert. The data from the pilot live concerts, and the digital concerts are explored and analysed in the third and fourth chapters of this thesis. Further investigation of the live concert variations will take place and contribute to future publications.

Further details about these projects can be found on their respective websites:

https://experimental-concert-research.org/?lang=en

https://digital-concert-experience.org/?lang=en

To be part of such a prestigious and ambitious project affords many privileges, from access to specialist equipment, funding, participant recruitment, and working as part of an interdisciplinary team with a wealth of expertise. However, there are also limitations. A significant limitation that I would like to address at the start of the thesis is the focus on Western art music. In many ways, this remains the music that is deemed 'worthy' of being studied, and yet it can neither be said to represent the appetite of 21st Century audiences, nor the breadth of music that has been produced across the world and throughout history. This thesis displays a significant lack of equality, diversity, and inclusion in the types of music that are studied, and the demographics of the audience. Therefore, the poignancy with which the focus on Western art music is highlighted throughout does not serve to headline this genre, but rather to acknowledge that the findings of this research should not be assumed to apply to different concert presentations that are associated with different genres, diverse audiences, and a range of time periods.

In many ways, the knowledge discussed in this thesis serves only to explain the status quo. However, it is my sincere hope that the knowledge of how to facilitate the social experience of a concert, and how to make music more accessible through technology will be used to help music evolve and continue to serve ***all*** members of future generations of audiences.

ii.iv Acknowledgements

Hauke Egermann – without whom I would not have the opportunity, skill, knowledge, experience, or ability to complete this thesis.

The *Volkswagon Stiftung*, and the Experimental Concert Research Team – In particular Christian Weining, Deborah Meier and Anna Cziepiel.

Caroline Waddington-Jones and Liz Haddon – for their careful and thoughtful advice as my internal examiners, mentors and friends.

Friends, colleagues and students at the University of York and the University of Lincoln – for their support, guidance, and advice.

Innumerable friends, but in particular Lottie Brooke (the CSB to my KON) with whom I dipped my toe into Music Psychology, and Hannah Rodger (the Tweedledum to my Tweedledee) with whom I dipped my toe into music scholarship all those years ago.

The participants of each of the studies described herein, who gave their time, and thus made essential contributions to the completion of this work.

Mum and dad, Steve, and of course LHP, to whom I owe my sanity, health, and happiness.

ii.v List of Abbreviations

AHEC Arts and Humanities Ethics Committee

ANOVA Analysis of Variance

BBC British Broadcasting Corporation

BFI Big Five Inventory

CFA Confirmatory Factor Analysis

CFI Comparative Fit Index

COVID-19 Corona Virus Disease 2019

DCE Digital Concert Experience

df Degrees of Freedom

DoP Depth of Processing

DV Dependant Variable

ECR Experimental Concert Research

EFA Exploratory Factor Analysis

GBP Great British Pounds

GCSE General Certificate of Secondary Education

GDPR General Data Protection Regulation

GEMIAC Geneva Music-Induced Affect Checklist (Coutinho & Scherer, 2017).

GEMS Geneva Emotion Music Scale (Zentner, 2008)

GmbH Gesellschaft mit beschränkter Haftung (company with limited liability)

H Hypothesis

HMD Head Mounted Display

HRTF Head-Related Transfer Function

IGIM In-Group Identification Measure (Leech et al., 2008)

ITR Item Response Theory

IV Independent Variable

JASP Jeffreys's Amazing Statistics Program

KMO Kaiser-Meyer-Olkin

MANOVA multivariate analysis of variance test

MPA Music Performance Anxiety

MPS Multimodal Presence Scale for Virtual Reality Environments

MSA Measure of Sampling Accuracy

N Full sample

n Subsample

NA Negative Activation

No. Number

OIS Other in Self (Aron, 1992)

p Probability (significance)

PA Positive Activation

PANAS Positive and Negative Affect Schedule (Watson, et al., 1988)

partial η2 Partial Eta Squared

PGCE Post-Graduate Certificate of Education

PSI Parasocial interaction

RCI Relationship Closeness Inventory

RQ Research Question

RSMEA Root Mean Square Error Approximation

SECS Social Experience of a Concert Scales (O'Neill & Egermann, 2022)

Self-Def Self-Definition

SEM Strong Experiences with Music

SLSS Social Live-Streaming Services

SPSS Statistical Package for Social Sciences

SRMR Standardized root mean square residual

STOMP Short Test of Musical Preferences (Rentfrow & Gosling, 2003)

TLI Tucker-Lewis Index

URL Uniform Resource Locator

VA Valence

VE Virtual Experience

VR Virtual Reality

Wilk's Λ Wilk's Lambda

X^2 Chi squared

YMPG York Music Psychology Group

PANAVA-KS Positive Activation, Negative Activation and Valence - *Kurz-Skala* (Short form) (Schallberger, 2005)

Chapter 1

General Introduction

1.1 Overview of the thesis

It has been suggested that social bonding is one of the fundamental evolutionary purposes of music (Huron, 2001). Social experience is often considered to be a key motivating factor for engaging with leisure activities and attendance at music concerts is no exception (Beard & Ragheb, 1983; Pitts, 2005). Live music consumption typically implies the presence of other people and co-presence is a key feature in the expanded frame-music-listener model (Wald-Fuhrmann et al., 2021), as a factor which contributes to the overall aesthetic experience of a concert. Despite this, Western art music concerts are still predominantly presented in ways which limit social interaction among audience members (Kulczynski et al., 2016) and, until recently, there has been limited interest in measuring the collective or social experience of live concerts in a quantitative way. Therefore, in this PhD a new measure was developed and validated to capture this information. This was subsequently used to explore and compare the social experience of a live string quintet concert, and various digital presentation of the same stimuli.

This thesis is presented in five chapters. Three studies are discussed within Chapters 2, 3, and 4. Prior to this, in the general introduction a theoretical framework is established (Chapter 1), and the final chapter includes a general discussion, in which more general implications, application, and limitations are considered, as well as suggestions for future research. The following serves as an extended abstract in which the methods and findings of each are briefly described.

1.1.1 Study 1: Development of the Social Experience of a Concert Scales.

Previous research has found that a significant motivation to make and consume music is the collective or social experience of the act (Freeman, 2000; Kreutz, 2014; Savage et al., 2015; Tarr et al., 2014). Despite the emphasis often placed on the social functions of music, there has been limited interest in measuring the collective or social experience of live concerts in a

quantitative way. Therefore, in this study, we created and validated a new measure of the social experience of a concert, based on theories of parasocial interaction and in-group bonding. These theories will be discussed in detail in sections 1.2.3 and 1.2.5.

In a pilot study, 103 participants were recruited across two concert settings. An extensive list of 65 items was used to measure the social experience of the concerts which were taken from the Parasocial Interaction Scale (Schramm & Hartmann, 2019) and In-group Identification Measure (Leach et al., 2008). Based on the results, the measurement scale was reduced to 22 items based on the internal consistency of items, to reduce fatigue effects influencing the results of such a long scale.

In the main study, a further 113 participants were recruited at several concerts with a range of musical genres. Participants provided self-ratings of their social experience, emotional response, enjoyment, and demographic information in a paper survey. Based on the results of exploratory and confirmatory factor analysis we were able to further reduce the number of items in the Social Experience of a Concert Scales (SECS) to 17 validated statements representing a five-factor model: Depth of Processing, Attention, Solidarity, Satisfaction, and Self-Definition. Using multivariate analysis of variance (MANOVA), we tested the influence of these factors on the emotional response of participants to the music and found that they are not significant predictors; however, the social experience of a concert was found to have a significant influence on enjoyment.

Thus, we developed and validated the first quantitative measure of the social experience of a Western art music concert. Our results also suggest that the emotional response to music and the overall experience of a concert are separate and that only the latter can be influenced by the social experience of a concert.

1.1.2 Study 2: Exploring the social experience of live and digitally presented concerts.

As part of the large scale Experimental Concert Research project, and Digital Concert Experience, the previously validated SECS was used to measure and compare the social experience of a concert presented live, and subsequently in various digital modalities. The

musical stimuli for this research were a classical chamber music concert including repertoire by Ludwig van Beethoven (op. 104), Brett Dean ("Epitaphs") and Johannes Brahms (op. 111). These works were performed by a string quintet and the live performance (*n* = 140) was professionally recorded and used as the stimulus in the digital variations of the study. These included the full concert presented on-demand (*n* = 133), a shorter version of the concert on-demand (*n* = 143), the concert presented with social interaction facilitation (*n* = 107), and an on-demand stream of the concert with a pre-talk from Brett Dean, the composer (*n* = 144). Participants were allocated to one of the digital conditions based on their interest and engagement with previous digital concerts.

The results suggest that the social experience of a live concert is significantly greater than that of an on-demand digital presentation of the same concert, particularly the amount of attention paid to other audience members and the satisfaction in being part of the audience reported by participants. In addition to this, the social setting facilitated a more social experience than other digital settings, based on the self-reported data.

Analysis showed that participants who reported high levels of bonding and solidarity with the rest of the audience experienced a significant increase in positive activation and valence, and a significant decrease in negative affect, captured with the Positive Activation, Negative Activation, Valence short scale (PANAVA-KS Schallberger, 2005; Schreiber & Jenny, 2020). Those who rated their satisfaction at being a part of the audience as higher experienced a significant increase in positive activation and a significant increase in valence. Finally, participants who paid more attention to other members of the audience experienced a significant increase in negative activation.

These findings suggest that, while it may not be possible to replicate the experience of the live or physical presence of others in digital concert consumption, manipulations in the presentation of streamed concerts can facilitate a more social experience. When coupled with the increased accessibility, affordability, and convenience of this type of music consumption compared to traditional live events, this may have exciting implications for the future of Western art music concerts.

1.1.3 Study 3: Exploring the social influence of co-presence and immersion in virtual reality concerts.

As seen in the previous study, digital engagement with Western art music concerts does not ellicit a social experience to the extent that live presentations of the same music achieves. It is often suggested that mediated or mediatised performances typically do not recreate the authenticity and presence that concert goers expect or seek (Charron, 2017). However, virtual reality (VR) is increasingly being used in various sectors to mitigate these limitations; for example, gaming, sports, medicine, military training and more (see Ball et al., 2020). When used well, virtual reality can create a more immersive and active experience for users (Bouckaert, 2021; Shin et al., 2019), with particular emphasis on increased presence and immersion. Despite this, there is limited research that explores the use of virtual reality to present concerts; therefore, this chapter includes an exploratory investigation of the topic.

In the final study discussed in this thesis we sought to explore the general experience of virtual reality presentations of a Western art music concert, and whether personality predicts enjoyment of this mode of engagement. More specifically we looked at the extent to which a virtual experience is considered social by participants and whether this is predicted by any interindividual characteristics. Finally, we tested whether perceived presence predicts the social experience of a virtual reality Western art music concert.

To do so, 50 participants were presented the same stimuli as in Study 2 (Beethoven, op. 104; Brett Dean, “Epitaphs”; Brahms, op. 111) in virtual reality. A monoscopic 360° VR recording was professionally produced, based on the live string quintet concert. This was then presented to participants using an Oculus Quest 2 head mounted display, with ambisonic sound, via headphones. Participants were seated on a revolving, office style chair and invited to explore the concert space from their vantage point, at the front of the stage. Since there is little previous research on the subject, a series of open questions were included to explore the general experience, both positive and negative, of the virtual reality concert. The SECS was once again employed to capture the social experience of

participants, and the PANAVA to measure change in mood, in addition to the multimodal presence scale (MPS, Makransky at al., 2017), and the brief version of the Big Five Personality Inventory (BFI-10, Rammstedt & John, 2007).

The findings suggest that the overall experience of a virtual reality concert can be categorised into a model in which concert factors and the overall user experience combine to contribute the experience of immersion and presence. Personality was found to predict the enjoyment of a Western art music concert presented in this way, specifically extraversion, agreeableness, and openness to new experiences. Social presence, and physical presence predict the extent to which participants rated the concert as providing a social experience, based on the MPS and SECS. These results significantly contribute to the field of research on virtual reality and music.

1.1.4 Original contribution to knowledge of the field

Throughout this thesis, the influence of physical presence, synchronous co-presence, asynchronous co-presence, and social presence are explored with a view to contributing to the field of audience research and informing future presentations of Western art music. An entirely new and original tool for capturing the social experience of a concert has been psychometrically validated in live, digital, and virtual reality contexts. The thesis also provides the most controlled and systematic comparison of the social experience of live, and various digital presentations of the same concert available, including ways to enhance or facilitate the collective experience. Finally, this provides one of the most significant studies on the presentation of Western art music in virtual reality to date.

1.2 Literature review

Each of the study based chapters of this thesis (Chapters 2, 3, and 4) contain an overview of the relevant literature that has informed the methods and research questions of each. In this section, some of the universally relevant theories and previous findings will be discussed.

1.2.1 Social Bonding as an evolutionary function of music.

The ubiquity of music throughout history and cultures suggests that it serves a biological, or evolutionary function (Blacking & Nettl, 1995; Wallin et al., 2001). While there are many theories of what that might be, from an evolution of animal song and phonocoding (Marler & Slabbekoorn, 2004), to a method of communication (Merker, 1999), the suggestion that music is a bonding mechanism between conspecifics is of greatest interest and relevance in this thesis. The view that music can be considered as a coevolved system for social bonding is an underlying function that to an extent unifies all other suggestions of why humans make music, including mate identification and selection, infant-parent bonding, and group cohesion (Savage et al., 2020). While there may be cultural variances in aesthetic appreciation for musical features, group performance and consumption is, in some ways, universal (Brown & Jordania, 2013; Mehr et al., 2018; Savage et al., 2015). Among the musical universals proposed by Brown and Jordania were the behavioural observations that "music is mostly produced by groups rather than individuals" and "music coordinates and emotionally unites groups of people" (2013, p. 241) thus reinforcing the social importance of the activity. Bannan (2012) proposed that music allowed individuals to become more group orientated, once group sizes had become too large for grooming to fulfil this purpose alone. Further to this, singing, dancing and drumming were all found to elicit endorphin release, (Dunbar et al., 2012), which has a positive effect on social bonding (Weinstein et al., 2016). Cross (2001) has gone as far as to state that music is "essential in … the development of capacities for flexible social interaction" (p.99). Music might create or maintain social cohesion by contributing to group solidarity, promoting altruism, and so increasing the

effectiveness of collective actions such as defending against a predator, or resource identification and collection (Huron, 2001).

There are two ways in which music has been suggested to influence social bonding. The first is through group effort, whereby music might contribute to the coordination of group work, such as pulling a heavy object through synchrony and entrainment effects (Huron, 2001). The shared goal of making music can also be seen as a method of co-action which has been found to have a bonding effect. However, the act of doing a task with others does not entirely explain this phenomenon, as bonding has been found to occur when consuming music as well as creating it (Boer et al., 2011; Nummenmaa et al., 2021; Rentfrow, 2012; Tarr et al., 2014). This will be further explored in the following section.

1.2.2 The presence of others and music consumption

Music consumption takes place in many different contexts, many of which are social and occur in the presence of others (North & Hargreaves, 2008). Social influence can manifest in many ways; for example, the influence of peer groups on music preference (Inglefield, 1972; Webster & Hamilton, 1981), the evolutionary benefits of social bonding induced by music (Cross, 2009; Freeman, 2000) and, specifically relating to emotional responses, the aforementioned emotion contagion and empathy mechanisms (Juslin & Västfjäll, 2008; Scherer & Zentner, 2001). Previous research on the influence that others can have on emotional responses has been studied, insofar as their presence can have a moderative effect on the cognitive appraisal that causes an emotion response (Scherer, 2005).

The highly ritualised experience of concert attendance seems to result in a collective effervescence (Durkheim, 2016) a theory that has previously been applied to sports fandom (Cottingham, 2012). Collective effervescence can be understood to be the intensification of an experience through sharing it with others (Durkheim, 2016). Cottingham (2012) originally applied the term collective effervescence to religious events as it was suggested to result in higher moral standards. However, it more generally acts as a symbol of social relationship and has been purported to enhance group bonding. For a ritual to form, there must be a

group assembly, in which physical co-presence is achieved. The mutual focus of attention and shared mood are intensified by a common action, including stereotyped formalities, and a short-term emotional stimulus (Heider & Warner, 2010). Previous research has applied the model to music contexts; for example, Vandenberg et al. (2021) explored whether livestreamed concerts conduce feelings of social solidarity and resilience when physical gatherings are impossible. Their focus was on livestreamed electronic music, specifically rave music events in the Netherlands (Vandenberg et al., 2021); however, the theory has also been applied to festivals (Berkers & Michael, 2017; Liebst, 2019), and sacred music (Heider & Warner, 2010; Schüler, 2017). While less demonstrable, the ritualised format of a typical, or at least traditional Western art music concert is well documented (Burland & Pitts, 2016; Toelle & Sloboda, 2021; Wald-Fuhrmann et al., 2021); therefore, it is possible that this collective effervescence would also be seen in such contexts.

Motivated by the closure of concert venues due to the COVID-19 pandemic (Hansen et al., 2021), researchers have also considered the ways in which the social experience is influenced by the liveness of a concert. It has been found that different motivations and interindividual characteristics influence the extent to which a participant is moved during virtual presentations of a concert, compared to live streamed events (Swarbrick et al., 2021). In this study, participants were invited to recall a live streamed concert, and compare their present experience of a digitally presented performance to the memory. Based on their results, researchers concluded that social connection was correlated with the experience of being moved by the music, and that empathic concern predicted both variables. Intuitively, live streamed concerts were found to have been perceived by participants as being more social than those that were pre-recorded. However, it should be noted that the reliance on the participants' memory and the inability to compare the same musical stimuli in this study introduce possible limitations to the design.

Onderdijk et al. (2021) developed this further by comparing various modes of digital presentation of a concert: live streamed via YouTube, via Zoom, and a 360^{o} recording presented either on a standard screen, or a head mounted display. They found that perceived physical presence predicted connectedness, both with the musician and audience,

but that co-presence, or the perception of virtual others, only predicted connectedness with other audience members. Also, physical presence was more likely to be perceived in stimuli presented in virtual reality, compared to the other digital modes.

When consuming music in the presence of others there are several figures who can influence the listening experience including those involved with the music production, and other consumers. They can have an influence on the experience without being able to converse with the listener in anyway. This type of interaction is explored further in the section below.

1.2.3 Parasocial interaction

A defining feature of typical or traditional Western art music concerts is the expectation that the audience will in no way influence the concert experience of others (Burland & Pitts, 2016). A key element of this schemata is that audience members should not communicate with each other, at least verbally, during the concert. Social relationships are built on familiarity and judgements of interactions, and yet through the continuation of concert etiquette this is prohibited. Therefore, any relationship that forms can be conceived of as parasocial.

A parasocial interaction is a defined by a one-way flow of information. Originally developed to describe the interaction of a television character and a viewer (Horton & Wohl, 1956), either real or fictional, in which the viewer receives information from the character, but there is no way of responding. The lack of interaction between the parties does not prevent the viewer from feeling that they have a relationship with the media figure, and it has been suggested that a good television presenter or performer is able to create the illusion of intimacy with the viewer, thus drawing them into the onscreen action and inducing the secretion of the relationship enhancing hormone oxytocin (Tian & Yoo, 2015). This can be seen particularly clearly in chat-show formats, in which the presenter often speaks directly to the camera, inferring that what they are saying is directed solely to the viewer.

In many ways parasocial relationships are easier and less demanding than social relationships as there is no sense of permanency or obligation of effort on the part of the viewer as they can withdraw at any moment by choosing to stop watching the character on the screen. However, some researchers have argued that the power lays not with the viewer, but rather with the persona of attention, particularly in cases where a parasocial interaction is a substitute for social relationships (de Bérail et al., 2019). Contemporary researchers believe that parasocial interaction is parallel to more typical interactions and can be compared to, but not synonymised with, social relationships (Giles, 2002; Jin & Park, 2009; Turner, 1993). Turner (1993) was the first to coin the term 'homophily' which describes the likelihood for people to form friendships with whom that they perceive to have commonalities, and this is as true for parasocial, and social relationships

Other terms with which it is important to be familiar in order to be able to separate parasocial interactions include *wishful identification*, in which the viewer wants to imitate the persona (Hoffner, 1996) and *identification* in which a viewer shares the performer's perspective (Cohen, 1999). Theories of identification have existed longer than parasocial interaction; however, the distinction between them is often ignored. Chory-Assad and Yanen (2005) found that parasocial interaction can be observed even when identification is absent in an interaction. Another important distinction is that of parasocial interactions and parasocial relationships. Interactions are defined as transitory, and influenced by the context in which they occur, as opposed to a relationship which is typically considered to develop over time, and with repeated exposure (Giles, 2002).

Parasocial interactions have been found to be developmentally beneficial in many ways; for example, children have been found to use these interactions to develop gendered identity, particularly between the ages of five and six (Bond & Calvert, 2014; Rosaen & Dibble, 2008) and children form attachments and learn from televised characters (Calvert et al., 2014; Hoffner, 1996; Lauricella et al., 2011). Adolescents find comfort in parasocial relationships during periods of identity development (Giles & Maltby, 2004) since there is no risk of rejection from the object persona and since it is not possible to know everything about a media figure the adolescent is able to construct a figure which is part-fantasised,

part-reality to meet their own expectations or needs. It is also possible for parasocial interactions to manifest in a negative way for children; for example, in terms of aggression (Eyal & Rubin, 2003) and body image (Maltby et al., 2005; Young et al., 2013). Sports fans form parasocial connections with players or entire teams and feel that they have some role in the success or failure of their chosen idol (Boyle & Magnusson, 2007; Frederick et al., 2012; Sun, 2010). It has more recently been used to describe viewers relationships with social media influencers (Kim & Song, 2016), particularly YouTube personalities (Chen, 2016; Ferchaud et al., 2018; Lee & Watkins, 2016).

Previous research has found that music can influence the extent to which parasocial interactions occur. Chang and Kim (2022) found that a film excerpt with inspiring music predicted an increase in parasocial interaction, particularly the subfactors closeness, elevation and empathy, compared to neutral music. Conversely, sad music had no overall influence on parasocial interaction but did predict feelings of pity in the viewer. In addition to this, it has been found that listeners form parasocial relationships with musicians (Kurtin et al., 2019a). The findings from this study indicated that parasocial relationships with musicians differ from those of more traditional media figures. As with previous research, parasocial relationships were found to be strengthened by higher levels of exposure, particularly due to the perceived authenticity of interaction through live social media engagement which gives fans intimate insights into musicians' lives. However, in some cases, the level of access and insight actually served to reduce the perception of a parasocial relationship as it displayed the unattainability of the lifestyle that musicians and other celebrities' lead; thus, highlighting the chasm between them and the viewer. As with many sociological and psychological constructs, there are multiple methods of measuring parasocial interactions. The most recognised is the Parasocial Interaction Scale (PSI-Scale, Schramm & Hartmann, 2019), For more information, see section 2.2.6.

While previous research has applied parasocial interaction theory to musicians and performers, it has not been investigated as a bonding mechanism between audience members. In many genres the relationship between consumers could not be described as parasocial since there is opportunity for interaction. One of the unique features of typical or

traditional Western art music concerts is the expectation of no verbal interaction between audience members during the performance (Burland & Pitts, 2016). It is for this reason that the relationship, or at least interaction between concert attendees can be described as parasocial.

While on a physical level music is the result of soundwaves produced by an agent, it seems it is possible to not only form a parasocial relationship with the agent, but also with the music itself. This phenomenon will be discussed in the section below.

1.2.4 Music as a social surrogate

A social surrogate is a temporary substitute for direct social interaction. Initially applied to parasocial relationships with television characters, Derrick et al. (2009) found that people who felt lonely were more likely to watch familiar and favoured programmes to alleviate the feeling. Subsequently, it has been found that music is also employed as a social surrogate, albeit with different mechanisms. Instead of representing a character in itself, music evokes memories of relationships, thus resulting in an identification process (Schäfer & Eerola, 2020). While there are overlapping experiences between these phenomena, the element of nostalgia seems to be specific to music listening. In a separate article, Schäfer et al. (2020) also found that listening to self-selected music reduces loneliness, regardless of the listener's mood, and concluded that this was a result of social surrogacy. Paraviti (2020) went on to explore whether music can act as a social surrogate and shield individuals from social threats; however, the findings were inconclusive.

Listeners seem to use social surrogacy as an explicit motivation when selecting music. In a study exploring the changes in musical behaviours during the first COVID-19 lockdown, Fink et al. (2021) found that over half their participants reported music engagement as a coping mechanism, and that this might be as a proxy for social interaction. The ability of music to act as a pseudo-presence so effectively that it alleviates loneliness is indicative of the importance of both social relationships and music in day-to-day life.

However, in this thesis, we are less interested in music as a social surrogate, but rather as an arena or context where social bonding can occur.

1.2.5 Group Belonging and Bonding

While knowing someone through previous interactions with them is one level of familiarity, the theory of social identity suggests that the more an individual identifies with a group of people, the greater the attention they will pay to them and also the more influenced they will be by other members of the group (Tajfel et al., 1979). The theory of social identity will be discussed in this section and a review of previous literature will be used to justify the application of this theory to a concert audience.

The psychological theory of social identity is based on how an individual's membership in a particular group influences their sense of who they are (Tajfel, 1981; Tajfel et al., 1979), a group that has become known as the in-group. Social groups, such as those formed according to social class, sports team, celebrity fandom, race, gender, nationality, family, gang, etc., and an individual may identify with many groups simultaneously, are considered to be a source of pride and self-esteem which is borne from the sense of belonging an individual experiences when they are in that group. By categorising the world into 'us' (in-group) and 'them' (out-group) people make sense of society and establish their own social identity. This process is based on the cognitive process of grouping things that are similar to reduce the cognitive load of retaining and recalling all stimuli that are experienced (Gobet et al., 2001).

According to the original theoretical development, there are three cognitive processes responsible for in-group and out-group judgments: Social Categorisation, Social Identification, and Social Comparison. In the Categorisation phase, an individual will appraise the subject to understand and attempt to identify them (Turner, 2010) and this process can be seen from the early stages of childhood development (Rhodes et al., 2018). However, it is not until adolescence that people start to consider if these categorisations fall into the in-group or not. If people can be assigned to a category, then it is easier to

understand what sort of interaction we can expect to have with them, based on internalised social schema (Howard & Renfrow, 2006) and appropriate behaviour is dictated by consulting the norms of the group to which we belong. In the second stage, Social Identification, an individual will take on the observed behaviours and characteristics of the group(s) with which they identify (Bernheim, 1994) and this conformity strengthens the bonds within a group and perpetuates the tropes of that group. The final stage of the Social Identity theory is Social Comparisons which can only occur once a group has been categorised and identified as in-group or out-group. Comparisons most typically occur between members of an in-group and self-esteem is maintained and enhanced when similarities are found (Wheeler & Miyake, 1992). The extent to which an individual feels that they are a part of an audience of a live classical concert will be influenced by several factors. These may include the number of times they have attended similar events, the degree to which they feel that they are similar to other members of the audience, how important being a member of a Western art music audience is to their identity, and the way that this influences their self-esteem.

Section 1.2.1 established that social bonding occurs in both active music making and music consumption and previous research has found this to be the case in Western art music audiences. For example, social bonding between audience members of an amateur orchestral concert was found to be associated with pre-concert talks, and as a mediator of emotion contagion as a mechanism for emotional response to the music (Garrido & Macritchie, 2020). Audience participation in traditional Western are music concerts was also found to predict pre-social behaviors (Polzella & Forbis, 2014), although the participatory element of this study may confound the exact mechanisms that influence the extent to which participants were pro-social. Finally, social bridging and bonding were found to occur in choral audiences, including feeling connected to others, feeling bonded with those from congruent or incongruent cultural backgrounds and identities, and memorability of other attendees (Brown, 2016).

There are various recognised methods of measuring group belonging. For example, the Other in Self Scale (OIS, Aron et al., 1992), is a single item in which a series of seven

Venn diagrams of two circles, representing the 'self' and the 'other' with varying degrees of overlap are presented. The scale was devised to measure self-perceived interconnection between an individual and an 'other' which was assumed to be able to arise from many conscious and unconscious processes. Participants are instructed to 'please select the picture which best describes your relationship with [the persona]' where the persona of focus is represented by the 'other' circle and the participant is represented by the circle labelled 'self'. The Venn diagrams should be presented according to the original scale so that the degree of convergence increases a constant amount to create an evenly distributed scalic progression. The circumference of each of the circles increases in a directly proportional manner to the degree of convergence so that the area of each diagram is constant. The benefits of using this scale are that it contains a single item which takes seconds to answer and has been widely used to measure interpersonal connections in many fields of study, thus achieving high levels of validity. However, the scale is highly demanding for a participant since it is such an abstract way of depicting relationships. It also provides very little specific information about aspects of closeness.

Another commonly used tool for capturing perceived social closeness is the relationship closeness inventory (Berscheid et al., 1989). This is based on the conception of closeness as a high interdependence between two parties (Kelly, 1983) and covers romantic, familial, and platonic relationships. The scale includes six items which seek to define the type of relationship, 38 items relating to co-action, 27 that explore the influence the object of the relationship has had on the subject's current behaviour, and a further seven items on how their future behaviour may be influenced. The tool produces an overall score of closeness out of 1200. Many items in this highly demanding survey are also outdated in the 21st century. Despite revisiting the measure in 2004, Berscheid et al. (2004) did not update it and while they claim that it still possesses both reliability and validity, the temporal validity should be carefully considered.

A third alternative for measuring social relationships and bonding is the In-group Identification Measure (IGIM, Leach et al., 2008) which was developed using a hierarchical, multicomponent method of in-group identification. The measure has a hierarchy of

segments whereby two more general dimensions: Self-definition, encompassing the subscales of individual self-stereotyping, in group-homogeneity, and Self-Investment to group the subscales of solidarity, satisfaction and centrality. The conception of the measure was theoretically informed, with each item relating to previous scales and research; subsequently, through a series of seven experiments the measure was reduced and validated (Leach et al., 2008). The measure was intended to halt the proliferation of new multicomponent scales by assimilating the discreet components into one general framework. The series of validation studies show significant correlations with the OIS (Aron et al., 1992) and the Relationship Closeness Inventory (RCI, Berscheid et al., 1989; 2004). The IGIM emerges as the optimal tool, of those discussed, for capturing the level of bonding experienced by participants in this research on the social experience of Western art music concerts.

1.2.6 Social experience, emotional responses to music, and enjoyment of the event

The ability of music to induce emotion in a listener has been widely researched and examined. For the purposes of this research, emotion is defined as the synchronised expression, feeling, activation and arousal, experienced as a transient episode, triggered by a specific stimulus (Scherer, 2005). An equation to illustrate how music induces an emotion suggests that an emotion is the result of an interaction of structural, performance, listener, and contextual features (Scherer & Zentner, 2001). The implication of this is that emotions can be altered by the presence of others as this will be a factor of the contextual features (Wald-Fuhrmann et al., 2021). Emotions can become disassociated with an individual and a stimulus when people are in proximity with each other and share a sense of group belonging, resulting in a collective emotional response (Mackie & Smith, 2015).

Some research has found that social listening contexts intensify emotional responses to music. The emotion experienced when listening to music, specifically strong experiences with music (SEM), has been found to be influenced by the social context in which the listening occurred (Gabrielsson & Wik, 2003). Using free descriptions and quantitative

ratings of participants' strongest experiences of music consumption, seven fundamental categories that describe these experiences were found: general characteristics, physical reactions and behaviours, perception, cognition, feelings/emotions, existential and transcendental aspects, and personal and social aspects. This final category indicates that the social context of listening influences strong experiences of music. Later investigation of strong experiences with music found that they occurred most frequently in live concerts when other people were present (Lamont, 2011); however, it cannot be concluded that it is only the presence of others that caused this result.

The influence of others has been found to be stronger if they are known to the listener. More intense emotions were reported when participants were listening with a close friend or partner compared to when listening along (Liljeström et al., 2013) in a study in which participants listened to self-chosen or randomly sampled music samples. Listeners reported more intense emotions in response to self-chosen music than to randomly selected music, and when listening with a close friend or partner than when listening alone. There is no possibility to compare the effect of known verses unknown co-listeners in this study.

However, it has also been found that listening in a group can result in significantly less intense emotional responses to music (Sutherland et al., 2009). In a study that aimed to test whether listening to music in a group setting influenced the emotion felt by the listeners, fewer chills were experienced in the group listening condition than when listening alone which the authors concluded was a result of participants having paid less attention to the music because their concentration had been drawn by the other listeners present. In subsequent analysis of the data, skin conductance responses during chills were significantly higher during the solitary listening condition (Egermann, et al., 2011), and that while listening context did not influence retrospective subjective ratings of emotion, there was a non-significant trend indicating that more chills were experienced in the solitary listening condition and that skin conductance responses were significantly higher for participants listening in solitude. In a later study by Linnemann et al. (2016) it was found that music reduces stress more if it is listened to in the presence of others, regardless of the original

motivation for listening to the music. When listening to music alone, there was only a reduction in stress if this was stated as the reason for listening to the music.

Despite these well controlled experiments, there has been limited attempt to explain the mechanisms by which the presence of others influences an individual's emotional response to music. The conflicting results suggest that prevailing finding is that group listening results in either a significant increase, or decrease in the emotional response of participants, but a significant influence nonetheless.

While many of the studies already discussed achieved high levels of control, the listening contexts in which they were conducted display poor ecological validity. The conclusions are also largely based on supposition since none of the studies sought to test the social experience directly but instead inferred a connection. An example of a study in which the researchers sought to explore the social influence of others on an individual's experience of an ecologically valid context was conducted with participants recruited from amateur orchestra audiences in Australia (Garrido & MacRitchie, 2020). The researchers used three self-composed items regarding the extent to which participants felt like they were immersed in the performance, whether their responses were amplified or intensified by the responses of those around them, or if instead participants felt that they had to repress their emotional response due to the presence of others. They also included a single item from a modular scale devised Brown and Novak (2007), despite the subscale from which it was taken having four items. While the item captured the phenomenon in which Gariddo and MacRitchie were interested ''To what extent did you feel a sense of belonging or connectedness with the rest of the audience?'' (Brown & Novak, 2007, p. 56), a scale or subscale can only be said to capture valid data when used in its entirety, the full form that was psychometrically validated.

The data collected from these items has allowed the authors to achieve meaningful results and conclusions including the establishment of a link between social bonding and attendance at enhancement events. However, items written by Garrido and MacRitchie (2020) were not validated and the social bonding dimension from Brown and Novak (2007)

might not adequately test the collective experience of a concert. The other items in the scale proposed by Brown and Novak were “To what extent did the performance serve to celebrate and sustain your own cultural heritage?” “To what extent did the performance expose you to one or more cultures outside of your own life experience?” and “Did the performance leave you with new insight on human relations or social issues, or a perspective that you didn’t have before?” (Brown & Novak, 2007, p. 56). Together these four items were said to capture social bonding in a concert setting; alone, it is impossible to tell if they adequately achieve valid results. Despite this, Garrido and MacRitchie concluded that participants’ emotional responses to the concert can be enhanced through emotion contagion, and that this is mediated by social bonging among audience members. However, based on the limitations discussed above, in this thesis we have addressed this limitation by psychometrically validating a measurement tool that captured this information.

The third chapter of this thesis explores the social experience of live verses various digital presentations of the same concert. The experience of being physically alone and yet virtually bonded with others while engaging with a digital music event has been facilitated by the rapid development of technologies and streaming services which enhance this paradox (Charron, 2017).

As musicians begin to exploit the direct link to their audiences that free social media platforms afford them, the motivations to engage with key audience groups online may include social resilience, togetherness and social connection (Vandenberg et al., 2021). Swarbrick et al. (2021) explored how different characteristics of participants would influence their experience of being moved in a virtual concert, compared to a live event. The results of this study indicated that social connection and feeling moved by the concert were correlated, and both significantly predicted by empathic concern. Another study (Onderdijk et al., 2021) found that participants in who watched a concert in virtual reality reported greater feelings of physical presence and connectedness compared to other concert conditions.

To build on this research and further contribute to the growing area of knowledge regarding the social experience of live and digital concerts, and the influence of a quantified

social experience on an individual's enjoyment and emotional response to the event the study described in Chapter 3 was devised. To the best of our knowledge, there is no previous literature on the social experience of virtual reality Western art music concerts, and Chapter 4 of this thesis will serve as a preliminary exploration of this topic.

1.2.7 Summary

From the research discussed above it can be seen that music serves social functions, and that this can influence various aspects of a concert experience, for example, enjoyment of the event and emotional responses to the music. It has also been found that there are various predictors of the extent to which an audience member may perceive their concert experience to be social, including concert factors such as the mode of presentation, and the genre or type of music, and also by individual characteristics such as personality, motivation for attendance and loneliness.

While further literature is discussed in the subsequent chapters of this thesis, this overview has served as a theoretical framework, or justification for the research questions and study designs, and philosophy of research that are discussed herein. The following sections will detail these aspects before moving on to discuss the three main studies of this PhD project.

1.3 Theoretical Framework

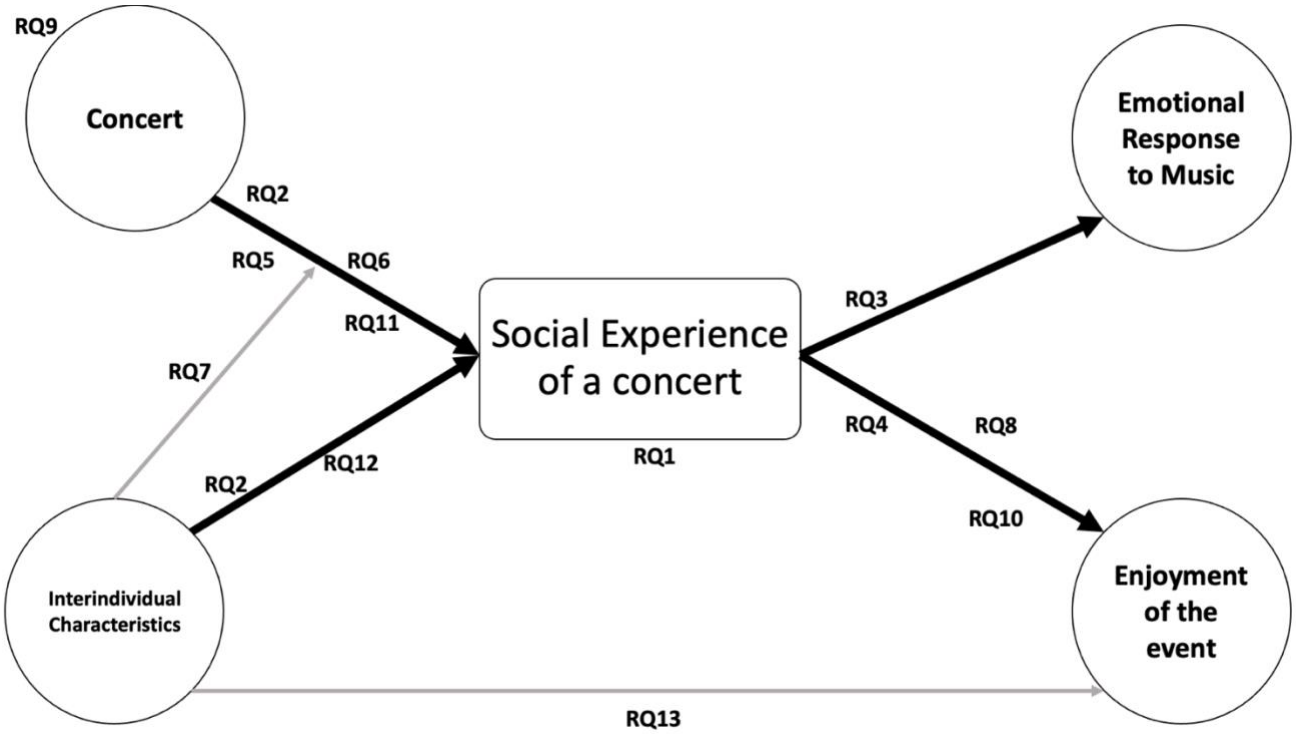

Figure 1. The flow chart depicts the theoretical framework of this thesis, with the themes of variables, and the research questions that seek to test each relationship

Note. RQ = Research Question. The numbers of the research questions correspond with those laid out in the subsequent section.

1.4 Research questions

As previously stated, this thesis explores the social experience of Western art music concerts. The aims were to first, develop and validate an efficient scale to quantitatively capture the social experience of live, digital, and virtual reality presentations of a concert, and subsequently to explore the predictors and outcomes of that social experience. Many elements of the topic are exploratory and have not previously received significant attention in music psychology research and as such, it is not possible to declare a-priori hypotheses. Therefore, the research questions, and the study in which they are tested, are described below:

1.4.1 Study 1: Development and validation of Social Experience of a Concert Scales.

RQ1: Can theories of parasocial interaction and in-group theory be applied to audiences of Western art music concerts?

RQ2: Are there demographic or contextual predictors of the strength of the social experience of a Western art music concert?

RQ3: Is emotional response to live musical stimuli influenced by the social experience of a concert?

RQ4: Is the overall enjoyment of a live Western art music concert influenced by the degree to which participants subjectively rate their social experience?

1.4.2 Study 2: Exploring the social experience of live and digitally presented concerts.

RQ5: Is a live concert experienced as being more social than a digital presentation of the same performance?

RQ6: Is it possible to manipulate a digital concert to be perceived as more social?

RQ7: Are there demographic or contextual predictors of the strength of the social experience of a digitally presented Western art music concert?

RQ8: Is the overall enjoyment of a digital Western art music concert influenced by the degree to which participants subjectively rate their social experience?

1.4.3 Study 3: Exploring the influence of co-presence and immersion in virtual reality concerts.

RQ9: How do people describe their experience of a virtual reality presentation of a Western art music concert?

RQ10: Do participants experience a change in mood following engagement with a virtual reality Western art music concert?

RQ11: Does personality predict participants change in mood and enjoyment of a virtual reality Western art music concert?

RQ12: Does the social experience of a virtual reality concert adhere to the same factor model as live presentations?

RQ13: Are there demographic predictors of the strength of the social experience of a virtual reality Western art music concert?

RQ14: Do social, physical and self-presence predict the social experiences of a virtual reality Western art music concert?

1.5 Research Framework and Paradigm

This thesis is situated predominantly within the positivism research paradigm, whereby scientific and empirical methods are employed to study human psychological and social life, to establish these disciplines as social sciences (Hasan, 2016; Park et al., 2020). This approach was chosen due to the existence of previous literature, sufficient to establish a theoretical framework, and with the aim of the findings being as widely impactful as possible, within the discipline, and within the Western art music industry. However, in some ways a pure positivist approach is old fashioned, and it is important to account for the lived experience of participants and researchers alike (Hasan, 2016; Shrader-Frechette, 1996). This approach to research will be briefly discussed in this section.

1.5.1 Ontology

The empirical emphasis on identifying causal relationships between variables throughout the predominantly quantitative data collection and analysis in this thesis adheres to the positivist principles (Park et al., 2020). This was developed from the hypothetico-deductive model and scientific approach whereby hypotheses are proposed in such a way as to be operationalisable, generalisable, falsifiable and causal (Køppe, 2012; Segalowitz, 2012). This means that a hypothesis must be able to be empirically measured, and applied to a range of situations, beyond the context in which data is collected (Alexander, 2006; Hultsch et al., 2002). The relationship between variables should be conditional so that one should cause a change in the other, and in order to infer this there must be evidence of temporal precedence (Park et al., 2020), correlation (Moreno & Martínez, 2008), and control of all confounding variables (Ittner, 2014). Finally, it should be possible to disprove the hypothesis, the logical possibility that a statement can be shown to be false, indicating that the null hypothesis should be accepted.

While pure positivist research would typically infer direct realism, it is important, when conducting research with human participants, to acknowledge a margin of error for the individual experience. By doing so, this situates the research between critical realism,

and direct or naive realism.

1.5.2 Epistemology

Generally, as is typical with this approach to research, we have assumed that there is a single 'true' experience, or a single tangible reality (Park et al., 2020). We aimed to test this by recruiting large participant samples, that are adequate to achieve the accepted threshold of significance, based on the effect sizes of the relationships we are studying. Tools used are generally standardised, and where this was not possible, we have taken steps to achieve statistical validity (Kincheloe & Tobin, 2009). This is with a view to generalising the findings of the studies to other contexts and populations, based on the assumption of objective universality of experience, and achieve replicability of results.

However, the very nature of this type of research requires there to be variance in the concepts being studied. Indeed, the use of the term 'variable' denotes the need for an ontological pluralism, or at the very least, dualism in which the research is separate from the participant.

1.5.3 Axiology

A positivist approach to axiology relies on absolute objectivity and thus dismisses the importance of the subjective experience of individuals', both researcher and participant (Park et al., 2020). Throughout the research, errors and bias have been minimised, and objectivity is striven for as far as possible; however, axiologically it is important to recognise that subjectivity exists due world views, cultural experience, and upbringing (Shrader-Frechette, 1996). In some cases, throughout this thesis it is the very existence of these prior subjective experiences that are the focus of study; for example, previous interaction with Western art music, familiarity and preference for different music, experience of typical concert attendance etc. There is also a perennial conflict between achieving high ecological

validity and high experimental control which we have attempted to balance throughout this research.

1.5.4 Methodology

Further to this, the data collection methods used throughout this research are, for the most part, based on the ability to achieve these criteria; however, it is often more accurate to describe the studies as quasi-experiments in which naturally occurring variance is measured, instead of an independent variable being systematically manipulated. Ultimately, the research questions are derived from previous literature and theory, and the findings from each study are intended to be fed back into the field to complete the cycle of theory → hypothesis → operationalising variables → experimentation → theory (Park et al., 2020). The specific methods of data collection are discussed in each chapter.

1.5.5 Ethics

The research described in this thesis was conducted with an aim to adhere to the highest standards of research ethics, based on the Nuremberg Code (1947), The Declaration of Helsinki (1964), and the Belmont Report (1979), as verified by the University of York Arts and Humanities Ethics Committee. This includes adherence with the following guidance:

- Informed consent of volunteers essential
- Anticipated results should justify experiment
- Physical and mental suffering and injury should be avoided
- There should be no expectation of death or disabling injury
- Degree of risk should be weighed by potential benefit
- Proper preparation and precautions should be taken
- Participants have the right to end experiment at any time
- Researchers must be prepared to end experiment if subject at risk

Nuremberg Code (1947)

- Clearly formulated experimental protocol
- Conducted by scientifically competent person
- Risk vs. Benefit
- Participant's right to safeguard integrity
- Accuracy of results in publications
- Informed consent
- Research protocol must contain statement of the ethical considerations involved

The Declaration of Helsinki (1964)

- Respect for Persons
  - Individuals should be treated as autonomous agents
  - Persons with diminished autonomy are entitled to increased protection
- Beneficence
  - Persons treated ethically and their decisions respected
  - Do no harm
  - Maximize possible benefits and minimize risks
- Justice
  - Distributing benefits/risks fairly

The Belmont Report (1979)

For further information, please see the University of York research ethics policy:

https://www.york.ac.uk/staff/research/governance/research-policies/research-code/

Chapter 2

Development of the Social Experience of a Concert Scales (SECS):

The Social Experience of a Live Western Art Music Concert Influences People's Overall Enjoyment of an Event but not Their Emotional Response to the Music

2.1 Introduction

"The close relationship between social and musical enjoyment … is at the heart of concert attendance" (Pitts, 2005, p. 269). Across the sector, audiences of Western art music are generally decreasing (Glinkowski et al., 2004) and performers, curators, and venues are often seeking to identify what separates a live performance from other music engagement in order to develop and expand their audience. A primary function of music has been to foster group solidarity and social bonding by promoting synchronisation of movement and affective states (Huron, 2001). One key aspect of live music consumption is that it typically occurs in a shared setting with others, and while this is not unique to live events, it could be an important indicator of why people enjoy engaging with music in this way. Historically, people would only be able to access music communally (Zangwill, 2012); however, today music consumption takes place in many different contexts, some of which are still social and occur in the presence of others, and others which are solitary (North & Hargreaves, 2008). This contrast, and the accessibility of music in the 21st century, highlights the selection to engage with shared music listening contexts. Social experience is often considered to be a key motivating factor for engaging with leisure activities (Beard & Ragheb, 1983) and the enjoyment of these experience and co-attendance at music concerts is no exception (Baker, 2000; Burland & Pitts, 2014; Kulczynski et al., 2016).

Despite this, until recently, there has been limited interest in modelling and measuring the collective or social experience of live concerts in a quantitative way with researchers and industry experts relying on qualitative research findings to justify the claim (e.g. Dearn & Price, 2016; Dobson, 2010; O'Sullivan, 2009). In this study we have addressed this omission by creating and validating a quantitative scale to measure the social experience of a concert and considered the ways in which the presence of others influences the enjoyment and emotional experience of a live music performance. The new insights achieved in this article will not only create a psychometrically validated scale that can capture the social experience at a live Western art music concert, but also contextualises it amongst other relevant variables such as enjoyment, demographic variables, and emotional responses to the music.

2.1.1 Social experience and emotional responses to music

It has been found that people often choose to engage with music because it moves them (Garrido & Davidson, 2013; Saarikallio, 2008) or induces an emotion (Garrido & Schubert, 2011; Lonsdale & North, 2011; Vuoskoski & Eerola, 2017). The ability of music to induce emotion in a listener has been widely researched and examined. An emotion is understood to be a brief episode which is characterised by the synchronisation of expression, activation, feelings, and arousal in response to a specific stimulus (Scherer, 2005). Scherer and Zentner (2001) illustrate that an experienced emotion is the result of an interaction between structural, performance, listener, and contextual features. The latter can be conceived as the setting where the music is being consumed; for example, are people engaging with music at home, or in a theatre or stadium? Are people alone or with others when they are listening to the music? Is it live or recorded or music? The implication of this is that emotions can be altered by the presence of others as this will be a factor in the contextual features.

Despite these theoretical indicators, it has been found that listening in a group (compared to listening in solitude) does not necessary lead to more intense emotional responses, perhaps due to less concentration on the music. Some studies have concluded that this could be a result of co-presence distracting the listener from concentrating on the emotional content of music (Egermann et al., 2011). Other research has shown that the influence of others has been found to induce more intense emotional responses if they are known to the listener (Liljeström et al., 2013). From this research it can be seen that the presence of others influences emotional responses to music. While these studies achieved high levels of control, the listening contexts in which they were conducted display poor ecological validity. The conclusions are also largely based on supposition since these studies did not assess the social experience of participants directly, but instead inferred a connection. Egermann et al. (2011) assumed that the other members of the pseudo-audience had distracted their fellow listeners from the music, thereby reducing the emotional salience of the experience at the expense of a general increase in arousal caused by the presence of others due to mechanisms such as evaluation apprehension (Cottrell et

al., 1968) or distraction conflict (Baron, 1986). However, since neither study sought to identify the mechanisms responsible for their findings it cannot be concluded that the presence of others was indeed the cause of their results.

Garrido and MacRitchie (2020) made some progress in testing the effect of others on emotion contagion during music listening in a more quantitative way. To measure the level of influence the people around a participant during a music performance had exerted, they presented three statements with which participants were asked to rate their agreement (see section 1.2.5 for more detail). The data collected from these items has allowed the authors to propose a link between social bonding and attendance at enhancement events. However, items written by Garrido and MacRitchie (2020) were not validated and the social bonding dimension from Brown and Novak (2007) might not adequately test the collective experience of a concert. Therefore, in our study we have addressed this limitation by psychometrically validating a measurement tool that captured this information.

2.1.2 Social experiences and enjoyment of concerts

Enjoyment can be defined as taking pleasure from something (Hernik & Jaworska, 2018). It is similar, but not synonymous with happiness, in part due to the duration of the experience: happiness may be more abiding than enjoyment and not as tied to a specific context. Enjoyment has been found to be a motivation for attendance at, and a common response to, live musical performance, in part due to the presence of others (Baker, 2000; Dearn & Price, 2016). In their research on chamber music festival goers, Pitts (2005) discussed the positive effects of being able to see other audience members responses to the music. One of their participants responded that "occasionally you see somebody with a slight smile . . . their involvement adds to your joy, your enjoyment" (Pitts, 2005, p. 260).

2.1.3 Devising a quantitative measure of social experience

To the best of our knowledge, there has been no previous attempt to capture the social experience of a live concert using a validated measurement instrument. In order to model whether the social experience of a live Western art music concert predicts the emotional response to the music or the enjoyment of the event, we employed two key theories to derive a suitable model for the social experience: the attention paid to other members of the audience, based on parasocial interaction theory (Horton & Wohl, 1956; Rubin & McHugh, 1987; Schramm, 2015), and the extent to which an individual identifies with other members of the audience, based on in-group theory (Alport, 1958; Sherif, 2015; Tajfel, 1981; Tajfel et al., 1979). Both theories were introduced in the introduction (Section 1.2.2) and will be expanded on and applied to this study in the following sections.

2.1.3.1 Parasocial interaction

A parasocial interaction is a term originally used to describe the interaction between a member of an audience and a television persona; either a character or a real person (Horton & Wohl, 1956). These relationships are characterized by a lack of reciprocity whereby there is a one-directional flow of information: from the media persona to the viewer. Regular viewers can feel that they know or understand a character, despite the interaction being nondialectical. We posit that the interaction between members of the audience fall under this title since there is a one-way flow of information, albeit largely non-verbal due to the convention not to interact during a Western art music concert (Wilson et al., 2014). It has been found that there are also similarities between parasocial relationships and social relationships (Giles, 2002; Jin & Park, 2009; Turner, 1993). It is important to differentiate parasocial interactions and parasocial relationships. Relationships require repeated exposure and develop over time whereas an interaction is rooted in a specific context, and can be momentary and transient (Giles, 2002).

To our knowledge, parasocial interaction theory has not yet been applied to audiences of live classical concerts but as stated above, the defining features of this type of

relationship can be found in a conventional Western art music concert. Typically, audiences sit facing the stage and, despite being surrounded by people, there is limited interaction (Wilson et al., 2014). This does not mean that audiences should be considered passive in this context; any live event is the culmination of active interactions between performers, audience members, and the environment (Toelle & Sloboda, 2021). An individual can observe non-verbal behaviours and characteristics exhibited by other members of the audience around them, but not provide an immediate response or feedback. This uni-directional communication typifies a parasocial relationship and as such, we have decided to adapt a measure of parasocial interaction to explore the level of intra-audience attention. The parasocial interaction process scale, in its entirety, consists of 14 subscales, each with eight separate items; six to measure cognitive parasocial responses, such as attention allocation, and evaluation of a persona and their actions; three to measure behavioural parasocial responses, including verbal and non-verbal behaviours, and intentions; and three to measure affective parasocial responses, such as sympathy, antipathy, empathy, and emotion contagion (Schramm & Hartmann, 2019). The specific items consist of statements in which the term "persona" can be replaced with the object of focus, in this case: the audience. For example, "I formed only a fleeting impression of (Persona)" (Schramm & Hartmann, 2019, p. 2) becomes "I formed only a fleeting impression of the audience".

2.1.3.2 Group belonging

In addition to parasocial interaction theory, it should also be considered whether people feel that other attendees at a live event enhance their experience, detract from it, or if people simply do not consider the presence of others to be important. To do this, we looked for ways to assess the degree to which an individual pays attention to others, and the extent to which they feel that being members of an audience, and sharing an experience, bonds them. As stated in section 1.2.3, the theory of social identity suggests that the more an individual identifies with a group of people, the greater the attention they will pay to them and also the more influenced they will be by other members of the group (Tajfel et al.,

1979). Social identity is based on how an individual's membership in a particular group influences their sense of who they are. This process is thought to be based on the cognitive process of grouping things that are similar to reduce the cognitive load of retaining and recalling all stimuli that are experienced (Gobet et al., 2001).

In order to measure this phenomenon, we have employed the In-Group Identification Measure (Leach et al., 2008). The measure has a hierarchy of segments based on two general dimensions: Self-definition, encompassing the sub- scales of individual self-stereotyping, in-group homogeneity; and self-investment, including the subscales of solidarity, satisfaction, and centrality. Individual self-stereotyping refers to the degree to which a person identifies with the group and how similar to the prototypical member of a group they perceive themself to be (Tajfel et al., 1979; Turner, 1993). In-group homogeneity is based on the perceived similarity between other group members (Doosje et al., 1995). Solidarity is predicated on the assumption that those who most strongly identify with a group will also be most likely to feel bonded with other members (Lewin, 1948) and satisfaction measures the positive or negative experience of belonging to a group (Tajfel et al., 1979; Tajfel, 1981). Finally, centrality describes the subjective importance an individual places on their membership in a group in context of their own identity (Turner et al., 1994).

The conception of In-Group Identification Measure (IGIM) was theoretically informed, with each item relating to previous scales and research; subsequently, through a series of seven studies, the IGIM was reduced and validated (Leach et al., 2008). However, since the scale has not previously been employed in a concert context, we also validated its use in this context.

2.1.4 Personal and situational influences of the social experience of a live concert

While the validation of a measurement instrument which is shown to capture differences in the social experience is the focus of this study, we also consider the other factors which might influence an individual's experience. We have categorised these in two main ways: the first is personal or demographic factors that relate specifically to the individual; and the

second considers situational or contextual factors, which are the features of the concert. These are discussed in more detail below.

Self-definition is an important factor in the process of forming a social bond with other members of a group and is based on an individual's ability to recognise that other members of a group are similar to each other (homogeneity) and/or themself (individual self-stereotyping). The typical criteria for making these judgements are those that are observable; notably, age (Barak et al., 2001). It follows that if an individual observes members of a group who are similar in age to each other and to themself, they may experience greater self-definition.

Of course, not all attributes are observable, but may still have an influence on the social experience; for example, musical training. It is well documented that participation in musical activity facilitates social bonding (Freeman, 2000; Kreutz, 2014; Savage et al., 2020; Tarr et al., 2014), and it has also been found that cultural familiarity and musical training elicit greater interpersonal closeness (Stupacher et al., 2020). It is not possible, in most cases, to appraise musical training in others based on appearance alone, and some prior knowledge of others would be necessary in order to determine self-definition. Prior knowledge may come from attending the concert with others or recognising others once you arrive. Typically, individuals will attend concerts as a social function, often with family, friends, or colleagues (Boyle, 2007); however, this is not a rule and some attendees will do so alone. To the best of our knowledge, there is no previous research on the effect this can have on the social experience of a concert. However, previous research has shown that shared experiences tend to be amplified (Boothby et al., 2014; Echterhoff et al., 2009; Shteynberg & Apfelbaum, 2013). This would be an example of a contextual factor which may influence the extent to which they experience a bond with the audience.

Other contextual factors include the event parameters, many of which have been found to have an influence on the social experience. These include the music being performed (Boer et al., 2011; Trehub et al., 2015), the staging (Dearn & Price, 2016), the arrangement of seating (Pitts et al., 2013), the level of audience interaction with each other and the performer(s) (Lee et al., 2019; Loxley, 1983; Pitts, 2005; Shin et al., 2019), the venue

(Dobson, 2008), the style of presentation, and any other curatorial aspects of a live music event. Each of these parameters can influence the extent to which an individual pays attention to those around them and thus potentially be used to predict the strength of their social experience.

2.1.5 Aims and research questions

Aims

1. Develop an efficient scale which could be utilised in an ecologically valid Western art music concert setting (Schatz et al., 2012; Sinickas, 2007) where participants are usually only willing to invest a short amount of time completing questionnaires.
2. Explore if there are demographic or contextual variables that can predict the intensity of the social experience of a live concert, and whether the social experience can be used to predict participants' emotional response to, and enjoyment, of the concert.

Research Questions

This chapter contains exploratory research on a hitherto unexplored topic and as such we do not have enough prior knowledge to formulate a-priori hypotheses. Therefore, we present the following exploratory research questions (RQ):

RQ1: Can theories of parasocial interaction and in-group theory be applied to audiences of Western art music concerts?

RQ2: Are there demographic or contextual predictors of the strength of the social experience of a Western art music concert?

RQ3: Is emotional response to live musical stimuli influenced by the social experience of a concert?

RQ4: Is the overall enjoyment of a live Western art music concert influenced by the degree to which participants subjectively rate their social experience?

2.2 Pilot Study: Methods

To test the questionnaires and first research question (RQ1: Can theories of parasocial interaction and in-group theory be applied to audiences of Western art music concerts?) the pilot study was conducted in two contrasting concert settings: the first in a controlled recital-experiment environment and subsequently in a more ecologically valid concert setting.

2.2.1 Ethics compliance

All participants who took part in this study gave informed, written consent in adherence with the ethical guidelines from the University of York Arts and Humanities Ethics Committee who formally approved this study. Each participant had the right to leave the study at any time. All data was collected and stored anonymously, and participants have given permission for their responses to be used in subsequent presentation and publication of the results. Participants received a copy of the information sheet and the University of York General Data Protection Regulation (GDPR) statement at the start of the study.

2.2.2 Participants

2.2.2.1 Concert 1

Participants were recruited through email and posters. 50 participants were recruited in total; however, one participant failed to complete the study and has been excluded from all analysis leaving 49 participants (female= 36, male = 12, prefer not to say = 1). The participants had an age range of 18–50 years (M = 24.63). 49% of the participants reported that English was not their first language, with 6.1% speaking Chinese, 6.1% Greek, 6.1%, Spanish, 4.1% French, 4.1% Persian, and then 2% considering Bulgarian, Dutch, German, Hindi, Japanese, Latvian, Portuguese, Sesotho, Turkish, or Ukrainian to be their first language respectively. One participant declined to answer this question. No participants were excluded from the study due to linguistic incomprehension.

All participants were university students at the at the time of the study, 42.9% were undergraduates, 34.7% were taught postgraduate students, and 22.4% were post- graduate research students. 55.1% of participants reported that they had no musical training, 12.2% said they were university music students, 28.6% were self-reported amateur musicians, and 4.1% were professional musicians. Of the 49.9% who had musical training, 18.3% of the participants played piano.

2.2.2.2 Concert 2

Participants were recruited through an email sent to members of the venue's mailing list who had already purchased tickets for the concert inviting them to participate in the study. Since it would have been a GDPR breech for the venue to share this contact information with us (the researchers); therefore, we gave the venue the information and they sent it to ticket holders. The email contained information on why they had been invited to take part, and what they would have to do. Participants were also invited to take part in the study in person, upon arrival at the venue for the evening's performance. In addition to this, participants gave informed consent before taking part in the study, and participation was entirely voluntary and did not impact their access to the concert. All participants were given the option of completing an online, or paper and pencil version of the questionnaire.

A total of 53 participants took part in this study, 21 completed the questionnaire online and 32 completed a paper copy (female = 25, male = 20, other = 1, did not respond = 7). The participants had an age range of 24–82 years (M = 66.14, *n* = 53). 7.5% of participants reported having A levels or equivalent as their highest level of education, 18.9% had an undergraduate degree, 50.9% had a postgraduate qualification (masters, teaching qualification etc.), 5.7% had vocational qualifications, 1.9% selected "other" as their highest qualification, and 15.1% declined to answer the question (*n* = 45). This is a highly qualified audience which is not representative of the national average, but may be representative of current audiences of Western art music (Roose, 2008). 64.15% of the sample were retired (*n* = 53). 50.9% of the participants reported having no musical training, 28.3% were self-

reported amateur musicians, 7.5% were professional musicians, and 13.2% declined to answer (*n* = 46).

2.2.3 Musical stimuli

2.2.3.1 Concert 1

The music used in the pilot test consisted of a live performance of four, short, Western art music piano pieces which were chosen to be stereotypically representative of two happy and two sad movements based on key, tempo, melodic structure and dynamics (Gabrielsson & Juslin, 1996). The pieces were *Allegretto Scherzando* from Arabesque No. 2 by Debussy (1888–1891), the first movement of Beethoven's Piano Sonata No.14, more commonly known as The Moonlight Sonata (1801), Nocturne No. 20 by Chopin (1870), and the first movement of Mozart's Piano Sonata No.16 (1788). The pieces are listed here in the order in which they were presented in the study. The pieces were performed live by a professional pianist.

Well known pieces were selected deliberately since the study design required participants to remember how they felt during each piece until the end of the concert, at which time they reported their subjective responses to them. Participants were given a program with the title and common names of each piece clearly stated to aid their memory at the end of the concert.

2.2.3.2 Concert 2

The musical stimuli were presented as a live orchestral performance and the concert was programmed as part of the BBC 3 Free Thinking Festival. The musical stimuli included Violin Concerto No. 3 in G major, K. 216 by Mozart (1775), then an interval and then Symphony No.6 in A major, (Bruckner, 1881). These were played, in full, by the Royal Northern Sinfonia.

2.2.4 Self-reports

2.2.4.1 Concert 1

At the end of the concert, once all four pieces had been performed, participants were asked to complete a questionnaire presented in Qualtrics on iPads. The questionnaire was separated into four sections for each piece with the title of the piece clearly displayed on the pages relating to each. The subjective emotional responses of the participants were measured using two sliders from negative five to positive five, measuring arousal and valence respectively.

2.2.4.2 Concert 2

Self-reports were produced by the completion of two separate questionnaires, one during the interval relating to the three movements of Mozart's Violin Concerto and the second, at the end of the concert, regarding the four movements of Bruckner's Symphony. This decision was made to alleviate the memory demands on participants as to recall how they felt in the early movements of the Mozart concerto by the end of the whole concert is unrealistic, especially if they were not familiar with the music. Participants could select whether to complete the questionnaire using a link to an online Qualtrics on their own smart device or on a printed copy of the questionnaire which we gave them at the start of the concert and asked them to hand back at the end of the evening.

The first questionnaire, to be completed during the interval, contained an instruction page and then three sections relating to the three movements of Mozart's concerto, in which participants rated their familiarity with, and preference for, the movement on a scale from negative five to positive five. Subsequently, they were asked to rate their emotion using the nine item Geneva Emotion Music Scale (GEMS9, Zentner et al., 2008).

Participants were instructed to complete the second half of the questionnaire at the end of the concert. In this section they rated familiarity, preference, and their subjective felt

emotion for the four movements of Bruckner's Symphony in the same way as the first half of the questionnaire.

2.2.5 Measuring parasocial interaction

Concerts 1 and 2

The PSI Process Scale (Schramm & Hartmann, 2019) was used to measure the parasocial interaction within the audience. Agreement with all items was rated on a five-point Likert scale (1 = not at all, 5 = very much). Only scales perceived to be relevant to the current study were selected to ensure the questionnaire did not take participants too long to complete, thus reducing the risk of participant fatigue. The scales included are described below:

- *Cognitive:* Persona-specific information reception (four items relating to depth of information processing and vividness of recall, e.g. "I can still remember exactly what (Persona) looked like" and four items relating to attention e.g. "(Persona) repeatedly attracted my entire attention").
- *Affective:* Sympathy (all eight items e.g. "I found (Persona) to be likable") and Antipathy (all eight items e.g. "I felt rather negative towards (Persona)"), and Emotion Release (four items relating to emotion induction e.g. "I occasionally reacted very emotionally towards (Persona)" and four items relating to emotion contagion e.g. "When (Persona) showed up, I forgot my own feelings and adopted his/her mood").
- *Behavioural:* Non-verbal behaviours (four items relating to mimicry and gesture e.g. "I sometimes gestured towards (Persona)"), and Behavioural Intention (seven items, excluding "when (Persona) was visible on the screen, I was not particularly eager to turn towards him/her") (Schramm & Hartmann, 2019, p. 8).

The total number of items presented to participants from the PSI Process Scale in this study was 51, which were presented in a random order using the randomise function in Qualtrics. When analysing the results, the mean of each selected subscale was calculated and used in subsequent analysis, regardless of whether the subscales are cognitive, affective, or behavioural. In each subscale selected items were reverse scored.

2.2.6 In-Group Identification Measure

Concerts 1 and 2

We used the complete In-Group Identification Measure (IGIM, Leach et al., 2008) of 14 items, which were presented to participants in a random order using the randomise function in Qualtrics. Participants were asked to "please rate your agreement with the following statements on a scale from 1 = strongly disagree to 7 = strongly agree". This measure allows for the collection of more detailed data relating to an individual's perception of their own group-belonging and is specifically designed to measure closeness to a group.

2.2.7 Co-attendance

Concert 1 and 2

Participants were asked how many members of the audience they knew on a scale ranging from zero to five and above. They were also asked "Thinking about the members of the audience you know. Did you attend the concert with them today (e.g. you planned to come together)?"

2.2.8 Overall enjoyment of the concert

Concert 2

There is no agreed method of measuring enjoyment, and it is typical for different disciplines to devise their own tool to ensure the test matches the stimuli, which reflects the contextual emphasis of enjoyment. We chose to measure the general enjoyment of the concert using a single item: "Please rate your overall enjoyment of this concert. On the scale below where 1 = ''Did not enjoy the concert at all'' and 5 = ''Enjoyed the concert very much''.

2.2.9 Background characteristics

Concert 1 and 2

Demographic questions were included at the end of the study to assess the age, gender, level of study and year, subject of study, level of musical training, and what instrument they played if their training level was novice or higher. Participants were asked if English was their first language and if not then they were asked what they consider their first language to be. Participants also completed the Short Test of Musical Preferences (STOMP, Rentfrow & Gosling, 2003) to facilitate the ability to control for musical preference.

2.2.10 Procedure.

A flowchart depicting the procedure of the study can be seen in Figure 2.

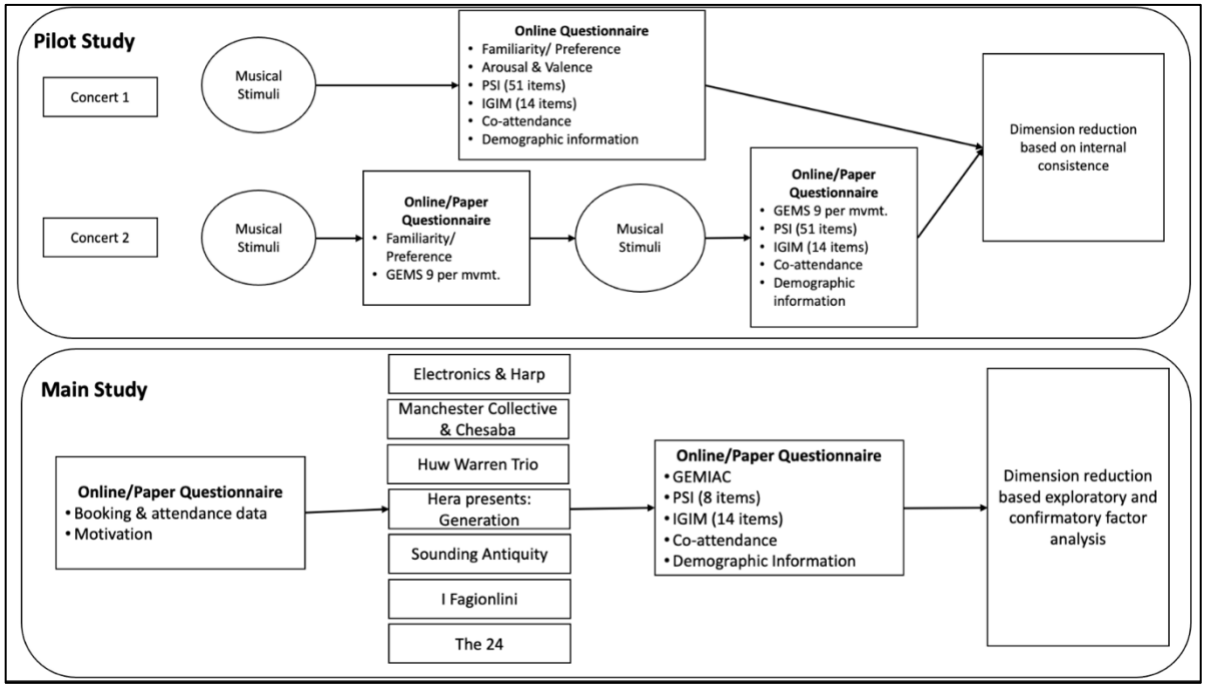

Figure 2. Flowchart depicting the procedure of the pilot and main study.

2.2.10.1 Concert 1

Participants registered on arrival, signed a consent form and received an information sheet, and then chose a seat. They were then given a participant number which corresponded to their iPad number. Once everyone was seated, there was a brief verbal welcome, and the music was performed. Without prompting, participants elected not to clap between each piece despite sufficient silence between them, but only at the end of the concert. This could be a result of the artificial environment of the concert experiment or an inexpert audience who were unfamiliar with the conventions of a live recital of Western art music. The musical performance lasted for approximately 20 minutes in total.

Participants were then invited to access the questionnaire using a short link that was included on the back of their program (n = 44) or they were given a paper copy to complete (n = 6). Analyses showed that there were not any differences between participants filling in the paper questionnaire and those filling in the online questionnaire.

2.2.10.2 Concert 2

Participants arrived at the venue and collected their tickets for the concert. They then came and signed in, if they had pre-registered interest, or signed up if they decided that they wanted to take part on the day. At this time, they were given the option of whether to complete the questionnaire online using their personal smart device, or on a paper copy which was provided to them by the researchers. All participants received a hard copy of the information sheet and GDPR guidelines. They then took their seat and attended the first half of the concert.

During the interval, participants completed the sections of the questionnaire relating to the three movements of the Violin Concerto by Mozart which took approximately five minutes. Participants could complete this in their seats or in the foyer and bar spaces, as they chose. They then returned to Sage Hall One and watched and listened to the second half of the concert. Finally, they completed the sections of the questionnaire relating to the symphony by Bruckner, the collective experience, and all other remaining personality,

demographic, and general questions before submitting the questionnaire (online) or handing it back to the sign in table (paper). The second part of the questionnaire took 15–25 min.

2.2.11 Analysis

Data from the online questionnaire was downloaded from Qualtrics into SPSS version 26, and the data from the paper questionnaires was manually inputted into excel and then converted and merged with the SPSS file.

2.3 Results

The two concerts attracted audiences with different characteristics. For Concert 1, participants were primarily in attendance to take part in the study and not for the performance. 36.7% of the participants in Concert 1 knew no one else in attendance and only 28% of participants planned to attend the study with someone else. Participants from the second concert were primarily concertgoers who agreed to complete our questionnaire as an auxiliary task. They booked tickets through a box office and were assigned seating in the hall. 68% of these participants had planned to attend the concert with someone else and only 1.9% of people knew no one else in attendance.

2.3.1 Dimension Reduction

Our first aim was to abbreviate the measurement tool since brevity is more likely to result in maintained levels of concentration by the participant and reduces the risk of fatigue effects (Lauer et al., 2013; Schatz et al., 2012; Sinickas, 2007). To achieve this, we aimed to be able to present the measure on one single A4 page, which would be approximately 20 items. Our subscale inclusion criteria were as follows:

1. Cronbach's alpha score of > .7, which indicates that the subscale items measure the same general construct and that the subscale has a high internal consistency (Taber, 2018).
2. That the subscale's mean is as close to the middle scale point as possible, which indicates the range of ratings for each item in the context of a concert.

Table 2 shows that the reliability statistics for the IGIM are all above the .7 threshold and although the means vary, none are outlying enough for conclusive exclusion of the subscales; therefore, the entire measure was retained in the main study. As a result, we had space for subscales with a total of approximately six items. The subscales of the PSI had a broader range of Cronbach's alpha scores, and Sympathy, Emotion induction and Mimicry and Gesture did not meet inclusion criteria described above. Of the remaining scales, Depth of Processing and Attention are the subscales that satisfy inclusion criteria and add up to a

total of eight items. The remaining 22 items (14 from the IGIM and eight from the PSI) were subsequently used further in the main study.

Table 2. The table shows the scale and reliability statistics for the IGIM and PSI sub-scales presented to participants in the pilot study.

	No. of Items	Mean	Standard Deviation	Standardised Cronbach's Alpha
In-Group Identification Measure (IGIM)				
Solidarity*	3	3.44	1.33	.78
Satisfaction*	4	5.18	0.92	.80
Centrality*	3	3.49	1.51	.78
Self-Stereotyping*	2	4.31	1.11	.78
Homogeneity*	2	4.49	1.00	.74
Total IGIM	14	4.22	0.86	.87
Parasocial Interaction Inventory (PSI)				
Depth of Processing*	4	2.48	0.93	.70
Attention*	4	2.18	0.95	.85
Evaluation	8	2.12	0.82	.84
Sympathy	8	2.41	0.59	.56
Antipathy	8	2.04	0.69	.76
Emotion Contagion	4	2.37	0.70	.73
Emotion Induction	4	2.27	0.83	.53
Mimicry and Gesture	4	2.28	0.84	.57
Behavioural Intention	7	1.83	0.85	.77
Total PSI	51	2.19	0.46	.88

Note. The IGIM was measured on a scale from 1-7 and the PSI was measured on a scale from 1-5 in accordance with the scales used in the development of each measure. Factors that met the inclusion criteria are indicted with an *.

2.4 Discussion

The two concerts of the pilot study had many contrasting features; for example, the first concert was more controlled, and participants were invited to take part in a study whereas for Concert 2 the audience was a closer representation of a typical concert audience (Pitts, 2005). Based on the results of our analysis, we suggest that Parasocial Interaction (Horton & Wohl, 1956; Schramm & Hartmann, 2019) and In-Group theory (Alport, 1958) can be applied

to social interactions within a Western art music setting (RQ1). The high internal consistency of the measures suggests that they can be used to quantify the social experience of audience members in this context and the range of results indicates the items are able to capture interindividual differences.

There are limitations in this pre-survey which should be addressed, specifically the inclusion criteria of factors in the social experience of a concert. While we have selected factors based on the criteria described above and limitations of space, there were other factors from the PSI with Cronbach's alpha scores which indicate they may also be useful when quantifying the social experience of a concert and future research should seek to test these factors further and provide evidence for inclusion in further validation analysis.

2.5 Main Study: Methods

To validate the 22 items identified in the pilot study, we collected further data to apply and validate the measure in an ecologically valid setting of a Western art music concert series. Furthermore, we aimed to address the remaining research questions and model whether the social experience predicts people's response to the music performance. For a flowchart depicting the procedure of the study see Figure 2.

2.5.1 Participants

Participants were recruited from attendees at the concert series. 113 participants were recruited in total (female = 59, male = 43, prefer not to say = 1, no response = 10). The participants had an age range of 16–88 years (mean = 41.9). 26% of the participants reported that English was not their first language with Chinese, Greek, French, German, Italian, Slovakian, Spanish, and Indonesian being stated as their first language. No participants were excluded from the study due to linguistic incomprehension.

Concert attendance at the York Concert Series is free or heavily subsidised for students and undergraduate music students are mandated to attend a certain number of concerts per term. 46% of the participants were students at the University of York at the time of the study, 67% of these were music students. 10% of participants reported that they had no musical training or considered themselves beginners, 47% were self-reported amateur musicians and 9% were professional musicians with the remaining 34% selecting "other". 31% of participants reported having A levels or below as their highest level of education, 18.6% had an undergraduate degree, 39% had a postgraduate qualification (masters, teaching qualification, vocational qualification etc.) and 11.4% declined to answer the question. 61% of the participants reported coming to the concert with at least one other person.

2.5.2 Concerts

The data collection for the main study took place at several concerts from the York Concert Series. Table 3 provides more information on each concert.

Table 3. The table shows the musical stimuli and participant numbers from the seven concerts from the main study.

Concert title (n)	Performer(s)	Repertoire	Description
Electronics and Harp (12)	Richard Barrett and Milana Zarić	Original compositions by the performers	Extended harp techniques and electronic augmentation
Manchester Collective & Chesaba (14)	Abel Selaocoe (cello and guest director), Rakhi Singh & Simmy Singh (Violin), Ruth Gibson (viola), Alan Keary (electric bass), Sidiki Dembele (Percussion)	A combination of classical string quartet repertoire (e.g. Haydn, Stravinsky), South African traditional songs and fusion of the two	Significant interaction with the audience and introductions and explanation of the curation of the concert by Selaocoe. Audience invited to participate in the concert using call and response
Huw Warren Trio (13)	Huw Warren (piano), Dudley Phillips (bass), Zoot Warren (Drums)	Original contemporary Jazz	Experimental Jazz including improvisation and extended techniques
Hera presents: Generation (8)	Donna Bateman (soprano), Linda Hirst (mezzo soprano), Shakira Tsindos (mezzo soprano)	Original operetta curation with spoken word and nine arias	A combination of staged operatic solos, duets and trios set in the present day
Sounding Antiquity (14)	Steph Conner (various instrument and voice), Barnaby Brown (various instrument and voice)	Experimental contemporary constructions, composed or arranged by the performers, drawing on archaeological evidence	A lecture recital exhibiting reconstructed ancient music on ancient instruments (38,000 BCE - 9th century CE)

I Fagionlini (18)	I Fagiolini. SATB, two per part	Chamber vocal music (e.g. Tallis, Howells, Bach, Rubbra)	Vocal consort music with accompanying art history presentation by Professor Martin Kemp
The 24 (31)	24 vocal students from The University of York	Chamber choir repertoire from English and French composers of the first half of the twentieth century	Complex choral harmony with a range of accompaniment and a Capella repertoire

Note: n = number of participants who attended each concert

2.5.3 Self-reports

All responses were collected as paper and pencil surveys. Participants were asked to record which concert they were attending, rate their motivation for attending the concert, and complete demographic questions before the concert.

At the end of the concert, participants were invited to write three aspects of the concert they liked, and three they did not. They then completed the Social Experience Questionnaire, comprising the 22 items identified in the analysis of the pilot study, with agreement ratings from 1 (not at all) to 5 (very much). They also rated their overall enjoyment of the concert on the same scale. Participants were also asked to rate, on a scale from zero to five, their liking and familiarity with the repertoire performed in the concert. The subjective emotional responses of the participants were measured using the Geneva Music-Induced Affect Checklist (GEMIAC, Coutinho & Scherer, 2017). The whole questionnaire took 5–8 min before the concert and 5–15 min after the concert to complete.

2.5.4 Analysis

The data collected in the main study was combined with the data from the relevant items in the pilot study for validation analysis. JASP was used to conduct the factor analyses and R.studio was used to extract the factor scores. Onyx was used to create the path diagram.

2.6 Results

The process of validation follows the recommendations of best practice derived by Worthington and Whittaker (2006).

2.6.1 Exploring the factor structure of the Social Experience of a Concert Scale (SECS)

Since the PSI and IGIM were not previously used in a live concert setting, we ran an exploratory factor analysis (EFA) in JASP to see if the underlying structure of the factors present in our social experience items matched the theoretical factors from the original scales. We used parallel analysis to identify six factors. Oblique Promax rotation was used because the factors are likely to be correlated.

The EFA model achieved a statistically significant Chi-squared result ($\chi^2 = 289.4$, $p < .001$) which is indicative of a poor model fit; however, since χ2 is overly sensitive with a sample of over 200 and non-normally distributed data, we ran additional fit indices. These show that the Root Mean Square Error Approximation (RMSEA) is .07, which is in the .05–.08 range and thus, indicative of a fair fit and therefore an acceptable model fit (Bentler, 1990; Bentler & Bonett, 1980; Hu & Bentler, 1999a). The sampling adequacy for each variable in the model was examined using the Kaiser-Meyer-Olkin (KMO) Test. Overall, the model achieved an average but acceptable measure of sampling accuracy (MSA) of .78 (Hutcheson & Sofroniou, 1999). All individual items achieve an average MSA between .70 and .79 (See Appendix 1, items 1, 2, 3, 5, 8, 9, 15, 16), meritorious MSA between .80 and .89 (see Appendix 1, items 6, 12, 13, 14, 17), or marvellous MSA between .90 and 1 (see Appendix 1, items 4, 7, 10, 11). This indicates that there is an acceptable degree of common variance between items and that the data is suited to dimension reduction via factor analyses, based on the conservative minimum threshold of .6.

The factor loadings achieved from the EFA, are displayed in Table 4. In accordance with their original theoretical models, the resulting six factors were named: *Satisfaction*, *Depth of Processing*, *Solidarity*, *Attention*, *Centrality*, and *Self-Stereotyping*. Three items did

not achieve an acceptable loading score: *I often think about being in the audience* (.29), *The audience has a lot to be proud of* (.47) and *I barely noticed how the audience behaved* (.35); therefore, these items were removed from further analysis. As a result, the factor of Centrality only had two remaining items which is not enough to conduct a confirmatory factor analysis (Raubenheimer, 2004) so the entire factor was removed.

Table 4. The table shows the result of an EFA of the Social Experience items used in the main study.

	Satisfaction	Attention	Self-Definition	Solidarity	DoP	Centrality	Uniqueness
1. People in the audience are similar to each other	.	.	0.64	.	.	.	0.53
2. Members of the audience has a lot in common with each other	0.48	.	0.41	.	.	.	0.54
3. I had a lot in common with the average audience member	.	.	0.72	.	.	.	0.42
4. I am similar to the average person in the audience	.	.	0.84	.	.	.	0.28
5. Being in the audience is part of my identity**	.	.	.	.	.	0.85	0.27
6. Being in the audience is an important part of how I see myself**	.	.	.	.	.	0.86	0.17
7. I often think about being in the audience*	.	0.29	.	.	.	.	0.71
8. The audience has a lot to be proud of*	.	.	.	0.47	.	.	0.51
9. Being in the audience gave me a good feeling	0.86	.	.	.	.	.	0.23
10. I was glad to be in the audience	0.63	.	.	.	.	.	0.6
11. It was pleasant to be in the audience	1.00	.	.	.	.	.	0.15
12. I felt a bond with the audience		.	.	0.66	.	.	0.39
13. I felt committed to the audience	.	.	.	0.92	.	.	0.30

14. I felt solidarity with the audience	.	.	.	0.57	.	.	0.45
15. The audience repeatedly attracted my entire attention	.	0.45	.	.	.	.	0.62
16. I did not really notice the audience	.	0.93	.	.	.	.	0.29
17. I rarely paid attention to the audience	.	0.76	.	.	.	.	0.41
18. I closely watched how the audience behaved	.	0.52	.	.	.	.	0.54
19. I barely noticed how the audience behaved*	.	0.35	.	.	.	.	0.88
20. I formed only a fleeting observation	.	.	.	.	0.40	.	0.66
21. I have a picture of the audience is still vivid in my mind	.	.	.	.	0.91	.	0.22
22. I can still remember what the audience looked like	.	.	.	.	0.83	.	0.23

Note. N = 214. Parallel analysis used to identify the number of factors. Oblique promax rotation applied. DoP= Depth of Processing. * item subsequently removed for inadequate factor score; **factor removed due to too few items loaded.

2.6.2 Confirming the factor structure

A confirmatory factor analysis (CFA) was run on the resulting factors and items from the EFA, with the items discussed above removed. The results can be seen in Figure 3 (see also Appendix 1). The CFA model achieved a statistically non-significant Chi-squared result ($\chi^2 = 129.8$, $p = .085$) which is indicative that this model is a good fit; however, since χ^2 is overly sensitive with a sample of over 200 and non-normally distributed data, we ran additional fit indices again. These show that the Root Mean Square Error Approximation (RMSEA) and Standardized root mean square residual (SRMR) respectively were .032 and .075, which are under the acceptable threshold of .08 and thus indicative of an acceptable model fit (Hu & Bentler, 1999). Based on this it can be assumed that theories of parasocial interaction and social bonding can be applied to a live concert setting and be used to

measure the social experience of an individual in that context. This model also shows that each of the five factors are significantly and positively correlated. The covariance of the factors can also be seen in the table in Appendix 2.

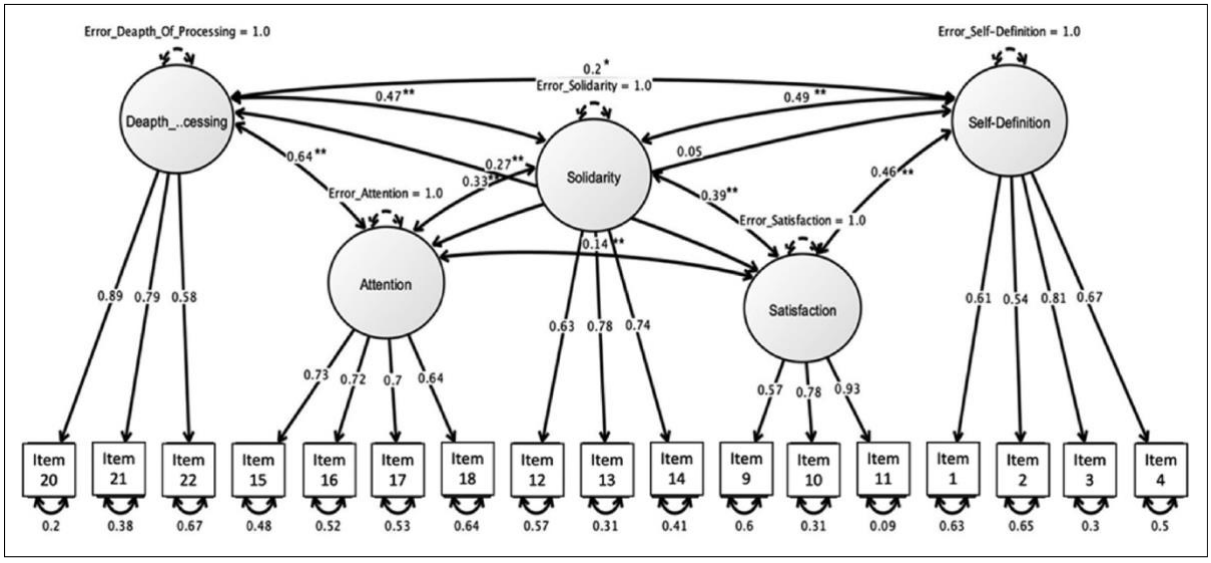

Figure 3. The path diagram derived from the confirmatory factor analysis with factor loading scores and factor covariance scores.

Note: *p < .05, **p <.01. The item numbers correspond with the item numbers in Table 3.

2.6.3 RQ2: Are there demographic or contextual predictors of the strength of the social experience of a Western art music concert?

Having found that many of the social factors are positively correlated, we used a multivariate analysis of variance test (MANOVA) to explore a range of potential predictors of a social experience (Huberty & Morris, 1989). These were the concert at which data was collected to see if the music influenced the social experience, whether participants attended the concert alone or with others, their age, highest qualification, and level of musical training. Musical training was captured with a single, self-assessment item and converted to four groups for the analysis with a view to achieving consistent sample sizes in each group (Beginner/no musical training (n = 40), intermediate (n = 44), professional (n = 38), and other/mixed category (n = 11)). While there are validated tools that can provide a more nuanced insight into musical training (e.g. Gold-MSI), the questionnaire was already very

long, so in the interest of efficiency a single item wa used. Future research seeking to explore musical training and the social experience of live events could use the Gold-MSI for a more nuanced insight. Thank you for this recommendation. Table 5 shows the outcome of the analysis; only main effects were tested to allow for meaningful interpretations to be made and any interactions that were non- significant were removed.

Table 5. Between-subjects effects on the social experience factors.

Independent variable	Dependent variable	Type III sum of squares (df)	Mean square	F	Partial eta squared
Intercept	Depth of processing	3.734 (1)	3.734	5.571*	.024
	Attention	0.186 (1)	0.186	0.444	.020
	Solidarity	0.594 (1)	0.594	1.606	.011
	Satisfaction	0.022 (1)	0.022	0.083	.002
	Self-definition	0.005 (1)	0.005	0.012	.007
Concert	Satisfaction	2.601 (1)	2.601	9.800**	.068
	Self-definition	2.577 (1)	2.577	5.826*	.065
Co-attendance	Attention	1.802 (1)	1.802	4.295*	.015
	Solidarity	1.529 (1)	1.529	4.138*	.034
Age	Depth of processing	2.974 (1)	2.974	4.438*	.040
	Solidarity	1.731 (1)	1.731	4.683*	.037
Musical training	Depth of processing	3.241 (1)	3.241	4.836*	.002

Note. *$p < .05$, **$p < .01$. Only significant predictors have been included in the model.

For this analysis, age was grouped into bands which included approximately the same number of participants in each group. The categories were: 23 years old or younger (n = 62), which included the majority of the undergraduate student population who attended the concerts and took part in the studies, 23–55 (n = 53), 56–75 (n = 65), and over 75 years old (n = 12). Highest qualification was reduced to five categories: GCSE, equivalent or below (n= 43); A levels or equivalent (n = 45); Bachelor's degree (n = 31); vocational qualification or PGCE (n = 36); postgraduate qualification (n = 40).

Using Pillai's trace, as it is more robust to departures from assumptions than other multivariate tests, there was a significant effect of concert on the social experience V = .16, $F(5, 93) = 3.58$, $p = .005$, a significant effect of age on the social experience V = .21,

F(5, 93), $p = .001$, a non-significant trend effect of co-attendance on the social experience V = .25, F(5, 93) = 3.12, $p = .08$ and a non- significant trend effect of musical training on the social experience V = .11, F(5, 93) = 2.21, $p = .06$.

F-test results for separate social experience factors are presented in Table 5. The mean of social experience factors separated by significant independent variables can be seen in Figure 4. Satisfaction and self-definition are significantly associated by the concert variable. For example, the lecture recital, solo recital, and choral concerts elicited the highest levels of satisfaction, whereas the jazz trio, chamber vocal, and experimental electronic concerts evoked the lowest levels of satisfaction. Again, the solo recital, along with the chamber orchestral concerts resulted in the greatest self-definition and the orchestral and experimental electronic concerts achieved the lowest. Surprisingly, co-attendance was negatively associated with lower level of attention and solidarity. Furthermore, older participants reported greater depth of processing and solidarity with the audience than younger participants. Finally, the higher the level of self-reported musical training the greater the depth of processing. The variable highest qualification obtained was not a significant predictor of any of the social experience factors.

Post-hoc tests were used to explore the pairwise comparisons for the concert, age categories, and musical training and the significant differences, and those pairs that display a non- significant trend can be seen in Table 6. Consistent with the data shown in Figure 4c, the following specific pairwise comparisons between concert type are seen to be significant: the satisfaction rating compared between Solo Recital – Orchestral, Solo Recital – Experimental Electronic, Experimental Electronic – Chamber Instrumental, and the self-definition rating compared between Solo Recital – Chamber Vocal. There is a non-significant trend in the satisfaction ratings in the Orchestral – Chamber Instrumental pair, and the comparison between Experimental Electronic – Choral. No pairwise comparisons in the age categories or musical training were significant.

1 *Table 6. Significant Bonferroni Post hoc pairwise comparisons between each concert type*

Dependent Variable	Concert type comparison	Mean Difference	Std. Error	p	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Satisfaction	Solo Recital - Orchestral	.4810*	0.11258	.001	0.1150	0.8469
	Solo Recital - Experimental Electronic	.7384*	0.18887	.005	0.1245	1.3524
	Orchestral - Chamber Instrumental	-0.5141	0.16291	.068	-1.0436	0.0154
	Experimental Electronic - Chamber Instrumental	-.7716*	0.22257	.024	-1.4950	-0.0481
	Experimental Electronic - Choral	-0.6322	0.20026	.068	-1.2831	0.0187
Self-Definition	Solo-recital - Chamber Vocal	.6481*	0.17468	.010	0.0803	1.2159

Note: Based on observed means. The error term is Mean Square (Error) = .402.

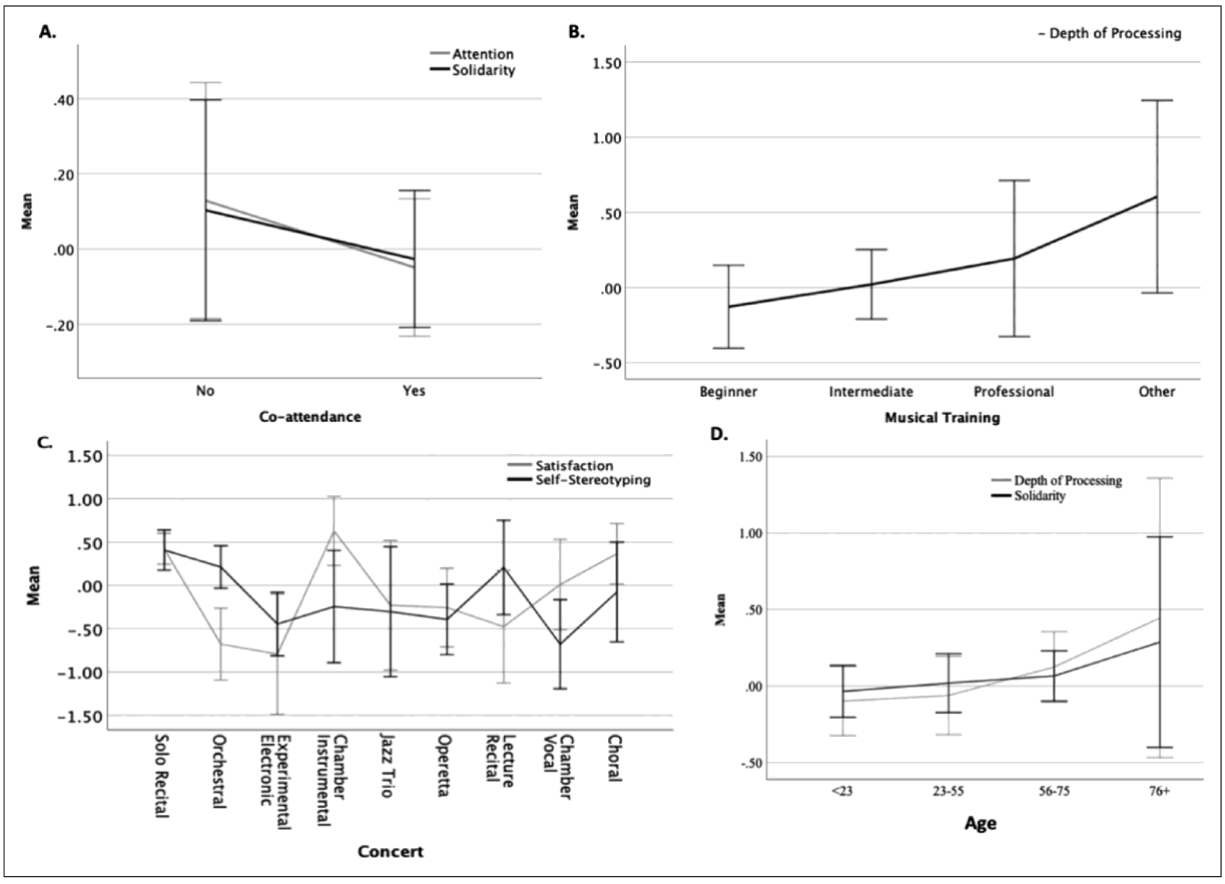

Figure 4. Means of social experience factors separated by significant independent variables

Note. A. Attention and Solidarity × co-attendance; B. Depth of processing × Musical Training; C. Satisfaction and self-definition × concert; D. Depth of processing and solidarity × age. Error bars show the 95% confidence intervals.

2.6.4 GEMIAC dimension reduction

Since there is no theoretical subfactor model of the GEMIAC items available in the original publication (Coutinho & Scherer, 2017), we conducted a principal component analysis with Varimax rotation and Kaiser normalizations on the GEMIAC item ratings to reduce the number of emotional dimensions. Based on the Scree plot, we used the elbow criterion to identify three factors which were labelled: Positive Energy, Discomfort, and Wistful. The factor loadings can be seen in Table 7.

Table 7. Loadings of the rotated component matrix for the principal component analysis of the GEMIAC.

Item	Positive Energy	Discomfort	Wistfulness
Energetic, lively	0.796		
Inspired, enthusiastic	0.787		
Filled with wonder, amazed	0.761		
Powerful, strong	0.734		
Joyful, wanting to dance	0.732		
Enchanted, in awe	0.725		
Moved, touched	0.68		0.384
Full of tenderness, warm-hearted	0.649		0.313
Tense, uneasy		0.908	
Agitated, aggressive		0.859	
Indifferent, bored		0.665	
Melancholic, sad			0.825
Nostalgic, sentimental			0.72
Relaxed, peaceful	0.319		0.68

Note. Rotation Method: Varimax with Kaiser Normalization. Scores <0.3 have been suppressed

2.6.5 RQ3: Is emotional response to live musical stimuli influenced by the social experience of a concert?

The three extracted emotion factors were used to ascertain if the social experience of a concert can be used to predict the emotional experience of the audience, in response to the music. To do so, we ran separate linear models for each of the emotion factors derived from the PCA. Overall, the social experience is not a significant predictor of Positive Energy $F(5, 93) = .90$, $p = .49$, Discomfort $F(5, 93) = 1.03$, $p = .40$, or Wistful $F(5, 93) = .64$, $p = .67$. Furthermore, no individual social experience factors are significant predictors of emotional experience of the music, as can be seen from the results of the linear modelling in Table 8.

Table 8. The table shows linear modelling of the social experience factors as predictors and the emotional experience of the music as the outcome.

		Beta	Std. Error	t	p
Positive Energy	(Constant)		0.111	-0.277	.782
	Depth of Processing	0.049	0.226	0.253	.801
	Attention	0.145	0.241	0.822	.413
	Solidarity	-0.308	0.257	-1.764	.081
	Satisfaction	-0.085	0.244	-0.644	.521
	Self-Definition	0.171	0.228	1.136	.259
Discomfort	(Constant)		0.11	0.388	.699
	Depth of Processing	0.098	0.223	0.508	.613
	Attention	-0.072	0.238	-0.408	.684
	Solidarity	0.171	0.254	0.986	.327
	Satisfaction	0.036	0.241	0.276	.783
	Self-Definition	0.006	0.225	0.042	.966
Wistful	(Constant)		0.113	0.227	.821
	Depth of Processing	0.105	0.229	0.538	.592
	Attention	0.057	0.245	0.322	.748
	Solidarity	0.039	0.262	0.224	.824
	Satisfaction	-0.024	0.248	-0.181	.857
	Self-Definition	0.046	0.232	0.304	.762

2.6.6 RQ4: Is the overall enjoyment of a live Western art music concert influenced by the degree to which participants subjectively rate their social experience?

Social experience was found to be a significant predictor of enjoyment $F(5, 169) = 20.15$, $p < .001$ in a linear model. In particular, the social factors Attention and Solidarity were found to be positively associated with enjoyment in Table 9 and Figure 5.

Table 9. The table shows a linear model of the social experience factors as predictors and the overall enjoyment as the outcome

Predictor variables	Outcome variable	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	p
(Constant)	Enjoyment	3.442	0.074		46.74	<.001
Depth of Processing		0.025	0.128	0.018	0.193	.847
Attention		0.427	0.152	0.243	2.802	.006
Solidarity		0.892	0.169	0.466	5.277	<.001
Satisfaction		0.11	0.17	0.048	0.646	.519
Self-Definition		-0.086	0.152	-0.048	-0.569	.57

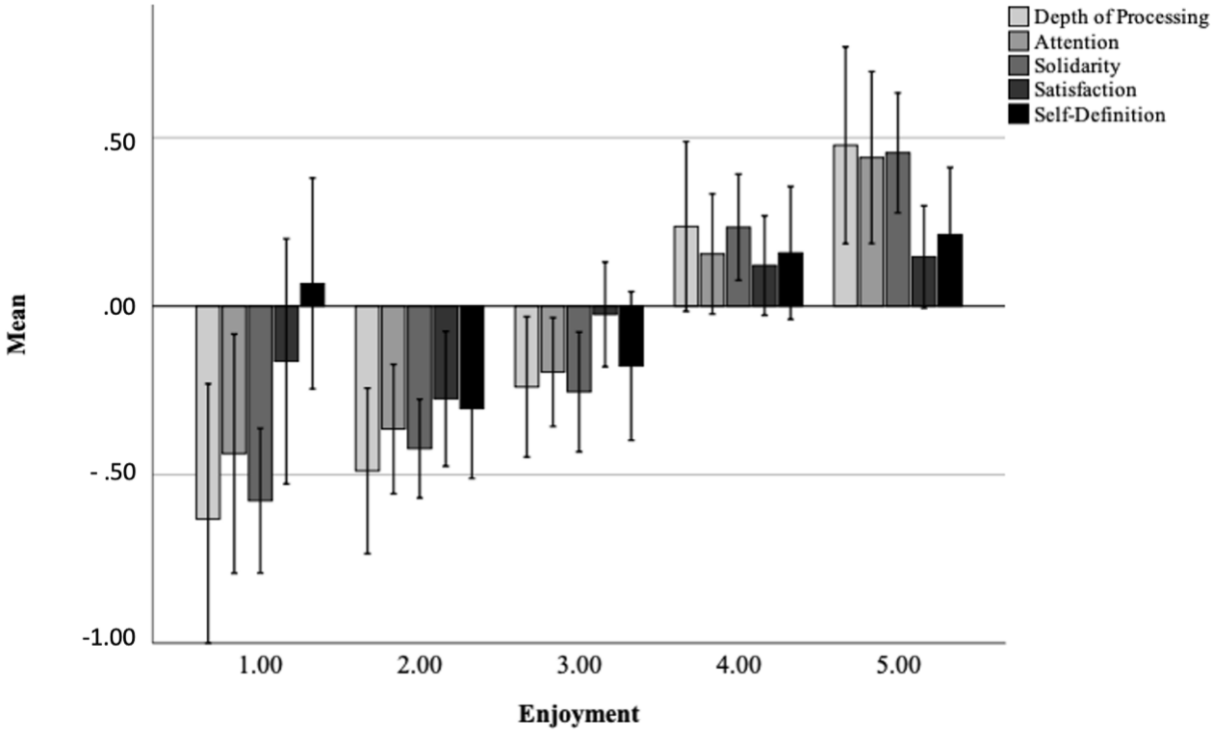

Figure 5. A clustered bar graph depicting the mean enjoyment score for each of the social experience factors.

Note. Error bars depict 95% confidence intervals.

2.7 Discussion

In this chapter, we have tested and validated a measure of the social experience of a live Western art music concert. An exploration of the literature and the high internal consistency of the factors indicate that theories of parasocial interaction (Horton & Wohl, 1956; Schramm, 2015; Schramm & Hartmann, 2019) and in-group bonding (Alport, 1958; Sherif, 2015; Tajfel et al., 1979) can be applied to a specific concert setting (RQ1). The adherence of our data to the theoretical factor models also indicates that these measurement tools can be used to quantify this experience. In our sample, co-attendance, age, musical training, and the type of concert were seen to influence the intensity of a social experience (RQ2). The social experience of a concert does not seem to effect participants' emotional response to music (RQ3) but it does predict a participant's overall enjoyment of the event (RQ4).

Our first research question was whether theories of parasocial interaction (Horton & Wohl, 1956) and in-group bonding (Alport, 1958) can be applied to a live, Western art music concert context (RQ1). Consequently, can we use existing measures associated with these theories to create an ecologically valid and appropriately brief (Lauer et al., 2013) yet reliable measure to quantify the social experience? We identified two commonly used questionnaire batteries corresponding to these two theories respectively and used them to collect information on the social experience of a concert; specifically, how much attention people pay to other audience members (Schramm & Hartmann, 2019), and their experience of bonding with them to form an "in-group" (Leach et al., 2008). The results from the pilot study show that seven factors from these existing measures achieve high internal consistency scores when used in a typical live, Western art music concert setting and the factor analyses revealed that data collected in this context achieves the same factor loadings as the original scales. From this, we believe that it is possible to apply these to an ecologically valid live Western art music concert and that these tools can be used to quantify this experience. The resulting measure of the social experience of a Western art music concert has a five subfactor model and captures depth of processing, attention, solidarity, satisfaction, and self-definition. The positive covariance of these five factors indicates that an increase in any

single factor will result in an increase in the other factors and that the items measure an overall social experience.

In the main study, we used the five factors from our validated measure of the social experience of a Western art music concert to explore if they are influenced by personal or situational factors (RQ2). The results indicated that age and musical training significantly influence the overall social experience. As was established in the introduction, self-definition often occurs based on observable traits, such as age, and this has been found to influence social bonding (Barak et al., 2001). Our findings suggest that this is also true in the context of a live concert since age was found to influence the social experience. Non-observable traits, such as musical training, require a degree of familiarity or prior knowledge of fellow attendees which was typically the case in our stimuli concerts. At the York Concert Series, music students are eligible for free tickets and are often seated at the extremities of the seating in the venue, whereas fee-paying public audience members are seated in the centre. From this, we can infer that audience members will be seated in proximity to others who are similar to them, based on observable and latent characteristics, and we see two distinct groups of attendees: students, who are likely to be younger, and public members, who are likely to be older (Bigand & Poulin-Charronnat, 2006; Botstein, 1992; Dobson & Pitts, 2011; Thompson, 2006). It can also be inferred that music students will recognise their peers, even if they did not attend the concert together, and as a result of this recognition or prior knowledge they can evaluate the homogeneity of the musical training of other audience members, and individually self-stereotype as being similarly musically educated, and thus experience a greater degree of social bonding (Stupacher et al., 2020). It is important to note that the results may have been different with a different population and any attempt to generalise these findings to other samples should be done with caution, until further research has found evidence to corroborate the findings,

We can see from our results that the overall social experience was not significantly predicted by this co-attendance; however, this variable was found to have a significant but negative influence on the attention and solidarity factors. This means that those who attend the concert with others paid less attention to them and felt less bonded to the

audience. This can be explained by the assumption that when attending a concert with others, we might pay more attention to their responses (Boothby et al., 2014) and thus have generally lower levels of awareness of the rest of the audience. In situations where concert curators or programmers want audience members to pay less attention to the general audience then they could offer discounts for sales of multiple tickets. However, if concert personnel are trying to enhance the general collective experience, then this could be achieved by encouraging audiences to be seated earlier with the house lights on to facilitate the attention and processing of other audience members. While controversial, it could also be interesting to not sell concurrent seats to those attending the concert with others, which may reduce the attention individuals pay to the responses of those with whom they have a relationship and encourage a transfer of attention to the general audience.

The type of concert was not found to be a significant predictor of the overall social experience of the concert; however, it was seen to significantly influence social subfactors satisfaction and self-definition. An explanation for this could be that we are similar to those who like particular types of music or ensemble, and therefore attend specific concerts, which would result in higher levels of self-definition (Boer et al., 2011; Trehub et al., 2015). The satisfaction factor captures the extent to which an individual is glad to be part of the group, in this case the audience, and it could be that there is a confluence of enjoyment of the concert and the pleasantness of the social experience. Specific concerts elicited particularly high social experience factor ratings; for example, the chamber orchestral concert achieved the greatest satisfaction score. This concert involved audience participation (Lee et al., 2019; Loxley, 1983; Pitts, 2005), the staging was informal (Dearn & Price, 2016) and the seating was taken forward onto the stage (Pitts et al., 2013), all of which have previously been found to influence the social experience of a concert. Another notable result was that the self-definition ratings in the solo recital were higher than in any other concert. For this concert, participants were invited to take part in a study recital, and they came exclusively from the student population, and they have responded to this homogeneity by grouping the other members of the audience to a greater extent and

identifying more strongly with them. This finding may be seen to indicate that, when considering audience development, people are inclined to rate themself as more similar to people who like the same type of music as they do; therefore, marketing material should reflect the target population for each concert and depict those that are similar to them. In addition to this, since the concerts with audience participation and informal tagging achieved the highest satisfaction scores, performers could seek to include these aspects more frequently into their events, moving away from the traditional concert format towards an inclusive and engaging one.

Based on our findings, the social experience does not influence the emotional response to the concert (RQ3). Previous research in a laboratory setting has found that the presence of others reduces the intensity of emotional responses to music in the presence of others (Egermann, et al., 2011; Liljeström, et al., 2013; Linnemann et al., 2016). However, the more ecologically valid research on emotion contagion and social bonding found that they are related (Garrido & MacRitchie, 2020). These previous studies suggest that the presence of others does influence emotional responses to music in varying contexts, albeit in contrasting ways. However, based on our results, the social experience appears to be separate from the emotional experience of music since no emotion was significantly affected, while the overall enjoyment of an event is influenced by the social experience (RQ4). This contributes to the belief that the overall experience of a live, Western art music concert and the direct influence of the music are separate (Beranek, 2012); therefore, concert organisers should not feel that enhancing the social experience of a concert will detract from audience engagement with, or response to, the performance. These findings should be used as encouragement to be innovative when curating and designing concerts and seasonal programs to enhance the social experience of live events. Perhaps the proscenium arch is no longer conducive to the appetite of the audience and performances in the round, on thrust or traverse stages that encourage a more active style of listening better reflect the taste of the modern audience.

In summary, the results suggest that the social experience of a concert can be predicted by certain demographic variables and in turn, can be used to predicted, and therefore alter, the enjoyment of a concert but not the emotional response to the music.

2.7.1 Limitations.

By validating a new measurement tool, we sought to mitigate the limitations we identified in previous research which did not adequately quantify the social experience in our opinion (e.g. Garrido & MacRitchie, 2020). We also aimed to improve the ecological validity of our data by recruiting participants from people attending concerts, rather than attending a study (e.g. Egermann et al., 2011) and validating the measure in a typical Western art music concert setting.

A limitation of this study arose from the need to significantly reduce the number of items from the original 126. It has been found that participant fatigue leads to a reduction on concentration and diligence when responding to questionnaires (Lauer et al., 2013; Sinickas, 2007). There is what is often considered to be a ‘‘trade-off’’ between the need for detailed and reliable data and the reduction in the quality of response a participant will give based on the amount of time spent completing a questionnaire (Schatz et al., 2012). As a result, the reliability of our data may have been compromised because, while we defined our exclusion criteria for discarding items from the pilot study, there were some other factors from the PSI which merit further explorations. For example, *behavioural intention* and *antipathy*, which both achieved high internal consistency scores, but had low means based on our data collection. It could be that with a larger sample or alternate context, these factors would have been included.

It should also be noted that the theories employed, specifically the parasocial interaction theory, may limit the validity of this measure for typical Western art music concerts in which the audience are seated facing the stage and without interacting. In concerts of other genres of music or with different staging, there is more potential for interaction between audience members and without further testing, it is not clear if the tool

would still be valid and future research could test it in alternate settings or, indeed, in digital concert settings with no audience physically present.

Finally, the sample sizes used in this psychometric instrument validation and analysis are small compared to other studies with similar aims. To address this, additional fit indices and conservative thresholds have been employed to conclude the acceptability of the models based on the factor analyses employed. All theoretically acceptable thresholds have been met and therefore we have concluded that the scale is a psychometrically validated measure. However, any future use of the scale should consider the internal consistency and fit of the model in each context and sample.

2.7.2 Conclusion

We conclude that in this study we have developed and validated the first quantitative measure of the social experience of a Western art music concert. The tool was derived from measures of parasocial interaction and in-group bonding which can be applied to a concert setting. Our results also suggest that the emotional response to music and the overall experience of a concert are separate and that only the latter can be influenced by the social experience. The implications of this are that concert curators, performers, and venue managers can increase audience members' enjoyment of a Western art music concert by altering the social experience that audience members have, without influencing the choice of repertoire.

Future research could address the efficacy of the SECS in capturing the social or collective experiences of the performers in an ensemble, both with each other and between the performer(s) and audience. It would also be interesting to explore the influences of different concert presentations and formats, including online concerts, in more controlled and hypothesis-led experiments.

Chapter 3

Exploring the social experience of live and digitally presented concerts.

3.1 Introduction

One of the key distinguishing features of engagement with live music is the presence of other people (Wald-Fuhrmann et al., 2021). The previous chapter described a study which explored ways in which to quantitatively capture the social experience of a live Western art music concert (O'Neill & Egermann, 2022). To further develop this line of investigation this chapter will discuss a study which alters the parameters of a concert with the aim of exploring the ways in which this influences the social experience of the event. Before the study is discussed, the existing literature on the social functions and experiences of music will be reviewed.

3.1.1 Social bonding as a function of music

As stated in the previous chapters (see section 1.2.1 and 2.1.1), social bonding, group cohesion and communication are often posited as some of the evolutionary origins of music making and its subsequent enjoyment (Huron, 2001; Loersch & Arbuckle, 2013; Oesch, 2019; Schulkin & Raglan, 2014; Trehub et al., 2015). While empirically problematic, the view that music can be considered as a coevolved system for social bonding is an underlying function that unifies all other suggestions of why humans make music, including mate identification and selection, infant-parent bonding, and group cohesion (Savage et al., 2020). While there may be cultural variances in aesthetic appreciation for musical features, group performance and consumption is, in some ways, universal (Brown & Jordania, 2013; Mehr et al., 2018; Savage et al., 2015). Among the musical universals proposed by Brown and Jordania were the behavioural observations that "music is mostly produced by groups rather than individuals" and "music coordinates and emotionally unites groups of people" (2013, p. 241) thus reinforcing the social importance of the activity.

Social or group bonding refers to the identification, categorisation and comparison of conspecifics in order to make in-/out-group judgments about ourselves and others. To revise the exposition of this (see section 1.2.5), categorisation can be conceived as the process by which an individual appraises others to understand and attempt to identify them

(Turner, 2010). The identification phase is where the individual takes on the observed behaviours and characteristics of a perceived group to strengthen the bonds and perpetuate the tropes of that group through conformity (Bernheim, 1994). Upon doing so, an individual compares themselves to other members of the in-group and where similarities are found, self-esteem is maintained and enhanced (Wheeler & Miyake, 1992). The social function of music to foster and strengthen group bonding can be seen to occur through both the performance and consumption of music and it is the latter which will be the particular focus of this chapter.

3.1.2 Social experience of live concerts

The presence of others influences both the decision to attend live music events and the real-time experience of them (Dearn, 2017). The desire to engage in a social experience is an important motivating factor in the selection of leisure activities and this has also been found to be true for co-attendance at music concerts (Baker, 2000; Burland & Pitts, 2016; Kulczynski et al., 2016). In fact, even when the other audience members are not known to us, they shape our experience of live music through a shared expectation of behaviour, enjoyment, and respect for the other members present (Small, 1998). These aesthetic, social and ethical convergences within groups of people unite people and influence their experience of the musical event (Clarke & Clarke, 2005; Pitts, 2005). In a recent framework of concert listening, Wald-Furhmann et al. (2021) have identified the co-presence of others as a concrete component that exerts a moderating and/or mediating effect on an attendee's aesthetic experience of music. The socialisation potential of a music event has been identified as being acutely important for those who would not frequently attend concerts (Baker, 2000) and for young people (Dobson & Pitts, 2011; Kolb, 2013), both groups that have been identified as being unlikely to attend alone. Conversely, there are audience segments who have a much lesser interest in socialising with others at a concert, and do not seek out a shared experience. For example, so called *frequent attendees* are often depicted as disinterested in these elements (Dearn & Price, 2016).

During a concert, the intra-audience effect, or the influence of others on an individual's experience has been found to affect listeners' subjective responses to music (O'Neill & Egermann, 2022; Egermann et al., 2013; Gross, 2013; O'Sullivan, 2009). For this influence to occur, some form of empirical social feedback mechanism must be displayed; for example, applause, focused attention, or other behaviours typical in a concert (Mann et al., 2013). The impact of social feedback has been interpreted as normative social influence through social appraisals (Manstead & Fischer, 2001). These subjective responses to the music may take the form of emotional experiences, which have been found to be influenced by the social context in which the listening occurred, especially strong experiences with music (Gabrielsson & Wik, 2003). In situations of synchronous consumption of pre-recorded music, more intense emotions were reported when listeners were in the presence of close-friends or partners, compared to alone listening conditions (Liljeström et al., 2013), regardless of self-selected or randomly samples music excerpts. In a live concert setting, Lamont found that intense experiences occurred more frequently when other people were present (2011). Some researchers have found that the presence of others enhances the experience of the performance, specifically the feeling of sublimity (Balteș & Miu, 2014; Harries, 2014). However, there is also evidence that the presence of others does not ubiquitously result in stronger emotional responses to music. It is possible that co-presence serves as a distraction and thus, reduces the likelihood of experiencing physiological responses to pre-recorded music (Egermann et al., 2011). In live music, communal consumption can also serve to lessen the enjoyment of the event, if other audience members are distracting or do not adhere to the expected behaviours (Burland & Pitts, 2014).

Despite the evidence that the social experience and presence of others is highly influential on the subjective response to live music events, there is surprisingly little engagement with these parameters by concert curators, nor by the research community. It could be suggested that, in contrast to other concert genres, Western art music concerts typically do little to foster an environment in which a social experience is encouraged (Kulczynski et al., 2016; Pitts, 2005). The potential for intra-audience interaction is much greater in jazz (Pitts & Burland, 2013) or popular music concerts (Brown & Knox, 2017).

Despite a small number of exceptions (e.g. Toelle & Sloboda, 2021), the facilitation of participation or interaction within, and between the audience and the performers is sparse.

There are previous examples of research that sought to measure the albeit limited social experience of Western art music concerts; for example, Gariddo and MacRitchie (2020). They found that social bonding mediated the effect of emotion contagion on emotional responses, and that concert pre-talks can be used to enhance participants perception of having a social experience. In an attempt to achieve more robust data regarding the social experience, a new measure was validated in the previous chapter (O'Neill & Egermann, 2022). The data was collected at a series of live, Western art music concerts, using measures based on parasocial interaction, and in-group bonding theories. The result is the Social Experience of a Concert Scales, which have been psychometrically validated to capture the social experience of live concert settings only. In this chapter, we seek to further validate the measure for use in digital concert studies since these occupy an increasing proportion of music engagement.

3.1.3 Social experience of digital concerts

The consumption of recorded music has become increasingly digital, offering consumers greater control and access to music from almost anywhere in the world (Aguiar, 2017; Arditi, 2018; Hracs et al., 2016; Magaudda, 2011; Molteni & Ordanini, 2003). However, in-person attendance and engagement with music concerts and performances continued to compete economically with the arguably more convenient mediatised content that is available (Wald-Fuhrmann et al., 2021). That was, until the COVID-19 pandemic catalysed the closure of concert venues and performance spaces around the world. The influence that others can have on the musical experience of an individual has already been discussed in this and the previous chapter, but it should also be acknowledged that achieving and maintaining a connection with others has mental and physical benefits. Even moderate social isolation can have severe negative consequences, increasing stress and instances of suicidal thoughts and clinical depression (Adam et al., 2006; Dawes et al., 2015; Heinrich &

Gullone, 2006; Matthews et al., 2016; Quach & Burr, 2021; Robb et al., 2020). The social distancing measures put in place by governments across the world at various stages to protect their citizens from the virus, also resulted in increased isolation, anxiety and depression (See section 1.2.3; Venkatesh & Edirappuli, 2020).

It is not a new phenomenon, that in an attempt to alleviate loneliness both during and preceding the pandemic, people have engaged with music (Schäfer et al., 2020; Taruffi & Koelsch, 2014) as well as other mass and social media (Pittman & Reich, 2016; Sirola et al., 2019). These pseudo social experiences may be achieved through empathy with the performer or composer (O'Neill & Egermann, 2020; Scherer & Zentner, 2001; Schubert, 2017), group affiliation and belonging (Schäfer & Eerola, 2020), representation of a real relationship partner (Van den Tol & Edwards, 2013), nostalgia for time spent with others (Garrido & Davidson, 2013) or a distraction from the perceived isolation (Schäfer et al., 2020). In addition to this, social surrogacy can be achieved through parasocial interaction which predominantly describes the relationship that an individual experiences with performers and characters engaged with through mediated formats such as television and online (Derrick et al., 2009; Giles, 2002; Greenwood & Long, 2009). This type of relationship is characterised by a one-way flow of information and can also be applied to the interaction that an individual experiences with musicians (See section 1.2.2; Kurtin et al., 2019).

The oxymoronic experience of being physically alone and yet virtually bonded with others while engaging with a digital music event has been facilitated by the rapid development of technologies and streaming services which enhance this paradox (Charron, 2017). Indeed, online streaming of other entertainment industries is significantly further ahead in terms of recognising this. For example, viewer engagement with content available on Twitch has been found to be motivated by social interaction, novel introductions, sense of community and social connectivity for some time (Hamilton et al., 2014; Hilvert-Bruce et al., 2018). The desire to communicate with others and socialise with specific groups was also identified by the international sample in Friedländer's research on Social Live-Streaming Services (SLSS) such as Periscope, Ustream, and YouNow (Friedländer, 2017).

As musicians begin to exploit the direct link to their audiences that free social media platforms afford them, such as Facebook, Instagram, YouTube and Twitch, it must be acknowledged that there is limited capital advantage in streaming via these platforms, except perhaps through advertisement and sponsorship. This suggests that there are other motivations to engage with key audience groups online, such as social resilience, togetherness and social connection (Vandenberg et al., 2021). Perhaps it is possible to achieve, through collective effervescence, ritual outcomes including group solidarity and symbols of social relationships in response to a digital event, despite the absence of a key element of ritual theory: Group Assembly and physical co-presence (see section 1.2.1; Collins, 2005).

3.1.4 Comparing the social experience of live and digital concert presentations.

As discussed, whether the barriers are logistical or attitudinal, the Western art music industry has only recently begun to engage with digital dissemination of their concerts, accelerated by the COVID-19 pandemic (Hansen et al., 2021). In response to this, researchers have begun to compare the social experience of concerts in live and digital settings. For example, Swarbrick et al. (2021) explored how different characteristics of participants would influence their experience of being moved in a virtual concert, compared to a live event. They conceptualised 'liveness' by asking participants to rate the similarity of a virtual concert to their recollection of a pre-pandemic live event. The results of this study indicated that social connection and feeling moved by the concert were correlated, and both significantly predicted by empathic concern. Further to this, they found that live streamed concerts facilitated greater social connection than pre-recorded concerts. This suggests that there is an influence of presence, as opposed to co-presence; however, they were not able to compare a live streamed and digital concert of the same material in this study, relying instead on participants recollection of live events. As well as the reliance on participants' memory, there are also possible confounding factors such as genre, repertoire, musicians, and other factors which we address in this study.

Another study (Onderdijk et al., 2021) which specifically explored the social experience of different concert productions presented participants a live streamed concert via YouTube, a 360° recording viewed through a standard screen, a Virtual Reality headset, and a concert presented via Zoom. Participants in the virtual reality group reported greater feelings of physical presence and connectedness compared to the other concert conditions. Generally, it was found that the perception of physical presence predicted reports of connectedness with both the musician and the audience, yet co-presence was found to predict only connectedness with the audience. This, and the research cited above, indicates that social connection in live events is greater than when participants attend digital versions; however, these conclusions are based on research that was not able to directly compare a live and digital stream of the same stimuli material. In addition, Onderdijk et al., were not able to inferentially analyse the data from their live condition due to a sample size of six participants.

Therefore, to build on this research and further contribute to the growing area of knowledge regarding the social experience of live and digital concerts, and the influence of a quantified social experience on an individual's enjoyment and emotional response to the event, the following research questions have been proposed.

3.1.5 Aims and Research Questions

This study seeks to explore the social experience of digital concerts, in various modes of presentation, and also in comparison with live concerts.

RQ5: Is a live concert experienced as being more social than a digital presentation of the same performance?

RQ6: Is it possible to manipulate a digital concert to be perceived as more social?

RQ7: Are there demographic or contextual moderators of the strength of the social experience of a digitally presented Western art music concert?

RQ8: Is the overall enjoyment of a digital Western art music concert influenced by the degree to which participants subjectively rate their social experience?

3.2 Methods

Data collection took place in-person at the RadialSystem V GmbH in Berlin (*N* = 140) and in four online conditions (*N* = 527). The research was granted ethical approval by the University of York Arts and Humanities Ethics Committee. Data was collected via questionnaire before and after the concert presentation and more detail can be found below.

3.2.1 Stimuli and test conditions

The stimulus for all conditions was a classical chamber music concert including repertoire united by the theme of remembrance and loss, including Ludwig van Beethoven (op. 104), Brett Dean ("Epitaphs") and Johannes Brahms (op. 111). The live concert, performed in September 2020, was recorded and used as the stimulus for the digital concert conditions. The concert described above was presented to participants in five different conditions. The first was a typical, live performance of the repertoire during which participants attended the performance space: a converted pumping station in Berlin. This will be referred to as the 'live' condition throughout this chapter. It should be noted that while the presentation of the concert was largely traditional, participants were socially distanced due to the COVID-19 regulations in place at the time of data collection. This was achieved through seating participants with two empty chairs between them and the use of only every other row. This condition took place over three consecutive days at live performances, the first two of which were performed by the Yubal Ensemble with Charlotte Chahuneau and Larissa Cidlinsky playing violin, Friedemann Slenczka and Martha Windhagauer playing viola and cellist Raphaela Paetsch. The third evening included the same staging and repertoire but was performed by a professional string quintet including internationally renowned instrumentalists, Baiba Skride and Gergana Gergova playing violin, Brett Dean and Micha Afkham playing viola, and Alban Gerhardt playing violincello. Based on the results of paired samples t-test results, no significant differences in participants responses to the two ensembles have been identified and therefore all data collected at a live concert will be

treated as one condition. The performance by the professional ensemble was captured for use in the digital conditions.

The second condition was a recording of the complete live concert, produced by a professional editor. The video presented various views of the ensemble including close-up streams and views of the full stage based on the musical content of the performance. The audience is inconsistently peripherally visible in the recording. The recording lasted for approximately 75-minutes and includes the full repertoire listed above. This recording was sent to participants in this group to be watched on-demand, at a time of their choosing within the test period. While this has allowed greater autonomy over their listening environment, differences in the context of consumption are not controlled for or measures and this may have influenced their experience and responses and this could be considered in future research This condition will be referred to as the 'full on-demand' condition in this chapter.

The third condition is based on the same recording as the second condition; however, it lasted only 38 minutes to address the phenomenon of shrinking attention spans (Singh et al., 2021). To achieve this abbreviated version, movements 2, 3 and 4 were omitted from Beethoven's String Quintet, and movements 3 and 4 from the Dean. Participants in this group were also able to engage with the concert on-demand, at their convenience. This condition will be referred to as the 'abridged on-demand' condition.

The fourth condition was designed to facilitate social interaction. To achieve this, a synchronous screening of the abridged concert recording was screened via the SpatialChat platform. This was set up with four spaces (see Figure 6): a foyer space for people to assemble in upon arrival, the survey space where participants could go and complete the pre- and post-concert questionnaires, the 'concert hall' where they watched the concert screening, and a 'cafeteria' area to facilitate further social interaction following the concert. These spaces were created to mimic the various spaces that an audience may experience in a traditional concert venue, and the experience of the participants in the live concert condition. The platform SpatialChat has advantages over other video conferencing software as it more closely replicated an in-person concert experience. Users can move their video

sphere around the space and proximity to others allows them to hear each other, while those further away cannot. There is also a typed-chat and emoticon function, participants were encouraged to turn their cameras on and unmute their microphones while in the socialising spaces, and to use the emoticon function during the concert. This condition will be referred to as the 'social' condition.

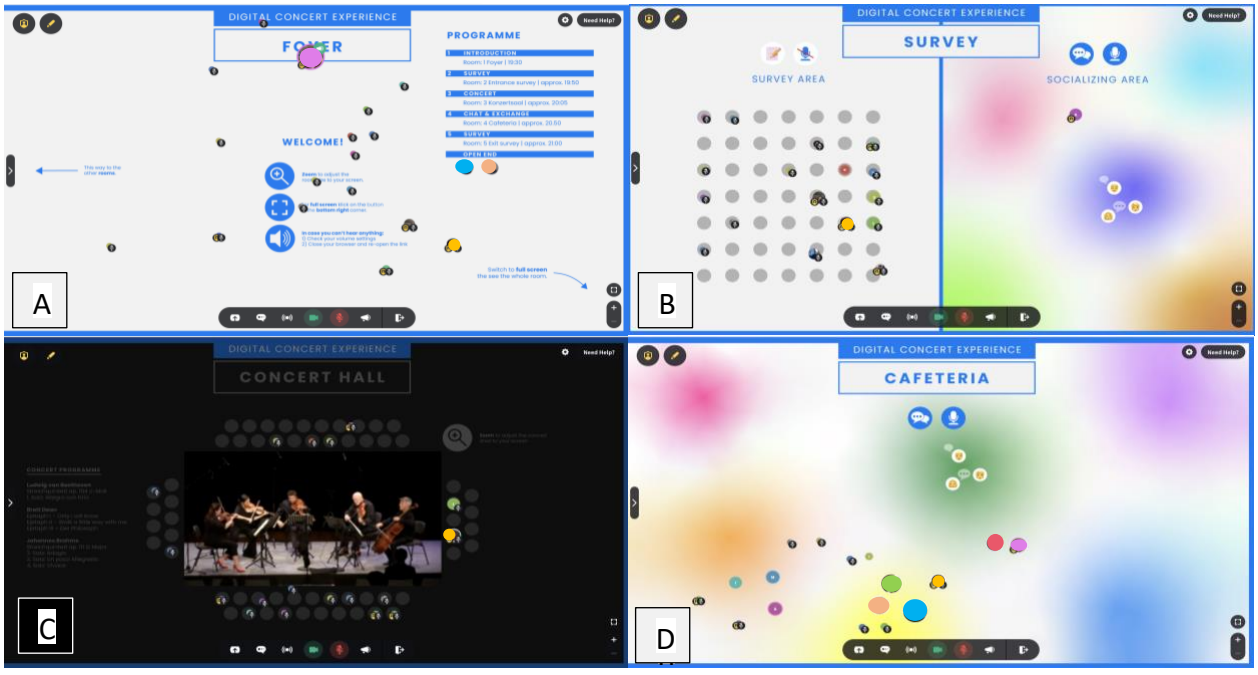

Figure 6. The figure shows the four 'rooms' of the SpacialChat platform set up to create the social condition.

Note. A = the foyer; B = the survey room; c = the concert hall, D = the cafeteria.

The fifth condition was the abridged recording of the concert, edited to include an introductory interview between composer and performer Brett Dean and the artistic director of the RadialSystem V GmbH. The discussion included the curation of the concert, exposition of the theme, and how Dean's composition *Epitaphs* addresses five departed colleagues and friends. This condition was presented on-demand to participants in this group and will be referred to as the 'pre-talk' condition in this chapter.

3.2.2 Participants

Participants for the live condition (*n* = 140) were recruited through the RadialSystem V GmbH box office. Tickets were free and advertised nationally through the media, venue marketing materials and website, social media, and other networks. Many of the media outlets that included the call for participants in their coverage of the event were specialist music publications which may account for the number of participants involved with music professionally (28-40%). A breakdown of participant demographic profile according to condition can be seen in Table 10.

For the digital concerts (*n* = 527), participants were recruited, through similar channels, via the use of a pre-survey (n = 1640; see Egermann et al., In review). This pre-survey was targeted at Western art music consumers and collected information about their previous engagement with live and digital concerts and invited to take part in the main study. 1301 people indicated that they would like to take part in the study and were assigned to one of the four concert conditions described above. Participants were distributed equally based on age, gender, education, and previous concert engagement. These variables were also used to categorise participants based on their level of preference for digital concerts based on a latent profile analysis of the pre-survey data (see Egermann et al., In review). 55.2% of participants in each stream belonged to the stream type preference group "*Digital Concert Enthusiasts*", 33.3% to the group "*Digital Concert Traditionalists*", and 11.5% to the group "*Undecided and Unengaged Concert User*" (Egermann et al., In Review).

Participants in the on-demand conditions (full, abridged and pre-talk) were sent a link to the survey, within which the recording was embedded, and participants in the synchronous social condition were invited to attend one of five available streaming dates. Participants were encouraged to use a SmartTV, personal computer or other similarly sized devise with an internet connection, and to engage with the recording in a quiet, and undisturbed location wherever possible.

Table 10. The table shows the demographic profile of participants, and their digital concert group, in each of the five conditions (N = 667)

	Live	Full on-demand	Abridged on-demand	Social	Pre-talk
n	140	133	143	107	144
Gender % (Male, Female, Other)	38, 58, 4	41, 57, 2	40, 57, 3	42, 58, 0	48, 51, 1
Age in years (Mean, Range)	45.43, 18-85	50.1, 18-85	49.35, 18-86	49.72, 18-93	48, 18-86
First Language German	87%	85%	91%	82%	84%
Professional involvement with Music	28%	36%	37%	40%	30%
University degree	82%	82%	83%	91%	86%
Digital Concert Enthusiast		53%	58%	53%	54%
Undecided and Unengaged Concert User		12%	14%	14%	13%
Digital Concert Traditionalists		35%	28%	33%	33%

3.2.3 Measures

Data was collected through two questionnaires, administered before and after the concert. The survey was hosted on LimeSurvey and was completed either on iPads provided to participants (live condition) or on their own internet enabled device (digital conditions). As this data was collected as part of a larger project, the questionnaires contained numerous batteries regarding a concert experience but only those used to explore the research questions in this chapter will be described here. Questionnaires were available in German and English.

3.2.3.1 PANAVA-KS

The PANAVA-KS (see Schallberger, 2005) was employed in both the pre- and post-concert questionnaire to capture participants' current emotional situation. The scale contains bipolar items that capture positive activation (PA), negative activation (PA), and valance (VA). This 10-item battery was translated into English, from German, for this project as there is no validated English language version (see Appendix 4). The PANAVA is a development of the Positive and Negative Affect Schedule (PANAS, Watson et al., 1988), with the added dimension of valance.

3.2.3.2 Social Experience of a Concert Scales (SECS)

This measure, developed in Chapter 2, captures the level of influence other audience members have on an individual. The five-factor model includes items relating to Satisfaction (e.g. I am pleased to be in the audience), Depth of Processing (e.g. I have a picture of the audience is still vivid in my mind), Solidarity (e.g. I felt a bond with the audience), Attention (e.g. I closely watched how the audience behaved), and Self-Stereotyping (e.g. I am similar to the average person in the audience). The scale consists of 17 items (O'Neill & Egermann, 2022)

3.2.3.3 Demographic information

Questions regarding the sociodemographic traits of the participants were collected including age, gender identity, engagement with Western art music concerts, previous experience of digital concerts, first language, education and professional relationship with the music industry. Based on their responses, they were matched based on these demographic variables and assigned to one of the concert conditions, thus avoiding self-selection bias.

3.2.4 Procedure

For the Live concert condition, participants arrived an hour prior to the start of the concert and were met and guided through the event by a briefed research assistant. They were taken into a hall in which each participant had a dedicated table on which were the consent form and information sheet, and an iPad on which the pre-concert questionnaire was already loaded. These tables were spaced according to COVID-19 social distancing restrictions in place at the time of data collection. The pre-concert questionnaire took between eight and 24 minutes to complete and was hosted on LimeSurvey. Once participants had completed the questionnaire, they were escorted into the concert hall and shown to their seats by their research assistant. Once again, due to COVID-19 mandated restrictions, participants were seated with two empty seats between them, regardless of whether they had attended the concert with others or not. Participants were permitted to remove their facemask only during the concert and they were obligated to wear one at all other times. The concert lasted approximately 85 minutes and included the repertoire discussed in section 3.2.1, and a 10-minute aeration interval during which the windows of the venue were opened to ventilate the space due to COVID-19 guidelines. Participants were encouraged not to leave their seats in this time. Following the concert, participants were escorted back to their questionnaire table in an adjoining hall, and they completed the post-concert questionnaire which took between 18 and 31 minutes to complete. 93% of participants answered the questionnaire in German, and the rest completed it in English.

For the on-demand digital conditions (full on-demand, abridged on-demand, pre-talk), participants were sent a URL to the pre-concert survey, which had a link to the concert video available upon completion. They were able to access this at a time of their choosing. 68% of participants in the digital conditions completed the questionnaires in German, the remaining 32% answered the English translation. The concert video was hosted on Vimeo and participants had access to one of the variations mentioned above. As is typical in on-demand streamed content, participants could play, pause, fast forward, and rewind the concert as they wished. At the end of the concert, they were directed back to LimeSurvey to complete the post-concert questionnaire. For the social condition, participants were invited

to sign-up for one of four available dates (three facilitated in German, one in English). They logged on to SpatialChat and were guided through the various rooms (see Figure 6) by a moderator and members of the research team.

3.2.5 Analysis

The data from the questionnaires was downloaded into SPSS version 28 for analysis. Where applicable, JASP was used to conduct the factor analyses and R.studio was used to extract the factor scores.

3.3 Results

3.3.1 Measurement check CFA

The SECS have previously been psychometrically validated (O'Neill & Egermann, 2022); however, this was based on data collected in a different country, a different language (German) and with different musical stimuli. Therefore, we used a confirmatory factor analysis to assess the scales' reliability for use in the Live condition of this study. The Chi-square test indicates a statistically non-significant result (x^2 = 82.16, p .097) which is indicative that this model is a good fit, and the SECS can be used to reliably capture the social experience of the live concert in the new context.

In addition to this, it is important to validate the model for use in capturing the social experience of digital concerts, which can be seen as significantly different to live events. Once again, a CFA was conducted with the data from the digital concerts (*n* = 572). In this case the Chi-square value was significant (x^2 = 208.64, p < .001); however, the Chi-square test is overly sensitive with samples of 200 or over (Barrett, 2007; Bearden et al., 1982; Meade et al., 2008). Therefore, additional fit indices were explored and found to support this model. The Root Mean Square Error Approximation (RMSEA) and Standardised Root Mean Square Residual (SRMR) respectively were .06 and .05, which are just within the *good* model fit threshold (RMSEA = .05 - .08, SRMS < .06 - ≈ 0.6 (Cheung & Rensvold, 2002; Fan & Sivo, 2007; Marsh et al., 2004). The Comparative Fit Index (CFI) value was .986 and the Tucker-Lewis Index (TLI) was .982 which are both over the accepted threshold of 0.95 (Hu & Bentler, 1999; Tucker & Lewis, 1973). Based on this, it can be assumed that the SECS model reliably fits the data from the digital conditions of this study.

Since subsequent analysis will be based on a pooled dataset, of the live and digital concerts (*N* = 667), one further CFA was conducted in order to produce factors scores for each participant. The fit indices indicate that the Chi-square value was significant (x^2 = 352.038, p < .001), but due to the sample size we once again move to consider the additional fit indices. The RMSEA = .058 and the SRMR = .063 which are indicative on an acceptable model fit (Cheung & Rensvold, 2002; Fan & Sivo, 2007; Marsh et al., 2004). In

addition to this, the CFI = 0.970 and the TLI = 0.962 which are both above the threshold for this type of analysis (Cai et al., 2021; Lai & Yoon, 2015). Since the model fits the combined data collected at both the live and digital concerts, all subsequent analyses have been conducted using the factor scores from this CFA model.

3.3.2 RQ5: Is a live concert experienced as being more social than a digital presentation of the same performance?

To test this hypothesis, a multivariate analysis of variance (MANOVA) was conducted to compare the social experience of the live concert and full on-demand concert. These conditions had the same stimuli material: the full concert, and a comparable number of participants (live *n* = 140, full on-demand *n* = 133). The social experience was measured using the SECS.

The analysis shows that the presentation of the concert significantly influences the extent to which participants rate the social experience of it Pillai's Trace = .771, $F(5, 45) = 30.305$, $p < .001$. Figure 7 indicates that participants rated the extent to which they paid attention to other audience members and their satisfaction at being part of the audience as being significantly higher in the live condition than the full on-demand.

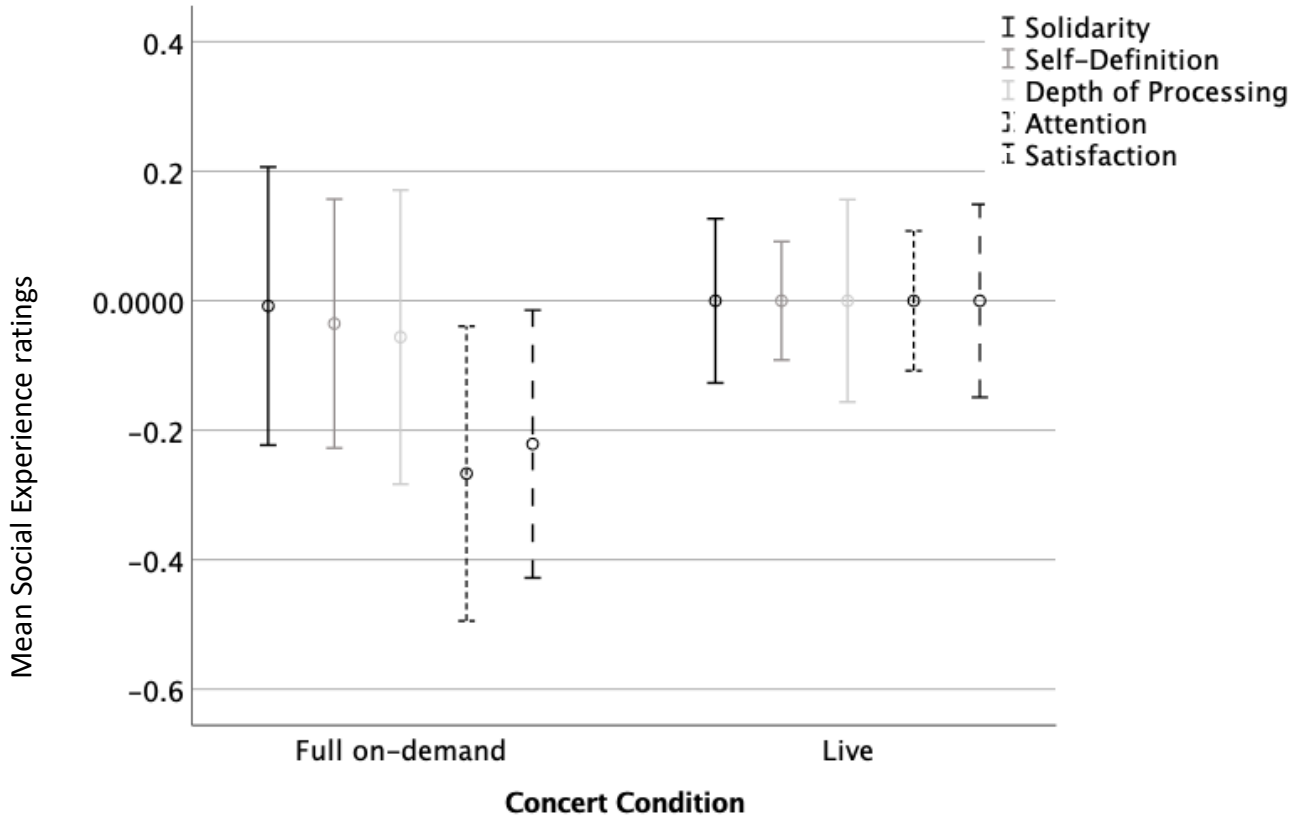

Figure 7. The error bar graph displays the social experience factors in the live and full on-demand concert variations.

Note. The error bars show the 95% confidence intervals.

Of the SECS factors, attention and satisfaction are significantly lower in the digital condition, compared with the live concert; the rest do not have a significant effect (see Table 11).

Table 11. The table shows the influence of live and digital concert presentations on the social experience factors

						95% Confidence Interval	
Predictor Variable	Outcome variable	B	Std. Error	t	p	Lower Bound	Upper Bound
Digital Concert	Solidarity	-0.008	0.124	-0.065	.948	-0.251	0.235
	Self-Definition	-0.035	0.104	-0.337	.736	-0.241	0.17
	Depth of Processing	-0.056	0.143	-0.392	.695	-0.338	0.226
	Attention	-0.267	0.113	-2.356	.022	-0.494	-0.039

Satisfaction	-0.221	0.138	-1.597	.037	-0.494	0.052

Note. The live concert was used as the reference category for this analysis.

The model was also computed with participant characteristics included to control for their affect. Age, gender, professional involvement with music and university degree were also included and none were found to have a significant effect on the mode of presentation on the social experience of the concerts. Based on this, we can conclude that any difference is a result of the liveness of the concert and not due to any confounding interindividual differences between the samples.

3.3.3 RQ6: Is it possible to manipulate a digital concert to be perceived as more social?

As discussed in the methods section, the digital concerts were presented in a variety of ways to explore the effect of this on participants' experiences. One condition was designed to facilitate greater social interaction before and after the concert, using the platform SpatialChat (see Figure 6). To test whether this condition had facilitated self-reports of a more social experience, a multivariate analysis of variance (MANOVA) was conducted. The SECS scores from the social condition were taken as the reference, against which the other digital conditions, of the same stimuli material were compared: abridged on-demand and pre-talk.

This analysis shows that Box's test of the assumption of equality of covariance matrices is non-significant ($p = .35$) and therefore, the covariance matrices can be assumed to be approximately equal. Pillai's trace indicates that there was a significant effect of digital condition on the social experience of the concert, Pillai's Trace = 0.178, $F(10, 542), = 5.295$, $p < .001$. The outcome of the analysis, according to the SECS factors can be seen in Table 12, and indicate that the social factors solidarity, depth of processing, attention and satisfaction are all influenced by the presentation of the digital concert. However, self-definition is not significantly influenced, therefore it has not been included in Figure 8.

Table 12. The table shows the between-subjects effects of the digital concert condition on the social experience of the concert, according to the five SECS factors.

	Type III Sum of Squares	Mean Square	F	p	Partial Eta Squared
Self-Definition	0.334	0.167	0.3	.741	0.002
Depth of Processing	3.229	1.615	3.166	.037	0.023
Solidarity	3.796	1.898	3.078	.048	0.022
Attention	2.73	1.365	2.447	.088	0.018
Satisfaction	5.305	2.652	4.199	.016	0.03

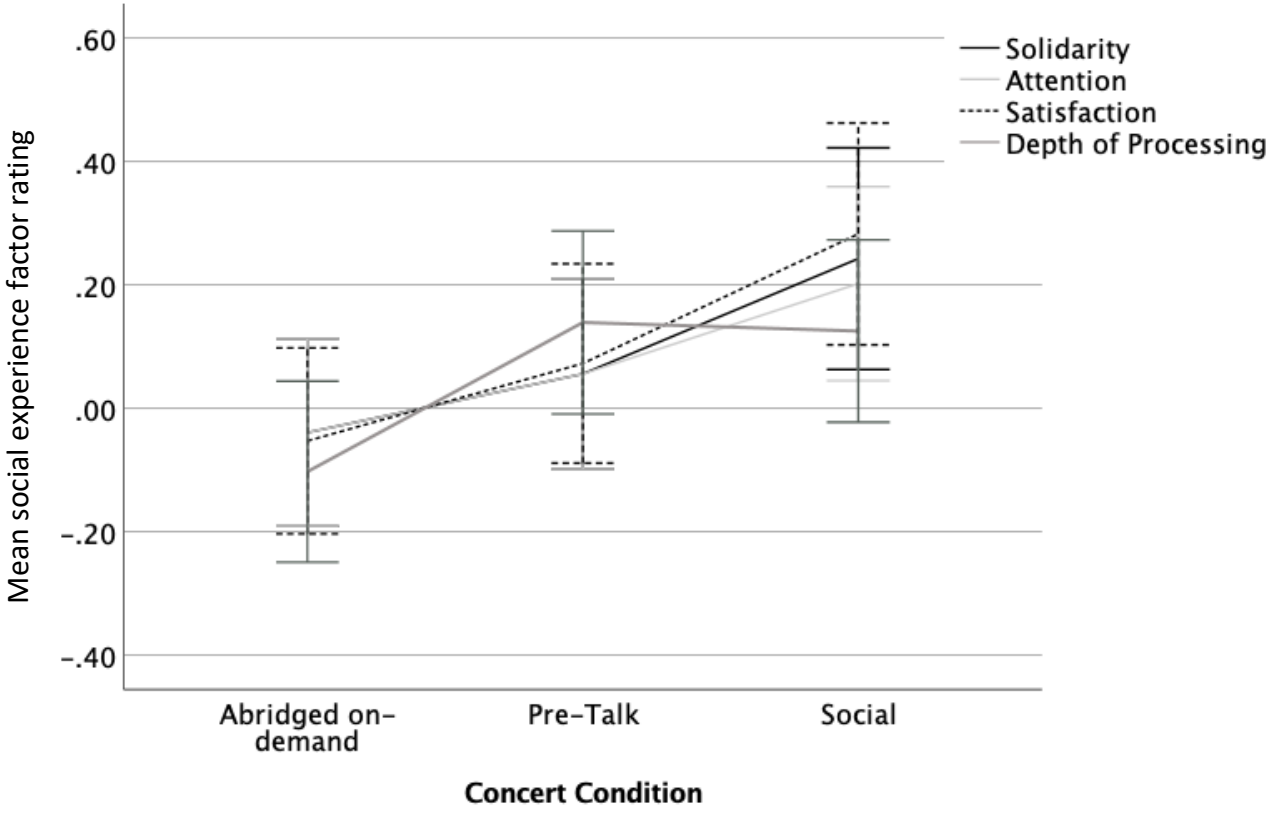

Figure 8. The line graph shows the effect of digital concert condition on the social experience factors.

Note. Error bars depict the 95% confidence intervals.

Separate univariate ANOVAs on the SECS factors revealed that the concert condition was not universally influential, as can be seen in Table 13. When participants received more information about the concert, they reported a non-significant trend towards experiencing lower levels of satisfaction at being part of the audience, compared to the social condition, but no other social experience factors were influenced. The abridged on-demand concert resulted in significantly less depth of processing, attention towards others, solidarity, and satisfaction at being part of the audience than the social condition. According to these results, self-definition is not influenced by the social condition.

Table 13. The table shows the influence of the full on-demand, abridged on-demand and pre-talk digital concert streams on the social experience of the concert, according to the five SECS factors, when compared to the social setting.

						95% Confidence Interval		**Partial**
Outcome Variable	**Predictor Variable**	**B**	**Std. Error**	**t**	**p**	Lower Bound	Upper Bound	**Eta Squared**
Self-Definition	Intercept	-0.053	0.078	-0.687	.493	-0.206	0.1	0.002
	Abridged on-demand	0.03	0.11	0.277	.782	-0.185	0.246	0
	Pre-Talk	0.084	0.11	0.765	.445	-0.132	0.301	0.002
Depth of Processing	Intercept	0.125	0.074	1.681	.094	-0.021	0.272	0.01
	Abridged on-demand	-0.228	0.105	-2.17	.031	-0.435	-0.021	0.017
	Pre-Talk	0.014	0.105	0.133	.895	-0.193	0.221	0
Solidarity	Intercept	0.243	0.082	2.962	.003	0.081	0.404	0.031
	Abridged on-demand	-0.282	0.115	-2.44	.015	-0.509	-0.054	0.021
	Pre-Talk	-0.187	0.116	-1.613	.108	-0.415	0.041	0.009
Attention	Intercept	0.202	0.078	2.594	.01	0.049	0.355	0.024
	Abridged on-demand	-0.241	0.11	-2.196	.029	-0.457	-0.025	0.017

	Pre-Talk	-0.146	0.11	-1.328	.185	-0.363	0.071	0.006
Satisfaction	Intercept	0.283	0.083	3.409	<.001	0.119	0.446	0.041
	Abridged on-demand	-0.335	0.117	-2.869	.004	-0.565	-0.105	0.029
	Pre-Talk	-0.21	0.117	-1.79	.074	-0.44	0.021	0.012

Note: The social digital condition was used as the reference for this analysis.

3.3.4 RQ7: Are there demographic or contextual moderators of the strength of the social experience of a digitally presented Western art music concert?

It could be that listener expectations and preferences moderate the effect of digital concert condition on social experience. Based on three groups of listeners, calculated with the digital concert sample (See Egermann et al., In review), a moderation analysis was conducted using a factorial MANOVA. For this analysis the concert condition, the predictor, has been reduced to a dichotomous variable with level 1 being the social condition (*n* = 107) and level 2 being the abridged on-demand concert (*n* = 143). These concert conditions were chosen as they are identical, except for the social facilitation and therefore any confounding influence, for example concert duration, is controlled. The moderation variable, listener group, has also been recoded to be bivariate with level 1 representing the *Digital Concert Enthusiasts (n* = 132*)* and level 2 including all other participants form the *Digital Concert Traditionalists* and *Undecided and Disengaged Digital Concert Users* groups (*n* = 118). By simplifying the model in this way, we are able to attribute results more confidently to the categories of interest, avoid a Type 1 error, and achieve a more parsimonious model. This is advantageous based on the principles of Occam's razor, in which an abductive heuristic process is applied (Gauch Jr, 2002). The five social experience factors are the outcome variables in this analysis.

There was a statistically significant interaction effect between concert condition and listener group on the overall social experience, $F(5, 175) = 11.266$, $p < .001$; Wilks' $\Lambda = .756$, partial $\eta 2 = .244$. The outcome of the analysis according to the social factors can be seen in Table 14. Figure 9 shows that being a digital concert enthusiast *increases* the extent to which the social concert condition elicited solidarity and satisfaction.

Table 14. The table shows the influence of the main effects and interaction of concert condition and listener group on the social experience factors, achieved via a MANOVA.

Predictor variable	Outcome Variable	Type III Sum of Squares	Mean Square	F	p	Partial Eta Squared
Intercept	Self-Definition	0.009	0.009	0.015	.902	0
	Depth of Processing	2.335	2.335	4.642	.033	0.025
	Solidarity	2.009	2.009	3.113	.079	0.017
	Attention	2.125	2.125	3.891	.05	0.021
	Satisfaction	2.608	2.608	4.078	.045	0.022
Concert Condition	Self-Definition	0.011	0.011	0.019	.892	0
	Depth of Processing	3.063	3.063	6.091	.015	0.033
	Solidarity	3.809	3.809	5.902	.016	0.032
	Attention	4.059	4.059	7.432	.007	0.04
	Satisfaction	4.812	4.812	7.524	.007	0.04
Listener Group	Self-Definition	0.056	0.056	0.095	.758	0.001
	Depth of Processing	0.442	0.442	0.879	.35	0.005
	Solidarity	1.32	1.32	2.045	.154	0.011
	Attention	0.533	0.533	0.976	.324	0.005
	Satisfaction	1.848	1.848	2.889	.091	0.016
Concert Condition * Listener Group	Self-Definition	0.031	0.031	0.053	.818	0
	Depth of Processing	0.722	0.722	1.436	.232	0.008
	Solidarity	3.48	3.48	5.393	.021	0.029
	Attention	1.193	1.193	2.185	.141	0.012
	Satisfaction	4.832	4.832	7.556	.007	0.041

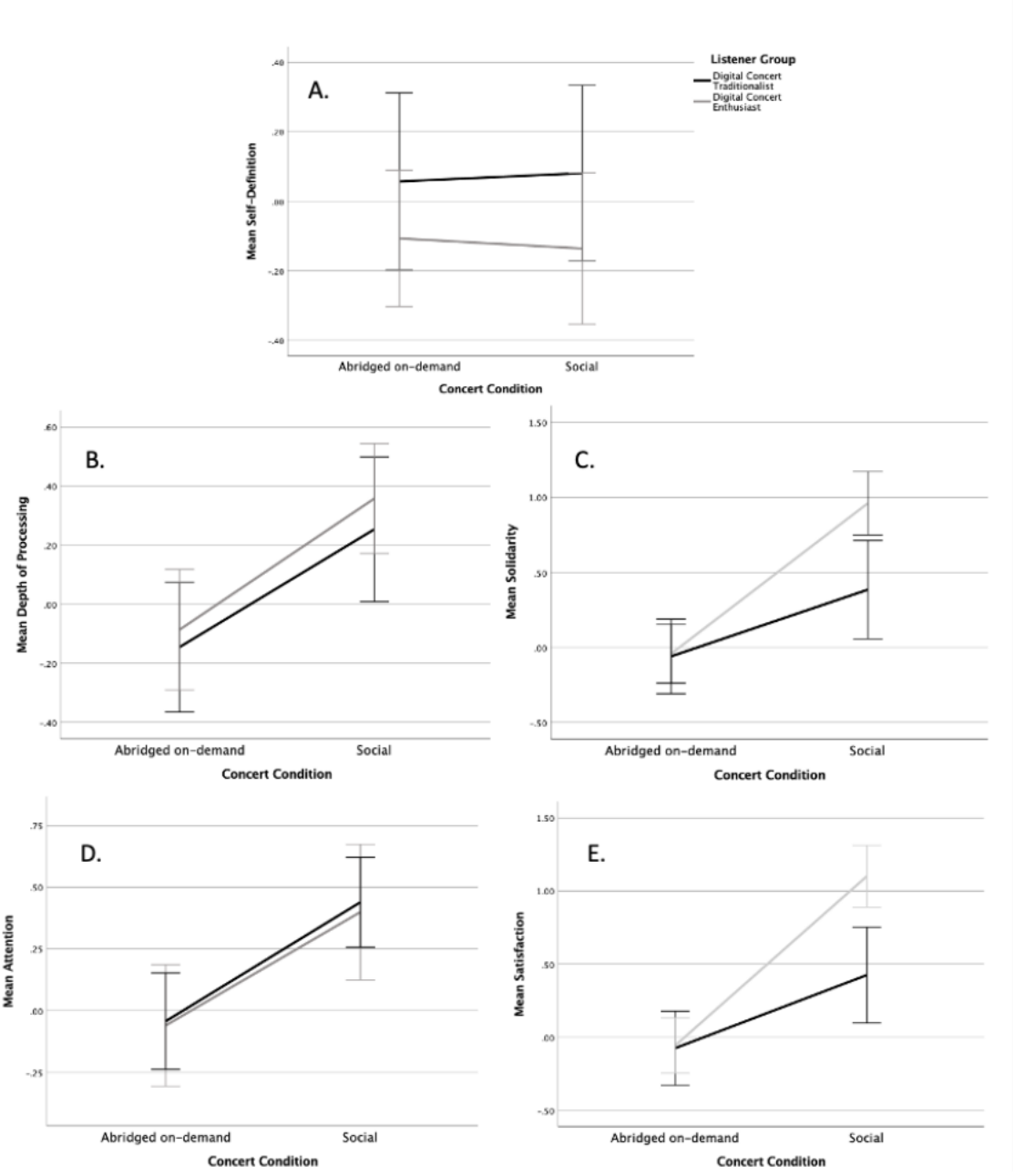

Figure 9. The line graphs show the direction of the moderating influence Digital Concert Enthusiast group membership has on self-reports of the social experience factors in the social concert condition, compared to the abridged on-demand concert.

Note. The error bars show the 95% confidence intervals. A – Self-Definition, B – Depth of Processing, C – Solidarity, D – Attention, E – Satisfaction.

The results, displayed in Table 15 indicate that there is a main effect of participant group on the amount of solidarity that participants report. In addition to this, being a digital concert enthusiast significantly moderates the extent to which the social condition facilitates solidarity and satisfaction.

Table 15. The table shows the outcome of a factorial ANOVA in which membership of Digital Concert Enthusiast group is examined as a moderator of the social experience of the social condition.

						95% Confidence Interval		
Dependent Variable	**Parameter**	**B**	**Std. Error**	**t**	**p**	Lower Bound	Upper Bound	**Partial Eta Squared**
Self-Definition	Intercept	0.033	0.272	0.123	.902	-0.504	0.571	0
	Condition	0.012	0.087	0.136	.892	-0.16	0.184	0
	Group	-0.111	0.36	-0.308	.758	-0.822	0.6	0.001
	Condition * Group	-0.026	0.114	-0.231	.818	-0.252	0.199	0
Depth of Processing	Intercept	-0.545	0.253	-2.154	.033	-1.043	-0.046	0.025
	Condition	0.2	0.081	2.468	.015	0.04	0.359	0.033
	Group	0.314	0.335	0.937	.35	-0.346	0.974	0.005
	Condition * Group	-0.127	0.106	-1.198	.232	-0.337	0.082	0.008
Solidarity	Intercept	-0.505	0.286	-1.764	.079	-1.07	0.06	0.017
	Condition	0.223	0.092	2.429	.016	0.042	0.403	0.032
	Group	-0.542	0.379	-1.43	.154	-1.29	0.206	0.011
	Condition * Group	0.279	0.12	2.322	.021	0.042	0.517	0.029
Attention	Intercept	-0.52	0.263	-1.973	.05	-1.039	0	0.021
	Condition	0.23	0.084	2.726	.007	0.063	0.396	0.04
	Group	0.344	0.349	0.988	.324	-0.343	1.032	0.005
	Condition * Group	-0.164	0.111	-1.478	.141	-0.382	0.055	0.012
Satisfaction	Intercept	-0.576	0.285	-2.019	.045	-1.138	-0.013	0.022
	Condition	0.25	0.091	2.743	.007	0.07	0.43	0.04
	Group	-0.641	0.377	-1.7	.091	-1.386	0.103	0.016
	Condition * Group	0.329	0.12	2.749	.007	0.093	0.566	0.041

RQ8: Is the overall enjoyment of a digital Western art music concert influenced by the degree to which participants subjectively rate their social experience?

In Chapter 2, we found that the social experience of a concert predicts the enjoyment of the event (O'Neill & Egermann, 2022). In the previous chapter enjoyment was captured by a single item relating to the topic. To add greater nuance, in this study the PANAVA-KS was employed to measure positive activation (PA), negative activation (NA), and valance (VA) in both the pre- and post-concert questionnaires which enabled a change in mood to be calculated (post-concert score – pre-concert score). To test the hypothesis, multiple ANOVA models were calculated with the social factors as predictors and the PA, NA and VA change scores as dependant variables. The results can be seen in Table 16 which shows that participants who reported high levels of bonding and solidarity with the rest of the audience experienced a significant increase in positive activation and valence, and significant decrease in negative activation. Participants who rated their satisfaction at being a part of the audience as higher experienced a significant increase in positive activation and in valence. Finally, participants who paid more attention to other members of the audience experienced a significant increase in negative activation.

Table 16. The table shows the extent to which the social factors predict participants' change in mood.

Outcome Variable	Predictor Variable	B	Std. Error	t	p	Partial Eta Squared
Positive Activation	Intercept	0.49	0.053	9.211	<.001	0.139
	Solidarity	0.36	0.329	2.316	.024	0.126
	Self-Definition	0.114	0.122	0.932	.352	0.002
	Depth of Processing	-0.131	0.164	-0.798	.426	0.001
	Attention	0.101	0.198	0.508	.612	0
	Satisfaction	0.21	0.231	1.019	.041	0.089
Negative Activation	Intercept	-1.075	0.059	-18.287	<.001	0.389
	Solidarity	-0.124	0.364	-0.341	.033	0.109
	Self-Definition	0.053	0.135	0.396	.692	0
	Depth of Processing	0.22	0.181	1.213	.226	0.003
	Attention	0.133	0.219	0.149	.082	0.097
	Satisfaction	-0.06	0.256	-0.234	.815	0
Valence	Intercept	-0.375	0.062	-6.039	<.001	0.065
	Solidarity	0.686	0.385	0.752	<.001	0.214
	Self-Definition	-0.171	0.142	-1.202	.23	0.003
	Depth of Processing	-0.048	0.191	-0.25	.802	0
	Attention	-0.028	0.232	-0.119	.906	0
	Satisfaction	0.517	0.271	0.431	<.001	0.201

3.4 Discussion

This study sought to further contribute to the growing area of knowledge regarding the social experience of live and digital concerts, and the influence of a quantified social experience on an individual's enjoyment and emotional response. The results indicate that participants experienced a more social experience at a live, in-person concert, compared to digital presentations of the same performance (RQ5). Despite this, there is evidence that the extent to which people rate the experience of digital concerts as being social can be influenced by the presentation of the concert; specifically, where social interaction is facilitated (RQ6). It was found that digital user group membership moderates the relationship between concert condition and social experience. Participants who were found to be Digital Concert Enthusiasts based on their demographic information and previous engagement with digital concerts (Egermann at al., In Review), reported higher levels of satisfaction and solidarity in the social concert condition, compared to participants in the Digital Concert Traditionalists, and Undecided and Disengaged Digital Concert User groups (RQ7). Finally, we found that some of the social experience factors predict the participants enjoyment of the event, as seen by their change in mood (RQ8).

The first research question that was tested stated that participants would have a more social experience at a live in-person concert, compared to digital presentations of the same performance. The results found evidence in support of this statement, in particular for the social factors attention and satisfaction. Participants reported paying significantly less attention to other audience members, and significantly lower levels of satisfaction at being part of the audience in the full on-demand digital concert. This replicates the findings of previous research which has also found that live concerts foster a more social experience (Swarbrick et al., 2021). It is not a surprise that others who are physically present will draw your attention to a greater extent. It has long been understood that the presence of others results in an increase of arousal as action in response to that presence may be required (Zajonc, 1965). The threat posed by digital presence is much lower so they will not draw attention to the same extent. In addition to this, in a live environment an individual can be entirely autonomous in where they look and direct their attention; however, in the digital

conditions the participants were only able to see what was displayed by the cinematography. The reference target (Mademlis et al., 2019) of the production was predominantly the musicians on the stage and not the audience. Interestingly, this appears not to be the case when participants are themselves making music. Fancourt and Steptoe (2019) found that participants in virtual choirs reported a slightly greater feeling of social presence than participants in live choirs which suggests that this increase in attention might be unique to audience members.

The SECS' items that relate to an individual's satisfaction at being part of the audience include 'I was glad to be in the audience', 'it was pleasant to be in the audience' and 'being in the audience gave me a good feeling' (O'Neill & Egermann, 2022). There are different ways of interpreting these statements, and it could be that people were rating their satisfaction at being present at the event, rather than their specific experience of being part of the group which is the audience. This would mean that they enjoyed being at the live event more than the digital ones. Despite this, it could be said that participants are more satisfied with being part of a physical group than a virtual one, which has been repeatedly found in education contexts (Richardson et al., 2016; Stein & Wanstreet, 2003; Swan & Shih, 2019; Wei et al., 2012). It seems that the same is true in the case of concert engagement with Western art music performances.

It is also worth noting that the depth of processing, solidarity, and self-definition subscales to not appear to be significantly different in live and digital contexts based on responses from the current sample. Despite paying more attention to other members of the audience, participants did not report a greater depth of processing, or being able to remember what the audience looked like, or having a more vivid image of the live audience compared to the digital one. This perhaps indicates that in neither modality do participants spend time dwelling on the audience. In a typical Western art music concert, the audience is not encouraged to focus on anything but the musicians and the music through seating arrangement and limitations on interaction (Toelle, 2018). In fact, concert etiquette goes so far as to demand that audiences avoid influencing the experience of others in anyway, even so far as restricting coughs and movement to breaks in the music. It has been argued that

any breach in etiquette forms part of the group and individual perception of identify and group categorisation. Those that adhere and those that do not form the in-group/out-group identification process (Wagener, 2012) and this lack of homogeneity in turn results in participants rating themselves as less similar to the average member of the audience one way or the other, regardless of the type of presence they pose. Social bonding is predicated on the assumption that an individual recognises themselves in others, be that similar behaviours, appearance, values etc. Therefore, if that self-definition does not occur then they will also be less likely to form a social bond, or feel solidarity with others (Leach et al., 2008).

The second research question posited that it is possible to facilitate a more social experience through variations of the digital presentation of a concert. The variations included an abridged on-demand stream, a synchronous social condition, and an on-demand stream with a pre-concert talk. In a multiple analysis of variance, in which data from the abridged on-demand concert was compared to the social condition, it was found that solidarity, attention, depth of processing, and satisfaction are all significantly influenced by the emphasis of the format of each digital concert.

In the questionnaire it was made clear that 'audience' referred to the audience which participants could see in the recording and to other people who were watching the concert digitally. This means that both were considered when making in-group judgments. For the on-demand concerts, participants would be able to see attendees at the live concert in the recording and they would be aware that others would also be engaging with the performance digitally. However, only in the social condition could participants see those also engaging with the concert digitally as they did, as well as the audience present in the recording of the live concert. In addition to this, participants were encouraged to communicate with other virtual attendees through a text-based chat function, the use of emojis or even turning on their microphone and camera and having a conversation in the social condition. Through these mechanisms, a social experience was facilitated. In many cases, this translated into significantly higher ratings of the SECS factors. However, it is also true that this is the only condition in which participants engage with the concert in

temporal synchrony. This may result in a more realised perception of the social presence of others, compared to the asynchronous digital concerts. The spatial synchrony of a live concert that results in physical presence has been found to influence this, therefore it might be more accurate to conceive of presence/co-presence as a scale, rather than a binary.

The Social Experience of a Concert Scales capture different aspects of the perceived collective nature of an event, and these will now be systematically discussed. The first subscale is attention which captures how often a participant felt other members of the audience drew their attention. It was found to be significantly higher in the social condition than the full on-demand, and pre-concert talk versions. As previously discussed, participants were encouraged to interact in the social condition. One mechanism for doing so was via a facilitator who would post prompts or starter questions, or give instructions to move between rooms, and when to begin the questionnaire. In response to this, participants were compelled to take action and reply and therefore they might have been paying more active attention to the general concert than in other conditions (Volonte et al., 2019). In addition to this, other members of the audience may have drawn the attention of participants by communicating with them in the pre-concert spaces, through one of the previously discussed channels. During the concert itself, participants could respond to the performance via emojis, and this will again have drawn their attention towards other participants (Robus et al., 2020).

The next subscale to be discussed is depth of processing through which participants rate their level of recollection of other audience members from their time in the concert. We found that the depth of processing was significantly greater in the social condition, than the abridged on-demand version of the concert. The interaction between participants facilitated a greater depth of processing and they report being able to recall other members of the audience more. It is also the case that in the abridged on-demand concert participants simply had less time to process the other members of the audience. In some theories of memory, the depth of processing and retention of memory is based on length of exposure and repetition (Craik & Lockhart, 1972; Craik & Tulving, 1975). In the social condition participants ‘met’ and interacted with other members of the audience before the

concert, after completing the pre-concert questionnaire, they could see each other during the concert, and then also after the post-concert questionnaire. This repetition of exposure seems to have resulted in a greater depth of processing and retention in keeping with the levels of processing theory of memory (Holyoak & Gordon, 1984).

Reports of a feeling of solidarity (being united and bonded with other audience members) were significantly higher in the social version compared to the abridged on-demand concert. It could be that, through their interactions, participants identified additional criteria for social categorisation (Turner, 2010) and as a result they were more likely to also experience social identification (Bernheim, 1994). Since bonding and solidarity are motivated by the desire for feelings of safety or companionship, it also follows that satisfaction at being part of the audience is significantly higher in those conditions that also result in greater bonding and solidarity (Bouchillon, 2014; Feldman et al., 1999; Freeman, 2000; Launay et al., 2016). Interestingly, both were higher in the concert which included a pre-talk by the composer of one of the pieces: Brett Dean. The repertoire of the concert was thematically linked by remembrance and loss. Epitaphs, by Dean, is about the death of close friends and colleagues, with each movement being an homage to a specific departed acquaintance of the composer. It is interesting that the pre-talk, in which these friends were discussed, did not result in a generally more social experience as this is often seen as a way to foster a connection between musician and audience. Previous research has found that providing information about the composer's motivations or emotions when writing the piece induced empathy in a listener (O'Neill & Egermann, 2020), and empathy is often mooted as a bonding mechanism (Stupacher et al., 2020). However, this does not seem to have been the case in the present data. Instead, the pre-talk may have invited participants to remember personal examples of those they have lost, and this has resulted in a more introspective and induvial experience (Ellis, 1991). It could also be that the participants have bonded with the composer and musicians, forming an in-group with them (Alport, 1958), and the rest of the audience then becomes the out-group who are perceived to have not experienced grief in the same way (Breen & O'Connor, 2007).

The concert variation has had no effect on the self-definition of participants,

according to our analyses. This means that the extent to which they see themselves as being similar to other audience members, and indeed the extent to which other audience members are similar to each other is not influenced by the social condition (Gaertner et al., 1999; Tesser & Campbell, 1980). There is, deliberately, a high level of homogeneity in the participants assigned to all concert conditions. This homogeneity has perhaps resulted in a uniform response to the items in this factor: members of the audience are not perceived as being more or less similar to each other, or the participant in any condition. This result implies that self-definition is more influenced by the types of people, and not the type of co-presence (Chen et al., 2004), or presentation.

Having established that it is possible to facilitate a social experience by manipulating the presentation of the digital concert, we sought to explore whether this is moderated by participants expectations and preferences for digital concerts. As previously mentioned in this discussion, participants in the social concert condition reported lower levels of solidarity and satisfaction, compared to the abridge on-demand or pre-talk conditions, which could be a result of these expectations and preferences. In a prior study, a latent profile analysis was used to identify participants as being *Digital Concert Enthusiasts, Digital Concert Traditionalists,* or *Undecided and Disengaged Digital Concert Users* (Egermann et al., In Review). This grouping was based on their preference for various production features including "duration, content of the production, filming location, distinction between live and on-demand, presentation platform, additional information offered, and interactive elements" (p. 10). We hypothesised that participants in the *Digital Concert Enthusiasts* group would welcome a more social experience in the social concert condition than members of the other participant groups because members of this group were identified via their expression of preference for innovative, exploratory, and new concerts. This included an openness to interactive, immersive, and social elements in a digital concert. Conversely, the *Digital Concert Traditionalists* are characterised by a strong preference for conventional or traditional Western art music concerts, including orchestral concerts performed in concert halls rather than private or more exploratory settings. Generally, they expressed a preference for on-demand digital concerts and were not interested in social or

interactivity. The *Undecided and Disengaged Digital Concert Users* group is significantly smaller than the other groups and is defined by their apathy or lack of preference, expressed through item means close to the scale midpoint. For this reason, the *Digital Concert Traditionalists,* and *Undecided and Disengaged Digital Concert Users* were grouped for the purpose of this analysis.

The outcome of the moderation analysis indicates that some social factors are moderated by participant group membership. Namely, membership of the *Digital Concert Enthusiasts* group positively moderates solidarity and satisfaction in the social condition. Those participants who are open to, or even prefer a social or interactive concert generally rated their bond with other audience members as higher, and their satisfaction at being in the audience during the social concert condition, as being significantly greater than other concert conditions, compared to participants in the traditional or undecided groups.

The final research question aimed to replicate the finding that the social experience of a concert predicts enjoyment of the event. Activation can be synonymised with arousal and as has already been discussed, the presence of others increases arousal due to the potential need for action (Platania & Moran, 2001; Zajonc, 1965). Solidarity and satisfaction were seen to predict a significant increase in both activation and valence which suggests that those who felt bonded with other audience members and were pleased to be so, also experienced a significant increase in positive activation. In addition to this, solidarity was also a significant predictor of a decrease in negative activation which further strengthens this relationship.

In summary, a live concert does result in a generally more social experience than a digital version of the same concert, particularly the satisfaction participants feel at being a part of the audience and the amount of attention they pay to other members of the audience (RQ5). Despite this, it is possible to facilitate a more social experience in a digital concert, by encouraging interaction with other audience members before and after a concert (RQ6). However, prefacing the concert with a pre-talk may reduce the social experience, and further research would be necessary to explore the extent to which it is the presence of a pre-talk, or the content of that discussion. The extent to which participants

report having a social experience is moderated by their prior interests and expectations of the digital concert format (RQ7). Finally, the finding that the social experience of a concert predicts the enjoyment of the event has been replicated (RQ8).

3.4.1 Limitations

While the live concert condition was in-person, due to the COVID regulations in place at the time, participants cannot be described as having an entirely typical concert experience. They were required to wear face masks while completing the pre- and post- concert questionnaires, and during the concert they were seated spaced two chairs apart. This is likely to have been influential on their social experience, which is in part related to, not only physical presence, but also proximity (Beckes & Coan, 2011; Fay & Maner, 2012). While the data has not been analysed in this article, physiological measurements were also taken, including galvanic skin response, heart rate variability, and respiration rate measured through sensors attached to the hand, and an elasticated waist belt. While these were designed to be minimally invasive, they restricted typical concert behaviours such as applause (Burland & Pitts, 2016).

The digital concerts pose the same limitations as any online research, namely that people may not have paid attention to the stimuli throughout. Since there was very little drop out between the pre- and post- concert questionnaires, this effect seems to have been minimal. In addition to this, participants were encouraged to use good quality audiovisual equipment to watch the concert; however, we did not collect data on their mode of engagement, nor their self-rated concentration and therefore it is not possible to assess the quality of their participation in this study. Another common limitation is the extent to which the sample represents the population. In this case, the sample cannot be said to be representative of the general population, having a generally narrower demographic profile, higher level of musical training, likelihood of working with music professionally, and attendance at Western art music concerts. However, this is typical of a Western art music concert attendees and therefore, the results can be reasonably applied to that demographic

(Egermann et al., In review). It would be interesting, in future research, to explore if the facilitation of a social experience was attractive to non-attenders, as a method of making these types of events more accessible and inclusive.

While the stimuli used in this study are taken from different periods, they are all examples of Western art music. The music, composers and musicians are in no way diverse, or representative of the global majority. There is every likelihood that the results would differ if a different genre and concert setting were explored, and this would be interesting to examine further, in future research.

3.4.2 Conclusion

In this article we aimed to compare the social experience of a live and a digital concert, and subsequently different digital presentations. The data collected at a live concert, and subsequent streams of the same concert have allowed us to compare the social experience of these events. As expected, participants report having a more social experience in the live condition, in the physical presence of others. However, it is possible to facilitate a more social experience, via online digital interaction before and after the concert. Participants expectations and motivations moderate the extent to which they report to have had a social experience. Participants who are engaged and enthused by digital concerts experienced greater solidarity with other audience members and satisfaction at being part of the audience. Finally, in a replication of previous findings, social experience positively predicts enjoyment of the event.

These results indicate that live music, unsurprisingly, enables the greatest level of interaction and social experience between audience members. Future research could explore how live concerts can be modified to influence the social experience, since it is possible to do so by varying parameters of a digital presentation of an event. There are many barriers that prevent people from accessing live Western art music concerts; therefore, providing the opportunity to engage with this type of music digitally has many benefits, which are beyond the scope of this study. However, it is possible to address the

need, and ability to facilitate a more social experience in digital concert settings. If concert venues, curators, performers, and agents are seeking to maintain the on-line audiences that they accrued during the pandemic, then they could look at the findings of this research which indicate social experience leads to enjoyment, and that it can be achieved in digital concert too.

Chapter 4

Presence, immersion, and personality predict enjoyment and social experience of a virtual reality Western art music concert.

4.1 Introduction

People engage with music in a number of different ways (DeNora, 2000). In the same way that people write music in order to challenge the status quo (Rydell & Bienvenu, 2021), producers and artists are also often seeking new ways of presenting, packaging and selling music to consumers (Gopinath & Stanyek, 2014; Im et al., 2019; Magaudda, 2011; Montoro-Pons et al., 2021). One such development that has thus far received limited attention in research, compared to other digital media, is the presentation of concerts via virtual reality, despite its conception as a technology approximately 40 years ago (Dixon, 2006; Gigante, 1993).

While the technology has been used extensively by the games industry, and received significant attention from ludologists, it has not permeated into the music industry in the same way, and certainly not the Western art music market. The reasons for this are beyond the scope of this chapter; however, many of the key concepts of the virtual reality field will be applied to this mode of presentation of music events. The experience of different typologies of presence, immersion in a mediated environment, the perception of social and parasocial interaction, and the enjoyment of the experience, for example.

When presented in virtual reality, users are provided with more opportunity for interaction and agency than other digital presentations, or even a live event and this gamification of the concert ritual is largely unexplored. Therefore, this chapter seeks to explore the interaction of these aspects of a virtual reality concert and the overall reception of audiences to the presentation of music in this way.

Before the study is discussed, the existing literature on the virtual reality and music, social presence and immersion, and predictors of enjoyment of virtual reality will be reviewed. Virtual reality, for the purposes of this article, refers to “a medium composed of interactive computer simulations that sense the participant’s position and actions and replace or augment the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation (a virtual world)” (Sherman & Craig, 2018, p. 16). Specifically, an interactive, three-dimensional, 360^{o} recreation of reality presented

through a specialist head mounted display. These are the key features that set it apart from other digital modes of presentation. There are various types of technology that are often conflated when discussing virtual reality, including augmented reality, immersive audio-visual recordings, and artificial intelligence. Milgram and Kishino (1994) considered these technologies to exist on a spectrum, as depicted in Figure 10.

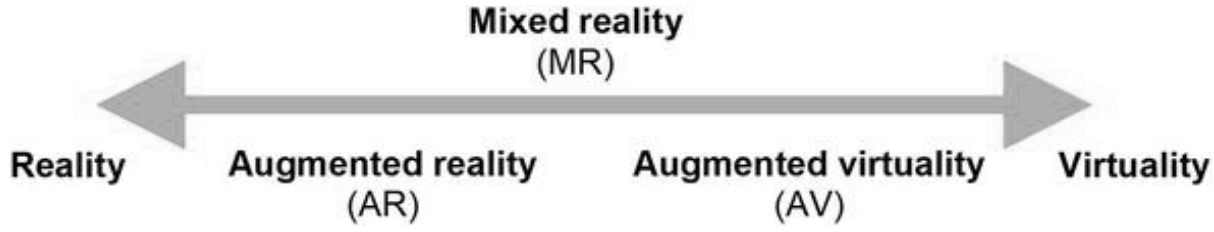

Figure 10. Simplified representation of a "virtuality continuum" (Milgram & Kishin, 1994)

In an immersive virtual reality setting, the real world is completely overwritten by a virtual and immersive experience. The aim of stimuli presented through this modality is to entirely reconfigure the experience of the user and replace their physical reality and they can interact with and influence their virtual environment. A semi-immersive virtual reality experience is such that the user can move around within the virtual space and thus, their visual and auditory experience may change in response to this movement, but the user will have no further physical sensation which enhances the experience, nor can they influence the virtual reality in any way. Augmented virtuality enhances the virtual experience by adding elements of the real environment, although this can reduce immersion. For example, a user may see their own hands in the virtual environment, or other physical objects that are transposed from the physical to the virtual realm. The penultimate step on the reality end of the virtuality spectrum is augmented reality which integrates or superimposes virtual elements into the user's physical reality. The following literature review considers research involving various types of virtuality.

4.1.1 Virtual reality music engagement

As mentioned, there is limited evidence that the music industry has taken much interest in exploring virtuality as a method of presenting music, and even less so music researchers. The exception to this is music education which has, to an extent, explored the potential uses of the technology in pedagogic settings. For example, Serafin et al. (2017) explored virtual reality as a potential mitigation of the lack of funding available for music education in mainstream education systems. They suggested that virtual reality can help students develop rhythmic skills, gain ensemble experience, combat music performance anxiety (MPA), and teach other musically relevant skills. Virtual reality was also found to result in conducting skill improvement (Orman et al., 2017), and a virtual reality AirPiano program was found to improve user experience (Hwang et al., 2017). MPA was also studied by Bissonnette et al., who found that participants experienced a decrease in anxiety based on virtual reality exposure training, which has been successfully implemented as a mode of treatment for a range of anxiety disorders (Krijn et al., 2004). Interestingly, they also observed an increase in performance quality, yet this does not seem to have inspired further research on the topic (Bissonnette et al., 2016).

The COVID-19 pandemic, and the resulting social distancing mandate that prevented performers rehearsing together and audiences attending live events, unsurprisingly catalysed a small number of studies on the potential use of virtual reality to facilitate alternatives to these activities. A virtual reality version of networked music performance, or the real-time interaction of musicians in different geographic locations to collaborate via a computer network, was explored by Loveridge (2020) in the early pandemic lockdowns. The conclusions of the literature review suggested that the topic was worthy of further review, specifically what are the key components that differentiate VR from videoconferencing, and the specific influence of immersion in the virtual environment influences the user experience (Loveridge, 2020).

A small number of artists have released songs which are composed to make the best use of virtual reality technology; for example, Muse whose single *Revolt* was turned into a semi-immersive 360° video, designed to be enjoyed via a virtual reality headset or other 360º viewing platform (Belamy, 2016). Western art music concerts are much less likely to have been developed or recreated with virtual reality technology in mind; perhaps due to the perceived typical audience member, or the perception of where and how this music *should* be consumed. The exception to this is the *VAN Beethoven* project, produced by the LA Philharmonic, aimed at educating, and widening access and interest. Their press release included the following:

> The Los Angeles Philharmonic launches the *VAN Beethoven* mobile tour, featuring the LA Phil's new Orchestra virtual reality app…[Visitors will] put on the Oculus headset and be transported … The immersive visual private experience is augmented by a soundtrack that adapts to the viewer's perspective; whether the viewer is in front of the orchestra, behind or standing amidst the symphony, the music will subtly shift to reflect listener-specific positions and enhance the feeling of being up-close-and-personal with the renowned orchestra.

(LA Philharmonic, 2015)

An often-cited advantage of virtual reality concerts is the access to perspectives not typically available, such as among the musicians, or on the stage. In a project set in the *Konzerthaus,* Berlin developers produced an Orchestra Application to facilitate interactivity with the orchestra, in part through virtual reality (Droste et al., 2018). They concluded that the response to the technology was "overwhelmingly positive" (p. 294), due in large part to the multiple perspectives available. In some cases, developers go as far as to put the user on the stage as part of the orchestra (Antoshchuk et al., 2018), although this would be considered to be augmented virtuality. Developed, once again, in collaboration with the *Konzerthaus* in Berlin, the *Magic Mirror Application* identifies the instrument that matches the users hand pose and overlays that instrument, so that it appears to be placed in their hands. The audio output corresponds to the speed and intensity of the users' movements, the position of their fingers and the recognised instrument. This extension of interactivity goes beyond the

individual controlling where they can look, into actual meaningful participation in the musical output that they experience. Both studies by Droste et al. (2018) and Antoschchuk et al. (2018) are based on market research, and a general review of the development of the applications, and they are not overly concerned with the psychological experience and mechanisms of virtual reality engagement.

Despite the lack of empirical evidence, an interview study of regular concert attendees found that many respondents consider virtual reality concerts to be a common method of presenting and engaging with music in the future, and many also indicated that they would attend more virtual reality concerts if they were available (Bouckaert, 2021). The accompanying survey found that virtual reality offers greater accessibility, better perspective or view of the performance, when compared to live attendance; however, generally virtual reality concerts were found not to produce the same fulfilment as a live event. While the comparison to a live event may not yield as much as comparing virtual reality to other digital formats, this research goes some way to exploring the appetite of audiences for this format and thus, further research on the topic.

4.1.2 Presence and Immersion

When considering the extent to which people recognise a virtual reality experience as having social elements, there are two key concepts which mediate the effect of co-presence: namely, presence and immersion. While often conflated or synonymised, these two phenomena describe discrete and yet complementary aspects of a virtual experience. Immersion and presence describe the sensory and mental experience of the self when being in a virtual setting. Immersion is how enveloped or engaged your body feels in that virtual space and is dependent on sensory interpretation from audio, visual and haptic stimuli. Immersion can be conceived as the extent to which an individual engages with a virtual reality environment (Berkman & Akan, 2019; Slater, 2003). Immersion in virtual reality environments is most significantly influenced by the authenticity of sensory information (Kim & Biocca, 1997).

Presence refers to how psychologically absorbed and engaged a user is, or the sense of being in that environment perceptually, if not cognitively (Slater, 2018). It is the belief that you are in that environment, despite the awareness that it is an illusion (Mantilla, 2018).

Research has previously defined the human experience as being comprised of real experiences, virtual experiences and hallucinations (Lee, 2004), in which the former and latter are defined as sensory experiences of actual objects, and non-sensory experiences of imaginary objects respectively. In this model, the virtual experience is described as occupying a middle ground, whereby people have a sensory, or non-sensory experience of para-authentic or artificial objects. It is this that forms presence research, within which researchers from different fields have developed their own definitions and terms to describe facets of this experience (e.g. virtual presence (Slater & Steed, 2000), telepresence (Steuer, 1993), co-presence (Bulu, 2012), mediated presence (Ijsselsteijn & Riva, 2003) etc.) This, combined with discord on conceptualising and defining a virtual experience, have resulted in interdisciplinary disagreement regarding the absolute definition of presence. It is beyond the scope of this chapter to reconcile this issue; however, for the purposes of this research, presence will be understood to mean the multidimensional construct of the subjective experience of being in a virtual environment. The three dimensions of this construct are physical presence, including objects and environments; social presence, which refers to the experience of others in a virtual environment; and self-presence which is the experience an individual has of themselves in a virtual environment (Makransky et al., 2017). These are further defined below.

The explicated, three factor definition of presence is based on Lee's work (2004). Physical presence is described as a "psychological state in which virtual (para-authentic or artificial) physical objects are experienced as actual physical objects in either sensory or non-sensory ways" (Lee, 2004, p. 44). High levels of physical presence are when an individual does not notice that the environment is not authentic or real, and conversely, low levels of physical presence would indicate participants awareness of the artificiality of their environment. Social presence relates to an individual's perception of the authenticity of

mediated humans (Biocca, 1997). It is different from co-presence which requires users to share the virtual space with other humans, often including a two-way interaction. Social presence covers this, and parasocial or one way interaction such as observation of non-verbal communication cues. Lee defines social presence as “a psychological state in which virtual (para-authentic or artificial) social actors are experienced as actual social actors in either sensory or non-sensory ways” (2004, p.45). The final factor of presence is self-presence which is “a psychological state in which virtual (para-authentic or artificial) self/selves are experienced as the actual self in either sensory or non-sensory ways” (Lee, 2004, p. 46). This relates to the extent to which a virtual representation of the individual is perceived by them to be real, be that an artificial construction of their character, or a representation of their true self (Ratan, 2013; Ratan & Hasler, 2009).

When applied to the virtual reality presentations of music, presence has been found to be influenced by the quality of the recording and playback, the autonomy to select where the user is looking, and in some cases (e.g. the Magic Mirror Application, Antoshchuk et al., 2018), the ability to influence the musical output to some extent (Sheridan, 2004). In a study on the analgesic effect of virtual reality music therapy, the effect was found to be enhanced, when compared to a *lower tech* alternative, due to the increased perception of presence (Honzel et al., 2019). In addition to this, a study found that participants experienced significantly higher levels of pleasantness, and presence in a classical concert presented in semi-immersive virtual reality, compared to a two dimensional desktop presentation of the same stimuli (Al Alam & Dibben, 2021). However, in this study, emotion perception and experience did not differ between the two conditions; therefore, this will not be a research question in this chapter.

As mentioned, immersion is related to presence, but is not synonymous. It refers to the extent to which an individual has a sense of being in the virtual environment (Sanders & Cairns, 2010). It has been described as having three levels: engagement, in which the player invests effort, time and attention into the experience; engrossment, whereby the user becomes more involved with the virtual experience; and finally immersion, in which participants loose awareness of the real world or become detached from reality and their

senses are consumed with the virtual information (Brown & Cairns, 2004). There are specific barriers of entry into each of these three phases, for engagement users must have sufficient time, and the content must be accessible in terms of subject matter and ease of navigation. Engrossment can only occur when the user suspends their disbelief sufficiently to accept the virtual surroundings, and they must be able to ignore external distractions. For a user to experience total immersion they must be able to empathise with the character they are embodying, which is clearly easier when they experience physical, social and self-presence in the virtual environment, and a loss of awareness of the passing of time and the real world (Brown & Cairns, 2004; Rogers et al., 2020).

Immersion is influenced by the realism of the stimuli that reach each of the senses. This includes the quality of the image (Dhaya, 2020), haptic feedback such as vibrations upon impact with virtual objects (Kim et al., 2017; Wu et al., 2017), and the auralisation of sound sources (Ballestero et al., 2017; Poirier-Quinot et al., 2016; Postma et al., 2016). In virtual reality games, all of these contribute to the immersive experience of a user, but they can be ranked with visual aspects being the most important, then sounds, then touch (Zhou & Deng, 2009). For the presentation of music, perhaps the aural experience is most influential.

Audio in virtual reality environments is produced by binaural stereo, combined with head-tracking technology in the virtual reality headset. This produces an effect of a three-dimensional sound field that surrounds the user. Movement tracking data allows sounds to be localised to the position of the virtual source, relative to the user's perspective, whether static or in motion. To an extent, this is no different to surround sound technology; however, the fundamental differentiator for virtual reality audio immersion is the need for the sound to be reactive to the user's behaviours and movements. This Head-Related Transfer Function (HRTF) is programmed into specialist speakers, headphones or the head mounted display (HMD) itself. It is used for both recording and reproducing the three-dimensional sounds that surround the user on both horizontal and vertical plains (Noisternig et al., 2003; Poirier-Quinot et al., 2016).

Outside the realm of virtual reality research, and instead applied to the experience of live music events, immersion has been found to provide increased levels of togetherness among audience members. In a study exploring the effect of projected visualisations of physiological responses to a jazz concert, researchers found that immersion is more likely to occur when participants like the music (Shirzadian et al., 2018). Live music attendance frequently involves immersion into the musical and social experience (Holt, 2010). Therefore, it is plausible to pose the question of whether presence and immersion influence of the social experience of a Western art music concert presented in virtual reality.

4.1.3 The effect of personality on virtual reality enjoyment

As previously discussed, there is limited existing scholarship on the presentation of Western art music concerts in virtual reality. More broadly, in other virtual reality applications that have been mentioned in this chapter, there is evidence to suggest that personality may predict the extent to which people enjoy interacting with virtual reality technology. For example, people seem to rate their real-life personality and virtual avatar personality consistently based on the big five personality traits, thus indicating that if they are extraverted in the real world, the same will be true in virtual reality (Aas et al., 2010).

Personality variables which seem to predict presence most consistently include imagination, immersive tendencies, and empathy (2013). Laarni et al. (2004) found that extraversion, impulsivity and self-transcendence were positively associated with presence ratings. Of the big five personality traits, extraversion and agreeableness have been found to be significantly correlated with spatial presence, and neuroticism and openness to new experiences with virtual absorption (Sacau et al., 2005).

There is also research on the influence of personality on immersion in virtual reality. Openness to new experiences, extraversion and neuroticism are significantly correlated with immersion (Jurnet et al., 2005; Weibel, 2010). In addition to this, trait empathy has been found to predict higher levels of immersion (Ling et al., 2013; Nicovich et al., 2005; Sas & O'Hare, 2003). Finally, locus of control within the virtual environment (the extent to which a

participant feels a sense of autonomy) and agreeableness have been found to be positively correlated with embodiment, or immersion (Dewez et al., 2019).

Based on the indicative findings of these studies on personality and virtual reality in general, in this study we seek to explore the influence of personality specifically on the enjoyment of a Western art music concert presented in virtual reality.

4.1.4 Social experiences in virtual reality environments

To an extent, the influence of presence and immersion in a virtual reality on a user's social experience has been previously explored, but once again this is restricted for the most part, to research on virtual reality games, and education. For example, it has been found that the participants who synchronised with virtual humans in an immersive virtual reality environment reported a significantly greater social closeness compared to an asynchronous condition, which was deemed to be less immersive (Tarr et al., 2014). Further, in an underwater seascape exploration, it was found that social interaction mediates the effect of immersion on satisfaction and loyalty of users towards the virtual world (Hudson et al., 2019). Previous research has also found that the strength of social ties and general social interaction significantly increase perceived enjoyment of virtual reality (Lee et al., 2019).

As with immersion, the extent to which a user can suspend their disbelief influences their social experience within a virtual environment. Social interaction has been found to be impeded when avatars are presented without facial expressions, gaze or other non-verbal communication cues (Roth et al., 2016). Even in situations where the virtual representation of others is more authentic, latency and asynchrony of sounds and movements reduces the social bonding of users and virtual avatars (Louis et al., 2019). It seems that users bring existing social group dynamics into virtual environments (Moustafa & Steed, 2018), and that they present themselves consistently with their real-world identity, regardless of their ability to curate or design their virtual self (Freeman & Maloney, 2021), which is consistent with the *Proteus* effect (Yee & Bailenson, 2007). Finally, the degree to which users actively participate in a virtual scenario, and their co-action or interdependence with others

enhances the social presence and cooperation of users in a virtual environment (Schindler et al., 2017). However, even in environments in which action and interaction is limited, non-verbal communication between users of collaborative virtual environments seems to result in accurate emotion perception, based on distinctive facial or physical cues (Fabri et al., 1999).

The majority of this research is predicated on the active interaction and action of users. In a concert environment the opportunities for this are typically limited. While users may be able to see virtual representations of the musicians and other audience members, in our stimulus video they are unable to interact with others, or influence the concert in anyway. Therefore, the effect or perception of this parasocial interaction may not adhere to the findings of the studies discussed herein.

One study (Onderdijk et al., 2021) which specifically explored the social experience of concerts presented in semi-immersive virtual reality found that participants experienced greater levels of physical presence and connectedness compared to other digital media. The other conditions, comprising of live stream via YouTube, pre-recorded concert streamed via Zoom, and a 360^{o} recording presented through a standard screen, did not elicit the same feelings of physical presence as the virtual reality condition. Further to this, the researchers found that the perception of physical presence predicted reports of connectedness with both the musician and the audience, yet co-presence was found to predict only connectedness with the audience. Based on this we will explore the effect that perception of different types of presence may have on an individual's social experience of a virtual reality concert.

In Chapter 2, we explored certain predictors of a social experience, and found that the type of concert, the participants' ages, their musical training, and whether or not they attended the concert with others influenced the extent to which they reported having a social experience (O'Neill & Egermann, 2022). In Chapter 3, participants were grouped based on their interindividual preference and engagement with digital concerts and this was found to significantly predict their social experience. We found that participants who reported high levels of bonding and solidarity with the rest of the audience experienced a

significant increase in positive activation and valence, and a significant decrease in negative activation. Participants who rated their satisfaction at being a part of the audience as higher experienced a significant increase in positive activation and a significant increase in valence. Finally, participants who paid more attention to other members of the audience experienced a significant increase in negative activation.

To extend this investigation of interindividual predictors of the social experience, we sought to explore characteristics that have hitherto been untested in this thesis, such as personality traits. Previous research has found that personality predicts the perception of social presence (Costantini et al., 2019; Lopes et al., 2005; Pianesi et al., 2008; Wieczorek et al., 2021), parasocial presence (Giles, 2002; Sun & Wu, 2012; Tsay & Bodine, 2012), and co-presence (Paetzel et al., 2018; Purarjomandlangrudi & Chen, 2020; Weibel, 2010) experiences. More specifically, Wieczorek et al. found that extraversion, agreeableness and neuroticism were predictive of real-world social satisfaction (2021), and these three traits have consistently been found to be socially relevant, with the effects of openness and contentiousness much less so (Back, 2021; Back et al., 2011; Harris & Vazire, 2016; Mund et al., 2016; Weibel, 2010). In a parasocial context, Tsay and Bodine found that neuroticism was the only personality trait that was a significantly predictor (2012). They suggested this was a result of the need for inclusion that those with high trait neuroticism experience, and the relative perception of safety of parasocial relationships compared to social ones. Therefore, we will explore the influence of personality on the extent to which people report having a social experience in a virtual reality concert.

4.1.5 Aims and Research Questions

Based on findings in the previous chapters, and the literature reviewed in this chapter, we have devised a study that aims to explore a virtual reality Western art music concert experience. Since there is limited research on this mode of presentation of a concert, once again we do not have enough prior knowledge to formulate a-priori hypotheses. Therefore, we present the following exploratory research questions (RQ):

RQ9: How do people describe their experience of a virtual reality presentation of a Western art music concert?

RQ10: Do participants experience a change in mood following engagement with a virtual reality Western art music concert?

RQ11: Does personality predict participants change in mood and enjoyment of a virtual reality Western art music concert?

RQ12: Does the social experience of a virtual reality concert adhere to the same factor model as live presentations?

RQ13: Are there demographic predictors of the strength of the social experience of a virtual reality Western art music concert?

RQ14: Do social, physical and self-presence predict the social experiences of a virtual reality Western art music concert?

4.2 Methods

Data collection took place in-person, in the York Music Psychology Listening Lab (*N* = 50). The research was granted ethical approval by the University of York, Arts and Humanities Ethics Committee, with additional approval based on an enhanced COVID-19 risk assessment. Data was collected via questionnaires before and after the concert presentation and more detail can be found below.

All national COVID-19 regulations and recommendations at the time of data collection were adhered to, including evidence of a negative lateral flow test, and no members of the household positive at the time of testing. Participants were encouraged to wear facemasks inside all areas of the Department of Music, and there was an emphasis on increased ventilation including windows being always kept open and a minimum of half an hour ventilation between participants at which time the Listening Lab was entirely unoccupied. All shared equipment was wiped with isopropyl wipes between uses.

Due to the social distancing mandate of the University, the room occupancy was limited to two people (participant and researcher/research assistant). Special permission was sought from the Head of Department to bring external visitors into the department, which was otherwise forbidden at the time of data collection.

4.2.1 Stimuli and their presentation

The stimulus for the virtual reality concert was a monoscopic 360° virtual reality recording that was professionally produced, following a live string quintet concert, performed at the RadialSystem, Berlin in September 2020 (See section 3.2.1 for further detail). The recording was produced and edited by Cineplus, and a research technician. The camera was placed at the front of the stage, depicting an intimate view of the performers. Participants were able to zoom in and out, and pan laterally and horizontally in a 360° plane.

The repertoire included abbreviated forms of works by Ludwig van Beethoven (op. 104,), Brett Dean (“Epitaphs”) and Johannes Brahms (op. 111) (see section 3.2.1). The string

quintet included Baiba Skride, Brett Dean, Alban Gerhardt, Mischa Afkam and Gergana Gergova. The concert was presented in two parts, the first part was 21:41 minutes long and included the first movement of Beethoven's String Quintet in C minor, Op. 104 and movements 1, 2 and 3 of Dean's *Epitaphs.* There was then a short pause during which participants could remove the virtual reality headset and take a comfort break. The second section of the concert was 16:18 minutes long and showcased movements 1, 2 and 3 of Brahms' String Quintet No.2, Op.111.

The stimuli were presented to participants using an Oculus Quest 2 head mounted display which the participants calibrated before watching the video. Ambisonic sound on the horizontal plane was presented via headphones with head tracking. Participants were seated on a revolving, office style chair and invited to explore the concert space from their vantage point.

4.2.2 Participants

Participants (N = 50) were recruited through mailing lists, social media, and personal contacts of the researcher. They initially responded with an expression of interest, and were invited to sign up for an individual appointment.

34% of participants identified as male, 64% identified as female, 2% identified as gender non-conforming, gender-queer, or non-binary. The mean age of participants was 35.2 (range 18-54). 96% of participants had a university degree (26% natural sciences/engineering; 22% social sciences/humanities; 46% music, arts, art or cultural studies) which is significantly higher than the average population, and even higher than a typical Western art music consumer. 66% of participants spoke English as their first language, 20% stated that Cantonese or Mandarin was their first language, 6% said Spanish and then 2% said Greek, Indonesian, Slovakian and French respectively.

Participants were given 15GBP in cash as compensation for their time, and to cover any expenses accrued in travelling to the Department of Music for the study.

4.2.3 Measures

Data was collected through two questionnaires, one administered before and one after the concert. The survey was hosted via Qualtrics and was completed online, using the YMPG laptop. As this data collection took place as part of a larger project, the questionnaires contained numerous batteries regarding a concert experience but only those used to explore the research questions in this chapter will be described here.

4.2.3.1 Positive Activation, Negative Activation, Valence Short Version (PANAVA-KS)

There are various ways of capturing enjoyment, it can be conceived of as the culmination of engagement, pleasure and satisfaction (Davidson, 2018). Typically, enjoyment will result in an increase in positive mood, which can be conceptualised on the same circumplex model as Russel's affect grid (1980). While these concepts are certainly not synonymous, in this study we have interpreted an increase in positive activation and valence as denoting enjoyment.

The PANAVA-KS (see Schallberger, 2005) was employed in both the pre- and post-concert questionnaires to capture participants' current emotional situation. The scale contains bipolar items that capture positive activation (PA), negative activation (PA), and valance (VA). There are 10 items, four relating to PA (of which two are reverse scored), four relating to NA (two of which are reverse scored), and two items measuring VA (one of which is reverse scored). Items are rated on a scale from -3 to +3 with antonymic scale labels at either end. This 13-item battery was translated into English, from German for this project, as there is no validated English language version (see Appendix 4). The PANAVA is a development of the Positive and Negative Affect Schedule (PANAS, Watson et al., 1988), with the added dimension of valance.

4.2.3.2 Social Experience of a Concert Scales (SECS)

To measure the social experience, we have used the Social Experience of a Concert Scales, developed in Chapter 2. This measure captures the amount of attention, depth of processing and bonding an individual experiences with other members of the audience (O'Neill & Egermann, 2022). The five-factor model includes items relating to Satisfaction (e.g. I am pleased to be in the audience), Depth of Processing (e.g. I have a picture of the audience is still vivid in my mind), Solidarity (e.g. I felt a bond with the audience), Attention (e.g. I closely watched how the audience behaved), and Self-definition (e.g. I am similar to the average person in the audience). The scale consists of 17 items and participants were asked to rate their agreement with the items on a scale from 1 = strongly disagree to 5 = strongly agree.

4.2.3.3 Multimodal Presence Scale for Virtual Reality Environments (MPS)

In order to capture the experience of presence and immersion in a virtual reality context, the Multimodal Presence Scale for Virtual Reality Environments (MPS) was employed. It was developed to capture three dimensions of presence identified by Lee: Physical, Social and Self Presence (Lee, 2004). The MPS is a psychometrically validated scale comprised of 15 items identified through an extensive extraction process from previously developed scales (Makransky et al., 2017). These items were reduced using a confirmatory factor analysis and assessed for reliability and accuracy using item response theory (IRT). The items relate to the three presence factors named above with five items capturing physical presence (e.g. the virtual environment seemed real to me), five which relate to social presence (e.g. I had a sense that I was interacting with other people in the virtual environment, rather than a computer simulation), and five relating to self-presence (e.g. when something happened to my virtual embodiment, it felt like it was happening to my real body). Participants were asked to rate their agreement with the items on a scale from 1 = strongly disagree to 5 = strongly agree.

4.2.3.4 A Brief Version of the Big Five Personality Inventory (BFI-10)

There are many validated methods of measuring personality traits, but the most commonly used theory and model of personality is the Big Five personality traits: Conscientiousness, Openness to New Experiences, Neuroticism, Agreeableness, and Extraversion (Cobb-Clark & Schurer, 2012; Digman, 1990; John et al., 2008).

In this study we used the short version of the Big Five Personality Inventory (BFI-10, Rammstedt & John, 2007). Participants were asked to rate how well a number of statements describe their personality on a scale from 1 = disagree strongly, to 5 = agree strongly. This 10-item measure has two questions relating to each of the Big Five personality traits, with one of each pair being reverse scored. This measure has been validated in both English and German, although only the former was used in this study.

4.2.3.5 Open Items

Participants general experience of the virtual reality concert were collected using four open items in the post-concert questionnaire. These included the following:

- Feel free to add comments and general thoughts about your concert experience here.
- List three things that you liked about this virtual reality experience.
- List three things that you did not like about this virtual reality experience.
- Where did you mainly look during the concert? (Particular performer, stage, audience etc.).

Participants were invited to respond to these as a string variable in which they could include as much detail as they liked. Participants typed their responses to these questions using the laptop keyboard. The aim of these questions was primarily to allow participants to express their thoughts about their individual experience; however, many of the responses were relevant to the research questions of this chapter and have therefore been used in subsequent analysis.

4.2.3.6 Demographic information

Questions regarding the sociodemographic traits of the participants were collected including age, gender identity, first language, and education.

4.2.4 Procedure

Participants booked one of the available slots via the expression of interest form they completed prior to the main study. Participants came to the Department of Music, at the University of York, and were met by the researcher and guided to the York Music Psychology Group Listening Lab. Upon arrival they read the information sheet and provided informed consent, before being given a program, and briefing by the researcher. They then completed the pre-concert questionnaire on the YMPG laptop which took between eight and 14 minutes. They were then invited to move and sit on a revolving office-style chair and given a brief amount of training for using and calibrating the Oculus Quest 2 headset to their requirements. The researcher was present throughout the calibration process to provide support and answer questions. Once the participant was comfortable and had loaded the convert video, the researcher left the room, thus allowing the participant to remove their facemask for comfort, and to prevent the headset screen from being distorted by condensed breath.

The participants watched the first half of the concert and then they were invited to remove the headset for a short comfort break before watching the second half of the concert. During this time, they could look around with in the virtual environment at their own discretion. When the concert had finished, the researcher came back into the room and the participants completed the post-concert questionnaire which took between 12 and 19 minutes to complete. Upon completion, the participants received 15GBP compensation for their time, and signed to say they had received it before being guided back to the entrance of the building. The whole procedure took approximately one hour to complete.

4.3.5 Analysis

The quantitative data from the questionnaires was downloaded into SPSS version 28 for analysis. Where applicable, JASP was used to conduct the factor analyses and R.studio was used to extract the factor scores. The responses to the open questions were imported into NVivo and iteratively coded and analysed using an inductive, thematic analysis approach.

4.3 Results

4.3.1 RQ9: How do people describe their experience of a virtual reality presentation of a Western art music concert?

After watching the concert via the virtual reality headset, participants were invited to enter three aspects of the experience that they liked, and three things they did not like. An inductive coding approach has been used to thematically code the responses. The codes resulting from the content analysis can be seen in Table 17.

Table 17. The table shows the codes induced from the content analysis of the open responses to positives and negatives of the virtual reality concert experience.

Code	Content
Ambiance	Comments relating to the environment, concert hall, atmosphere etc.
Comfort	Relating either to comfort of the headset, or physical experience of the image e.g. dizziness/nausea.
Control	Comments relating to autonomy over where participants could look, ability to pause the video, adjust the volume etc.
Focus	Ability to focus on concert or being distracted by the setting. Differs from immersion as it relates to a specific sensory or stimulus modality.
Image/view	Comments relating to what the participant can see.
Immersion	Comments relating to sensory immersion, absorption, authenticity of the experience, perception of it being 'real'.
Intimacy/closeness to musicians	Observations about personal locus in relation to musicians and/or the rest of the audience.
Lack of audience	Comments relating to absence of audience, audience interaction, connection with audience etc.
Music/musicians	Relating to repertoire, musical preference/familiarity, performance, interaction between musicians etc.
Novelty	Observations about previous experience of the technology, the type of concert, difference compared to other concert experiences etc.
Presence	The sense of being in the virtual world

Sound/audio	Comments relating to what the participant can hear

While we did not approach the analysis with a predefined codebook, the questions were leading, asking participants to identify first positives and subsequently negative aspects of the virtual reality experience. For this reason, the responses were coded separately; however, as can be seen in Figure 11 the same types of codes immerged. Since different participants identified certain aspects of the concert as being either positive or negative, despite all environmental variables being kept constant (e.g. they used the same headset and viewed the same recording), we can infer the experience is subjective.

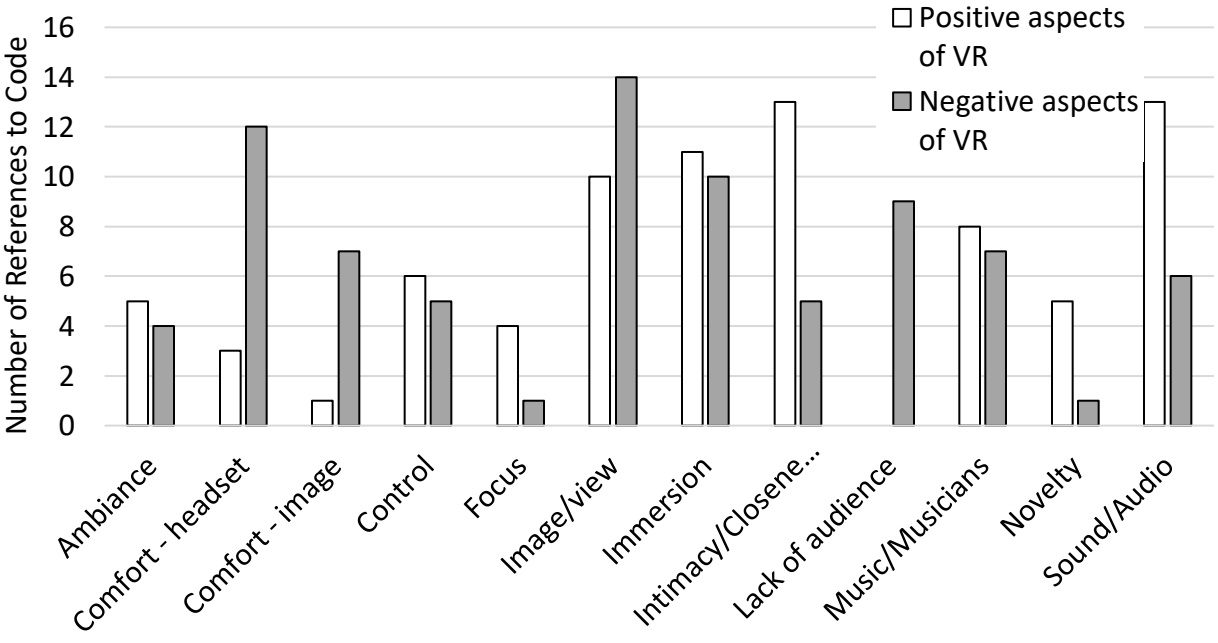

Figure 11. The graph shows the number of times a code was identified in the inductive coding process, separated by valence of question (positive/negative aspects of the virtual reality concert).

The initial codes derived from the data were organised into three themes which can be seen in Figure 12. The first theme is more generally about the experience of engaging with the virtual reality concert condition including the extent to which participants had control over the experience, their perception of their ability to focus and the comfort of the experience.

The second relates to the concert itself and includes audio-visual elements, the music, and the musicians. The final theme is made up of comments relating to presence and immersion, combined in part due to the semantic ambiguity and conflation that often arises and their relatedness to each other. Figure 13 depicts how Immersion can be conceived as being a result of the user experience and concert themes.

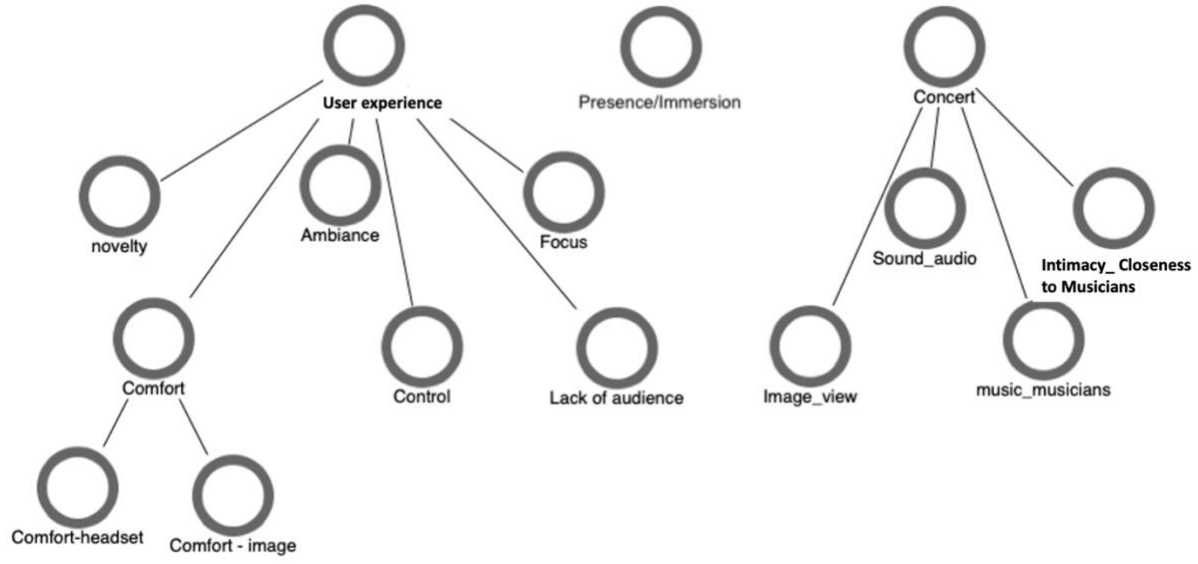

Figure 12. The hierarchical coding frame depicts the thematic grouping of each of the codes.

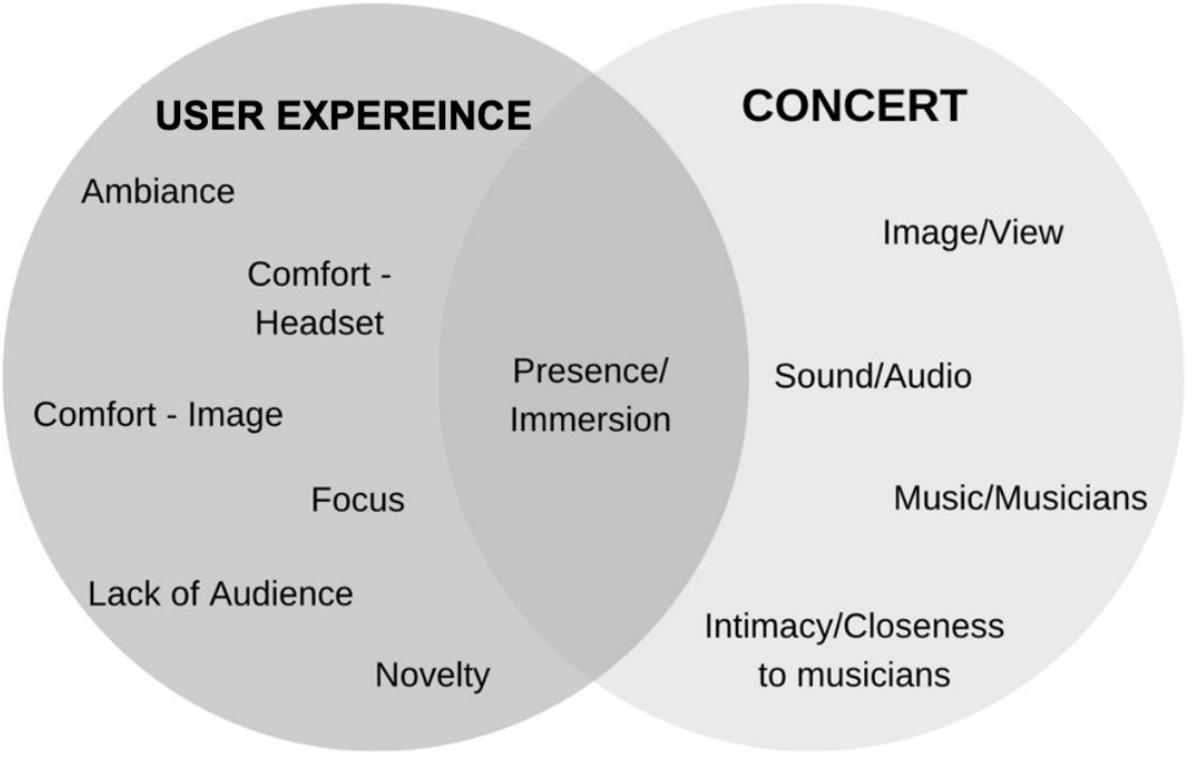

Figure 13. The Venn diagram depicts Immersion as being the combined result of the experience and concert elements.

The outcome of the thematic analysis, based on the iterative coding of the data, can be seen in Figure 14 and shows that there were generally more references to concert features, including the music, musicians, audio, and visual aspects when participants were asked to identify three aspects of the virtual reality experience that they liked. Conversely, participants commented on the experience of the concert more often when asked to provide three aspects of the virtual reality experience that they did not like. This theme is heavily weighted by the 'comfort' code as the discomfort was commented on more than any other code. Immersion has been identified as an element that participants liked about the virtual reality experience and an element they did not like an equal number of times. Once again, this points towards the subjectivity of the experience.

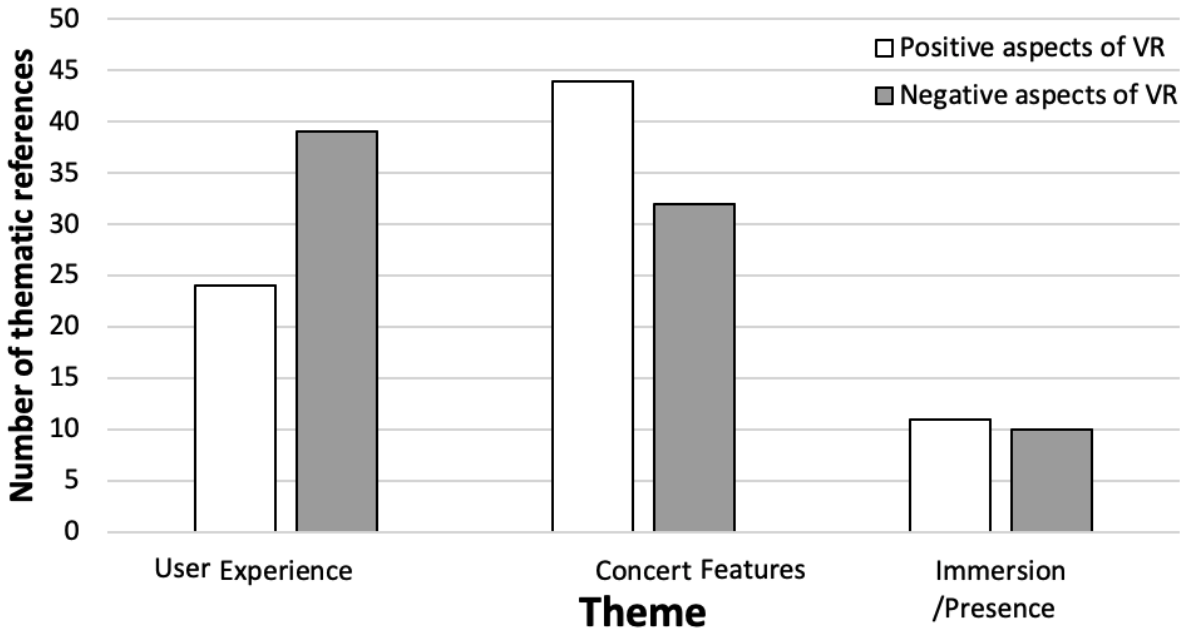

Figure 14. The bar chart displays the number of references to the Concert, Experience, and Immersion themes in the data, separated by valence of question (positive/negative aspects of the virtual reality concert).

4.3.2 RQ10: Do participants experience a change in mood following engagement with a virtual reality Western art music concert?

In this study we have conceived of an increase in positive activation and valence, and a decrease in negative activation as denoting enjoyment. Table 18 shows that based on a paired samples t-test, positive activation and valence significantly increased during the concert, and negative activation decreased. We have interpreted this as being indicative of enjoyment of the event.

Table 18. The table shows the result of a pair samples t-test comparing pre- and post-concert mood

Paired variables	Mean	Standard Deviation	Mean Difference	t	df	p
Pre-concert Positive Activation	3.81	0.5	0.23	2.31	49	.013
Post-concert Positive Activation	4.04	0.47				
Pre-concert Negative Activation	3.62	0.5	-0.26	-2.64	49	.006
Post-concert Negative Activation	3.36	0.52				
Pre-concert Valence	3.95	0.58	0.2	1.92	49	.03
Post-concert Valence	4.15	0.62				

4.3.3 RQ11: Does personality predict participants change in mood and enjoyment of a virtual reality Western art music concert?

Previous research has shown that personality influences the enjoyment of virtual reality experiences (Dewez et al., 2019; Jacques et al., 2009; Kober & Neuper, 2013; Rosenthal et al., 2013; Wallach et al., 2010). Therefore, using a MANOVA we sought to explore the influence of personality on enjoyment of a virtual reality concert, inferred from their change in mood over the course of the concert. Table 19 shows that only openness to new experiences influenced the overall change in mood, and enjoyment of the virtual reality concert. Table 20 indicates that openness to new experiences is related to a significant increase in positive activation, and a decrease in negative activation. Extraversion can also be seen to significantly predict an increase in valance.

Table 19. The table shows the outcome of a MANOVA, in which the influence of the Big Five personality traits on enjoyment (measured as a change in mood) is explored.

Predictor variable	Outcome Variable	F (df)	p	Partial Eta Squared
Extraversion	Enjoyment	.706 (3, 40)	.554	0.050
Agreeableness		.563 (3, 40)	.643	0.041
Open to new experiences		4.717 (3, 40)	.007	0.261
Neuroticism		.366 (3, 40)	.778	0.027
Conscientiousness		.224 (3, 40)	.879	0.016

Table 20. The table shows the influence of each personality trait, measured using the BFI-10 inventory, on participants change in mood, calculated from pre- and post-concert completion of the PANAVA scale.

Dependent variable	Parameter	B	Std. Error	t	p	95% Confidence Interval Lower Bound	Upper Bound	Partial Eta Squared
Positive Activation	Open to new experiences	0.188	0.076	2.488	.017	0.036	0.341	0.128
	Neuroticism	0.076	0.112	0.684	.498	-0.149	0.302	0.011
	Conscientiousness	0.058	0.129	0.452	.654	-0.202	0.318	0.005
	Extraversion	-0.083	0.073	-1.138	.262	-0.23	0.064	0.03
	Agreeableness	-0.033	0.102	-0.327	.745	-0.239	0.172	0.003
Negative Activation	Open to new experiences	-0.183	0.075	-2.453	.018	-0.334	-0.032	0.125
	Neuroticism	-0.052	0.11	-0.468	.642	-0.274	0.171	0.005
	Conscientiousness	-0.047	0.127	-0.372	.712	-0.304	0.209	0.003
	Extraversion	-0.077	0.072	-1.074	.289	-0.223	0.068	0.027
	Agreeableness	-0.001	0.1	-0.006	.995	-0.203	0.202	0
Valence	Open to new experiences	-0.026	0.081	-0.323	.748	-0.19	0.137	0.002
	Neuroticism	-0.063	0.12	-0.529	.599	-0.305	0.178	0.007
	Conscientiousness	0.054	0.138	0.39	.699	-0.225	0.332	0.004
	Extraversion	0.135	0.078	-2.442	.046	-0.193	0.123	0.105
	Agreeableness	-0.127	0.109	-1.161	.252	-0.347	0.094	0.031

4.3.4 RQ12: Does the social experience of a virtual reality concert adhere to the same factor model as live presentations?

The extent to which participants had a social experience when engaging with a music event via virtual reality can be explored in two ways. The first is through a qualitative exploration of the open question data, and the second is by exploring the SECS questionnaire. Both will be examined here.

Of the 50 participants, five directly commented on the audience, or lack thereof, in their responses to the open questions. In fact, all five of these were in response to the question *list three things that you did not like about the virtual reality concert* and they specifically identified the lack of audience in relation to this category. The comments ranged from the mere observations of absence e.g. “lack of audience reaction” and “I felt more disconnected to others”, to comparing this to live concerts: “no real audience beside me…much less attractive than live performance” and “not as connected to the audience or musicians compared to live concert”. One participant went so far as to identify why the absence of a physical audience had a negative impact on the experience: “I didn’t like feeling as though I was watching alone. It’s nice to be able to discuss the music you’re watching with others” (quotations taken from participants’ written responses to the open questions). From these responses it is clear that a portion of the participants in this study (c. 10%) noticed the absence of an audience, and that this had a negative impact on their experience. However, none of these replies explicitly mentioned the audience that was visible in the video of the concert.

When asked *Where did you mainly look during the concert? (Particular performer, stage, audience etc.)* 48 participants mentioned the performers/musicians, five mentioned the stage, 11 mentioned the audience and five included other things such as the lighting or the “environment”. It is not a surprise that the majority of the time, participants are watching the musicians and not looking at the virtual audience, as this is habitual in almost all genres of musical concert, but particularly so in Western art music concerts.

We can also explore the social experience of a virtual concert quantitatively, through analysis of the SECS data. We have previously validated the SECS for use in live environments in which physical presence determines the social experience, and mediated digital environments in which synchronous, and asynchronous co-presence is explored. In order to test whether the social experience of virtual reality co-presence adheres to the SECS a confirmatory factor analysis was conducted. Based on the data, the X^2 value was 132.2, $p = .065$, which is not significant and indicates an acceptable model fit. Therefore, we can conclude that a virtual reality social experience can be reliably measured and quantified

using the SECS.

4.3.5 RQ13: Are there demographic predictors of the strength of the social experience of a virtual reality Western art music concert?

In the second chapter of this thesis it was found that concert, age, musical training, and co-attendance were all significant predictors of the extent to which an individual will report having a social experience (O'Neill & Egermann, 2022). In Chapter 3 of this thesis participants were grouped according to their engagement and preference for digital concerts and this was found to significantly influence the extent to which they reported their digital concert experience as being social. While not all of these variables were available in the current study, we were able to explore the effect of age, education and gender on the social experience using a MANOVA.

Unlike in Chapter 2, age did not significantly predict any of the social factors, and nor did highest level of education. However, in the current data set, gender influenced depth of processing. Identifying as male significantly predicted the social experience ($F(5, 42) = 2.729$, $p = .032$, Wilk's $\Lambda = .755$, partial $\eta^2 = .245$). As can be seen in Table 21, being male displays a non-significant trend towards greater levels of solidarity, and a non-significant trend towards a reduced depth of processing. This finding should be treated with caution as it is not significant and the effect sizes only just meet the medium threshold of .06 - .14 (Levine & Hullett, 2002; Richardson, 2011). It is also important to recognise that treating gender in this way is problematic because the sample size in the groups is not equally distributed (male *n* = 16, female *n* = 33, identified as gender non-conforming, gender-queer, or non-binary *n* = 1).

Table 21. The table shows the non-significant trend of gender on social factors depth of processing and solidarity.

Predictor Variable	Outcome Variable	B	Std. Error	t	p	95% CI Lower Bound	95% CI Upper Bound	Partial Eta Squared

Male	Depth of Processing	-0.631	0.348	-1.812	.076	-1.333	0.07	0.067
	Solidarity	0.772	0.424	1.82	.075	-0.082	1.625	0.074

To extend our understanding of the interindividual differences which predict the extent to which people are likely to have a social experience, in this case in a virtual reality concert, we explored the influence of the Big Five personality traits. Many of the Big Five personality traits relate to how we interact, not only with our environment, but also with those around us. To explore whether personality has an influence on the extent to which participants will have a social experience in a virtual reality concert we ran a MANOVA with the Big Five personality traits as the predictors and the social experience factors as the dependant variables. Table 22 indicates that extraversion and agreeableness significantly predict the extent to which a participant will report having a social experience.

Table 22. The table shows the multivariate test, based on Pillai's trace, of the influence of personality on the extent to which participants report having a social experience in the virtual reality concert.

Effect	**F (df)**	**p**	**Partial Eta Squared**
Extraversion	15.470 (5, 38)	<.001	0.667
Agreeableness	2.936 (5, 38)	.02	0.283
Open to new experiences	.838 (5, 38)	.531	0.147
Neuroticism	1.690 (5, 38)	.161	0.194
Conscientiousness	.579 (5, 38)	.716	0.068

To further explore this effect, multiple linear regression models were conducted to ascertain which SECS factors are particularly predicted by personality. We can see in Table 23 that extraversion significantly causes an increase in participants' satisfaction at being part of the audience, their solidarity with other audience members, and the extent to which they consider members of the audience to be similar to each other, and themself. Satisfaction and solidarity are also both positively influenced by agreeableness.

Table 23. The table shows the influence of each personality trait on the five SECS subfactors based on a multiple linear regression model.

Outcome Variable	Predictor Variable	B	Std. Error	t	p	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	Partial Eta Squared
Satisfaction	Open to new experiences	-0.227	0.144	-1.576	.123	-0.518	0.064	0.056
	Neuroticism	-0.147	0.197	-0.746	.46	-0.545	0.251	0.013
	Conscientiousness	0.314	0.227	1.385	.173	-0.144	0.772	0.044
	Extraversion	0.629	0.129	-4.88	<.001	-0.889	-0.369	0.362
	Agreeableness	0.336	0.179	1.877	.047	-0.025	0.698	0.077
Solidarity	Open to new experiences	0.024	0.112	0.212	.834	-0.202	0.249	0.001
	Neuroticism	0.226	0.153	1.475	.148	-0.083	0.534	0.049
	Conscientiousness	0.11	0.176	0.624	.536	-0.245	0.465	0.009
	Extraversion	0.752	0.1	7.527	<.001	0.551	0.954	0.574
	Agreeableness	0.392	0.139	2.824	.007	0.112	0.673	0.16
Self-Definition	Open to new experiences	-0.13	0.153	-0.85	.4	-0.438	0.178	0.017
	Neuroticism	-0.212	0.209	-1.013	.317	-0.634	0.21	0.024
	Conscientiousness	0.025	0.241	0.106	.916	-0.46	0.511	0
	Extraversion	0.411	0.137	-3.008	.004	-0.687	-0.135	0.177
	Agreeableness	-0.129	0.19	-0.679	.501	-0.512	0.254	0.011
Attention	Open to new experiences	-0.382	0.262	-1.457	.152	-0.91	0.147	0.048
	Neuroticism	-0.086	0.359	-0.239	.812	-0.81	0.638	0.001
	Conscientiousness	-0.292	0.413	-0.708	.483	-1.125	0.541	0.012
	Extraversion	-0.28	0.234	-1.196	.238	-0.753	0.193	0.033
	Agreeableness	0.066	0.326	0.203	.84	-0.591	0.724	0.001
Depth of Processing	Open to new experiences	0.179	0.149	1.2	.237	-0.122	0.479	0.033
	Neuroticism	-0.178	0.204	-0.875	.386	-0.59	0.233	0.018
	Conscientiousness	0.147	0.235	0.625	.535	-0.327	0.62	0.009
	Extraversion	0.087	0.133	0.65	.519	-0.182	0.355	0.01
	Agreeableness	0.2	0.185	1.078	.287	-0.174	0.573	0.027

4.3.6 RQ14: Do social, physical and self-presence predict the social experiences of a virtual reality Western art music concert?

To test this research question, a confirmatory factor analysis was conducted with the data collected via that Multimodal Presence Scale for Virtual Reality Environments (MPS) to ascertain whether our data fits the theoretical model. The chi squared test was not significant which indicates that the model is of an appropriate fit ($x^2 = 90.45$, $p = .38$) since it does not differ significantly from the modelled covariance matrix. However, the additional fit indices did not meet the acceptable thresholds (RMSEA = .097, SRMR = .085, CFI = .899), TLI = .878. Therefore, we tested the internal reliability of the scale and subfactors. The results of this are shown in Table 24, each factor has an alpha score of above .76 which is the *very high* threshold, and the overall scale has a *strong* reliability score of over .91 (Tavakol & Dennick, 2011). Based on this result we conducted all subsequent analyses with the theoretical factor structure.

Table 24. The table shows the internal reliability for the Multimodal Presence Scale for Virtual Reality Environments (MPS), and its three subfactors: physical, social, and self-presence.

	Cronbach's Alpha	**Cronbach's Alpha Based on Standardized Items**	**N of Items**
Overall Presence	*0.915*	*0.917*	*15*
Physical Presence	0.843	0.844	5
Social Presence	0.783	0.788	5
Self Presence	0.894	0.895	5

To test whether perception of presence in the virtual environment influences the social experience of a virtual reality concert a MANOVA was conducted. The results, show that physical presence $F(5, 42) = 26.06$, $p < .001$; Wilk's $\Lambda = .244$, partial $\eta^2 = .756$, and social presence $F(5, 42) = 42.88$, $p < .001$; Wilk's $\Lambda = .164$, partial $\eta^2 = .836$ are significant predictors of the social experience. However, self-presence is not $F(5, 42) = .699$, $p = .627$; Wilk's $\Lambda = .923$, partial $\eta^2 = .077$.

To investigate which social factors were significantly influenced by presence,

multiple ANOVA were conducted. The results in Table 25 show that social presence significantly positively influences the extent to which participants experienced satisfaction at being part of the audience, solidarity with other audience members and the amount of attention they paid to other members of the audience. Physical presence significantly and positively influences the amount of attention participants paid to other audience members and shows a non-significant trend toward positively influencing the depth with which participants processed other members of the audience. Finally, although there was no overall significant effect of self-presence on the social experience, the results show a non-significant and positive trend towards influencing the social satisfaction of participants.

Table 25. The table shows the influence of social, physical and self presence on the participants perception of the social experience of the virtual reality concert.

Outcome Variable	Predictor Variable	B	Std. Error	t	p	95% Confidence Interval Lower Bound	Upper Bound	Partial Eta Squared
Satisfaction	Social	0.968	0.213	4.545	<.001	0.539	1.397	0.31
	Physical	-0.193	0.214	-0.901	.372	-0.624	0.238	0.017
	Self	0.261	0.148	1.762	.085	-0.037	0.559	0.063
Solidarity	Social	1.512	0.104	14.499	<.001	1.302	1.722	0.82
	Physical	0.056	0.104	0.537	.594	-0.153	0.265	0.006
	Self	0.04	0.072	0.549	.585	-0.106	0.185	0.007
Self-definition	Social	0.081	0.127	0.637	.528	-0.175	0.337	0.009
	Physical	0.666	0.418	1.592	.118	-0.176	1.509	0.052
	Self	0.043	0.088	0.484	.631	-0.135	0.22	0.005
Attention	Social	1.096	0.42	6.229	.02	-0.943	0.75	0.701
	Physical	1.321	0.126	10.446	<.001	1.067	1.576	0.703
	Self	-0.007	0.291	-0.025	.98	-0.593	0.579	0
Depth of Processing	Social	0.117	0.229	0.511	.611	-0.343	0.577	0.006
	Physical	0.423	0.228	-1.861	.069	-0.881	0.035	0.07
	Self	0.054	0.158	0.339	.736	-0.265	0.372	0.002

4.4 Discussion

In this study, we sought to explore the social experience of a virtual reality Western art music concert. Participants were presented with a programme of Beethoven, Dean and Brahms via an Oculus Quest 2 head mounted display which presented the visual elements of the concert in a 360º, three-dimensional field with binaural sound. Before and after the virtual reality concert, participants completed questionnaires which allowed us to collect data to respond to our research questions. Since there is limited previous research on the virtual reality presentation of Western art music concerts, we were interested in the overall experience of participants (RQ9), which we explored through a thematic analysis of their responses to the open questions in the survey. In addition to this, we used these responses to consider the extent to which a virtual reality concert is considered to be social by the participants, and apply the model for capturing this identified in Chapter 2 of this thesis (RQ4). We used pre- and post-concert mood ratings to calculate participants change in mood as a result of the concert, and took an increase in positive activation and valence, and a decrease in negative activation as an indicator of enjoyment (RQ10). Previous research has found that personality influences engagement and reception of virtual reality in a range of contexts. Therefore, we used the brief Big Five Inventory to investigate the effect of personality on the enjoyment of the virtual reality concert (RQ11) and to explore whether personality, or any other demographic characteristics predicted the extent to which a participants would have a social experience (RQ13). Finally, previous research on virtual reality has identified immersion and presence as being particularly salient features of the technology, and our participants frequently commented on their immersion within the concert. Existing literature has identified that these terms are often synonymised by scholars and lay people alike. Therefore, we used a measure of presence which included self-presence, social presence, and physical presence to see if this predicts the social experience of a virtual reality Western art music concert (RQ14). These results will be discussed and interpreted in this section according to the literature and theory identified in the introduction of this chapter.

While it is not correct to say that there is no research on the use of virtual reality in Western art music engagement, it is a limited field. Those that have done so predominantly sought to gamify the experience and introduce participatory elements (e.g. Antoshchuk et al., 2018; Droste et al., 2018; Hwang et al., 2017), or use the technology in music education settings (e.g. Orman et al., 2017; Serafin et al., 2017). Popular music has engaged with virtual reality to an extent, with some acts producing marketing materials or videos that utilise three-dimensional, 360º technology. There are many possible reasons for the apathy towards presenting concerts in virtual reality, which may include the cost of head mounted displays, and the cost of producing suitable recordings. It could also be the case that there is a level of discomfort, both regarding the headset and the disorientation or cybersickness caused by the video. These are both comments that arose from the open responses in the post-concert questionnaire that participants completed with participants commenting on the discomfort of the headset (48% participants) and visual image (36% participants). This observation has been made in previous virtual reality research (Biocca & Levy, 1995; Gigante, 1993), which has also found that it is disproportionately uncomfortable for female users due to the typically larger female interpupillary distance (Stanney et al., 2020) and field of view (Grassini & Laumann, 2020). This could be mitigated by the development of lighter, less intrusive hardware, more flexibility in the set-up of an image to account for the previously mentioned physiological differences, or to develop a more automated panning mechanism of the YouTube 360º function, which users can control with head movements but without having to wear a head mounted display.

The most commonly coded positive aspects of the virtual reality concert experience were the intimacy or closeness to the musicians, and the sound or audio. The former is a significant advantage of not only virtual reality, but many digital presentations of arts. Audiences can access perspectives that they would not in a live setting and this intimacy seems to be valued (Lovejoy, 2014). This is an aspect of presenting concerts digitally that producers, artists, and directors should continue to consider in order to attract audiences to engage with arts through virtual reality. The appreciation of the audio highlights another aspect of producing media for this format that should continue to be prioritised. The quality

of the auralisation influences the extent to which a user can suspend their disbelief and become immersed in the virtual environment (Ballestero et al., 2017), the more responsive the sound localisation is to participants movements, the more 'real' the experience will be perceived to be. This was highlighted by participants' responses to the open questions in our survey too. Therefore, a further recommendation to those considering the production of virtual reality Western art music concerts should note the importance of this factor. Conversely, the image or view was the most frequently cited code in response to negative aspects of the experience, with participants identifying lag, jitter, image clarity, or moments when the audio and video where not synchronised.

Immersion, which is often conflated with presence, was identified almost equally in the response to the positive comments (46% of participants), and the negative comments (40% participants). The positive comments relating to audio (Poirier-Quinot et al., 2016; Postma et al., 2016), and negative observations about the visual aspects (Dhaya, 2020) of the virtual reality experience will have influenced the extent to which participants felt immersed in the virtual environment. The relative success of these elements seems to have resulted in the mixed response to immersion. While our stimuli did not have explicit haptic elements, the discomfort of the head mounted display is also likely to have impacted immersion with participants conscious that they were wearing one (Carnegie & Rhee, 2015; Howarth & Costello, 1997). Other than improving the comfort of the hardware, producers could consider ways in which to introduce haptic elements into the virtual reality experience without deviating too far from a typical live concert experience, perhaps by causing vibration of the head mounted display or handheld controls during moments of applause.

The thematic analysis of responses was ultimately interpreted as having a hierarchical structure, with codes either relating to the concert itself, the overall user experience, or the immersion and presence. Based on the literature, we argue that both stimuli and experiential elements contribute to the immersion or presence expressed by participants. In Chapter 2 we concluded that the emotional response to the music and the overall enjoyment of a live concert are not synonymous (O'Neill & Egermann, 2022). This thematic model adheres to this differentiation, but also acknowledges the importance of

both in a virtual reality context. Based on the limited sample, and descriptive analysis of the qualitative interpretation of results in this study the overall user experience was more commonly coded as negative, and the concert was more commonly coded as positive, with immersion and presence being bidirectionally coded. Therefore, in response to the first research question, it could be concluded that people have a generally mixed experience of a Western art music concert presented in virtual reality and that there may be other variables that predict the enjoyment of this medium.

One such predictor of the enjoyment of virtual reality Western art music concerts seems to be personality. In the third research question (RQ11) we sought to explore whether personality traits predicted enjoyment of virtual reality concerts. This research question was informed by the previous literature which suggests that there is a correlation between openness to new experiences and absorption in virtual reality (Sacau et al., 2005), and perceived ease of use of virtual reality (Srivastava et al., 2021). In addition to this, Jurnet et al. (2005) and Weibel (2010) found that openness to new experiences, extraversion and neuroticism were significantly correlated with immersion. While these findings only indicate a non-directional relationship, our results replicate the finding that openness to new experiences is related to perception of virtual reality, and that it indicates greater enjoyment of a virtual reality experience, based on a significant increase in positive activation and valence, and a significant decrease in negative activation. According to the original theory of the Big Five personality traits, those who tend to have high trait openness are more willing to engage with new ideas, experiences and tend to seek out novelty (Digman, 1990). While this relationship is intuitive, the empirical and quantitative confirmation of its existence contributes to the existing knowledge in the field. Extraversion was also found to significantly predict an increase in valence in our study. Trait extraversion is characterised by those who are social, assertive, emotionally expressive and excitable (Wilt & Revelle, 2009). It may be that those who experience high trait extraversion naturally report higher levels of valence; however, since we are conceptualising enjoyment as a change in mood, calculated by comparing pre-and post-concert ratings this possibly confounding variable has been controlled for. Based on our data, no other personality traits

were significant predictors of enjoyment of a virtual reality Western art music concert. Of course, there may be other influential factors which predict enjoyment of virtual reality Western art music concerts, and this would be a potential topic for future research to explore.

The fourth research question relates to the extent to which the social experience of a virtual reality concert adheres to the model or structure that describes the social experience of a live concert. As with a live concert, the stimuli for this video only facilitated parasocial interactions in which the viewer can perceive information from the audience members they can see, but not respond to them or interact in any way. In fact, the virtual reality experience accentuates this as not only was interaction during the concert systemically discouraged (Burland & Pitts, 2016), it is entirely impossible. Yet, in previous chapters we have found that people still have a social or collective experience of Western art music concerts, whether presented live or digitally. In this study, the participants had some autonomy over where they looked during the concert from the vantage point from which the footage was taken: the front of the stage. When asked where they predominantly looked during the concert c.20% of participants mentioned the audience indicating an awareness of the virtual co-presence. However, none of the open text answers mentioned the digital representation of the live audience captured in the concert recording, instead various comments related to the absence of an audience, the lack of connection with others compared to a live concert experience and the overall negative impact this had on the virtual reality concert experience. From this we can conclude that people value the social element of concert attendance at Western art music events, and that the virtual reality experience has lessened the potential for this.

As in previous chapters, the social experience of the virtual reality concert was quantitatively captured using the SECS (O'Neill & Egermann, 2022). The data in this study fit the factor model, based on the non-significant X^2 measure of fit. This suggests that the social experience of a virtual reality concert adheres to the same factor model as live presentations (RQ12)

As with a lot of quantitative studies or quasi-experiments, as many confounding variables as possible were controlled in the present study. For example, participants were asked the same questions, took part in the study in the same location, experienced the same stimuli, and were given the same guidance from the researcher during data collection. However, in any research there are interindividual differences that have the potential to influence the outcomes. Our fifth research question in this chapter (RQ13) was developed to explore these differences and compare them to predictors of social experience in the other concert conditions examined in Chapters 2 and 3. In this quasi-experimental analysis we sought to test the effect of these naturally occurring demographic differences, on the extent to which people report having a social experience in a virtual reality Western art music concert. Of the variables available in this data set, we explored the effect of age, highest level of education and gender on the social experience. Unlike Chapter 2 (O'Neill & Egermann, 2022), neither age, nor education were significant predictors of the social experience of a virtual reality concert. However, in a virtual reality context gender does seem to be a significant predictor of the overall social experience. More specifically, participants who identified as being male showed a non-significant trend towards greater levels of solidarity, and a non-significant trend towards a reduced depth of processing. As stated in the results section of this chapter, a non-significant trend is ultimately a non-significant result. However, the effect size is only just within the medium range (Levine & Hullett, 2002; Richardson, 2011), and it might be that with a larger sample, and more equal distribution of participants across the spectrum of genders, this effect would be significant. This is a question that would require further research to address.

We also, for the first time in this thesis, explored the predictive effect of the Big Five personality traits on the extent to which participants have a social experience. Based on the previous literature we posited that participants with high trait extraversion and agreeableness, and that those with low trait neuroticism would have a more social experience since previous research had identified a correlation between these variables in a virtually mediated space (Sacau et al., 2005). This relationship was directly replicated based on our analyses, in which we found that extraversion significantly indicates an increase in

solidarity, satisfaction and self-definition, and agreeableness significantly results in an increase in satisfaction and solidarity. As previously discussed, trait extraversion is characterised by a general sociability (Wilt & Revelle, 2009) and in this study, this has been found to be true in a virtual environment. In particular, extraversion predicts feelings of being bonded to the rest of the audience, satisfaction at being part of the group and identifies audience members as being more similar to each other, and to themself. Extraversion and agreeableness have both previously been found to predict relationship satisfaction in real-world environments (Tov et al., 2016), and that extraversion which leads to social connectedness, also predicts well-being (Lee et al., 2008). The effect of extraversion on self-definition is less intuitive; however, there is research to suggest that extroverts are very consistent in their perceptions of actual and ideal selves (Hendrick & Brown, 1971). Perhaps this assuredness of self-definition also allows those with high trait extroversion to make consistent judgements about the perceived similarity of members of a group. As an alternative interpretation of these results, we posit that due to reciprocal determinism, through which a person's behaviour both influences and is influenced by personal factors and the social environment, extraverts generally perceive others to also be more extroverted and therefore similar to themselves (Bandura, 1978). In real world situations their extraversion makes others behaviour more extrovertedly (Eaton & Funder, 2003), and since there is only parasocial interaction available in the virtual environment (Giles, 2002) which cannot contradict their real-world based expectation they are predisposed to rate others as being more similar to themselves.

Agreeableness defines those who possess this trait as being likeable, pleasant (Graziano & Tobin, 2009), and who have a “motivation to maintain positive social relations” (Crowe et al., 2018, p. 772). Based on this descriptor it is not surprising that it predicts a more social relationship, but it is interesting that this translates to co-presence and virtually mediated parasocial relationships. Once again, the specific social factors which are influenced by trait agreeableness are satisfaction and solidarity. It seems likely that there may be a predisposition of those who experience high trait agreeableness to experience and report higher levels of satisfaction generally (Tov et al., 2016), and this translates into

their real-world social satisfaction (Fors Connolly & Johansson Sevä, 2021; Wieczorek et al., 2021). Our findings show that this is also true in a virtual environment.

Based on previous research, we may have expected participants with lower levels of trait neuroticism to report having a more social experience based on previous literature that found this to be the case in real world settings (Back, 2021; Back et al., 2011; Harris & Vazire, 2016; Mund et al., 2016; Weibel, 2010). Indeed, Tsay and Bodine (2012) found that neuroticism was the only significant predictor of parasocial dimensions, suggesting that neurotic individuals experience stress due to real-world social anxiety, and simultaneously they may also encounter a fear of social exclusion. This has been found to be mitigated by parasocial relationships (Wang et al., 2008), which we suggest are present in Western art music concerts generally, including in virtual reality. Despite this, neuroticism was not found to be a significant predictor of the social experience of participants in our study. It has been suggested that neuroticism is the result of a neural system which identifies differences between expected and lived situations (Eisenberger et al., 2005). In virtual reality the place and plausibility illusion intensify the threat perception for those with high trait neuroticism, which will cause them to employ avoidance strategies such as disengagement, to bring their cognitive and emotional appraisal back within their optimal level of processing and arousal (Lin, 2017). If this is the case, then their disengagement may have reduced their perception of the social experience of a concert resulting in an unstructured rating of its factors.

The final research question in this study, and thesis (RQ14) was whether participants who experience higher levels of physical presence, social presence, and self-presence report stronger social experiences in a virtual reality concert. Our results indicate that social and physical presence are significant predictors of the social experience of a concert, but that self-presence is not. More specifically, social presence positively predicts the satisfaction participants report at being part of the audience, solidarity with other audience members and the amount of attention they paid to other members of the audience.

Social presence captures the extent to which an individual perceived those with whom they are virtually co-present to be real and able to interact with them. Those who experienced greater levels of perceptual realness seem to have done so by paying greater

attention to other members of the audience. As identified in Chapter 3, the satisfaction subscale of the SECS may not consistently be able to differentiate between satisfaction at being part of the audience, as conceived as the in-group, and their satisfaction with the concert generally. Social satisfaction and enjoyment may, therefore, become conflated. The effect of social presence on bonding adheres to the model proposed by Ning Shen and Khalifa in which awareness, affective social presence and cognitive social presence predict sense of community (2008). They found that this effect is mediated by a users' motivation, and it would be interesting to apply this to a virtual reality concert in future research.

In addition to this, physical presence, or the extent to which the virtual environment felt real and captivating to the user, concurrent with their real-world expectations, predicted the amount of attention participants paid to other audience members and shows a non-significant trend toward positively predicting the depth with which participants processed other members of the audience. In the real-world, it is well recognised that the presence of other people attracts attention (Bosch, 2018; Platania & Moran, 2001), and those that perceive the virtual environment to be more real also pay greater attention to the audience. Thus, we can conclude that the mere presence effect is also experienced in virtual environments.

In summary, there is an appetite for engagement with virtual reality presentations of Western art music concerts (RQ9). Some of the advantages identified include the accessibility of watching a concert without having to go to a concert hall, the novelty of the technology, the immersion and the potential for otherwise inaccessible perspectives and intimacy with the performers. However, there are also limitations with the current technology which is physically uncomfortable to wear for long periods of time, and the experience of cyber sickness by some participants. It must also be acknowledged that the hardware, and production of the media is currently expensive. In our study, participants experienced a significant increase in positive activation and valence, and a significant decrease in negative activation (RQ10), and personality was found to predict enjoyment of the virtual reality experience (RQ11); specifically, openness to new experiences and extraversion. The extent to which participants have a social experience is also influenced by

personality traits, particularly extraversion and agreeableness (RQ13). This finding contributes identified interindividual differences that have previously been identified in this thesis. Finally, we found that social and physical presence predict the social experience of a concert (RQ14), and this was supported by the qualitative analysis of the open questions. With a few exceptions, many of our findings on the effect of personality on the social experience have replicated the results of previous research, what is novel about our findings is that they replicate these relationships in a virtual setting.

4.4.1 Limitations

While we have utilised the responses to the open questions in our analysis and interpretation of this study, the questions were not necessarily designed to capture such pivotal information. As such, it is likely that they were not optimally phrased to explore the topic. Asking participants to type open text responses is more demanding than rating scales (Reja et al., 2003), and as a result the depth of their responses to these questions was often limited. However, these insights allowed us to explore this mode of presentation of Western art music concerts, which has not been done in this way before. Therefore, conducting further qualitative research would yield further insights into peoples' opinions on virtual reality and inform future directions of scholarship, and technological and programming development in this area.

Other measures which were suboptimal include the use of the PANAVA to capture enjoyment. While there is an intuitive mechanism whereby an increase in positive activation and valence are indicative of enjoyment, this measure is not validated to measure this variable. It would have been better to use a tool that has been found to reliably measure enjoyment of virtual reality. To our knowledge no such scale exists; therefore, future research could seek to develop this. In addition to that, the differentiation between immersion and presence is often indistinct and therefore we have used the open text responses and the MPS to cautiously make conclusions that cover both concepts. Future

research should attempt to clarify these key aspects of a virtual experience, and develop a tool that can capture both.

As with the research in Chapter 3, this data was collected with restrictions mandated by the COVID-19 pandemic response. The effect is likely to have been less significant as participants would have had to complete the study two at a time at most due to the availability of Oculus Quest 2 headsets. However, wearing a mask, social distancing and the enhanced cleaning protocols may have influenced the experience. It must also be acknowledged that asking people to come to the York Music Psychology Group Listening Lab reduces the ecological validity of the experience. However, virtual reality is meant to suspend a user's awareness of their physical location, so perhaps this is not as much of a limitation as with other presentations of stimuli.

A key variable in this study was the social experience of the concert, for which participants were invited to consider "the audience that you could see in the recording and to other people who watch the concert in VR, like you" (taken from the questionnaire). However, the vantage point of the 360º video was directly at the front of the stage. While this created an intimacy with the performers and provided a perspective that is not typically available to audience members, it limited the extent to which participants could see the audience in the video, unless they purposefully turned to look at them. It would have been better to film the concert from three or four rows back to give a more realistic experience of being in a concert audience.

Finally, the use of Western art music in this study means there are many remaining questions about how people would respond to other musical genres, or even more visually engaging performing arts, such as dance or opera, which lend themselves more naturally to virtual reality presentation.

4.4.2 Conclusion

To conclude, we have found that personality predicts the enjoyment and social experience of a virtual reality concert, in particular extraversion, agreeableness, and openness to new

experiences. Social and physical presence also predict the extent to which a user will rate the concert experience as being social. Many of these results are in line with previous research; however, we have provided a substantial original contribution to the field by replicating them in a virtual reality setting.

There is a risk that as the technology develops, researchers will bypass contributing to the scholarship on virtual reality Western art music concerts, in favour of artificial intelligence (AI) and computationally generated music, for example. However, this study has found that concert attendees have an appetite for engaging with music events in this way, which supports the need for further research. This could include presenting Western art music concerts with computer generated visuals designed specifically for the piece, or include more interactive elements in the presentation of the concert. Indeed, exploring other genres and art forms generally would be a good next step.

In order for the technology to be more attractive it needs to be made more fiscally accessible to create appropriate media, and more comfortable head mounted displays need to be developed. Those seeking to harness virtual reality to develop their audience will need to consider these limitations when programming media in this format.

Chapter 5

General Discussion

5.1 General discussion and synthesis

The main aim of this thesis was to explore how social factors contribute to the overall experience of a concert. As discussed in the general introduction, and the literature reviews in each of the subsequent chapters, there is significant research on the social implications of music making and consumption. Yet the very format which implies the presence of others to a greater extent than other modes of music engagement: concerts, has received relatively little quantitative exploration of the mechanisms that influence this relationship. Based on the existing literature, four key factors were identified as either being predictors or predicted by the social experience of a concert: interindividual characteristics, concert features including mode of presentation and musical repertoire, emotional response to the music, and enjoyment of the overall event. The theoretical model derived from this summary can be seen in Figure 16.

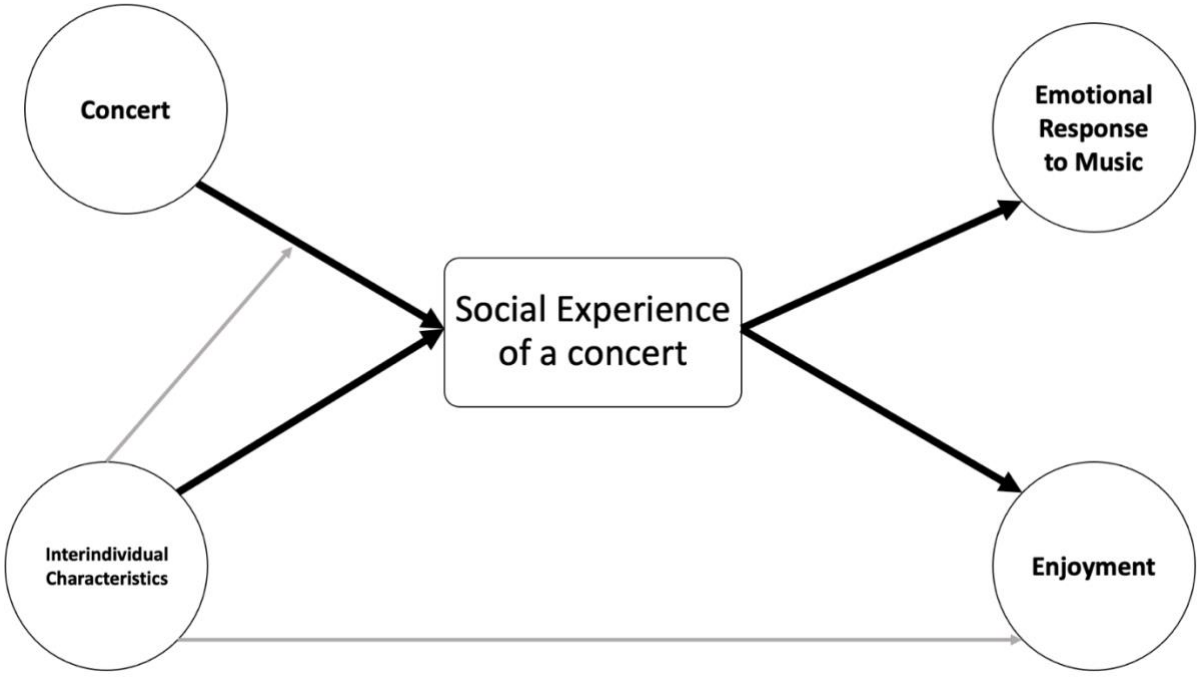

Figure 15. Theoretical Framework

This model was explored and tested through three studies, discussed in Chapter 2, 3, and 4 of this thesis and the key results will be summarised below, before moving into a thematic discussion of the implications and findings.

5.1.1 Study 1 - Development of the Social Experience of a Concert Scales (Chapter 2)

As mentioned above, there is evidence that the presence of others influences the way in which people interact with music, and yet there was no existing method of capturing this, or any discussion of the mechanisms by which it is influential. Therefore, the first aim of the project was to develop, and psychometrically validate such a tool. The first iteration of this was based on items taken from the Parasocial Interaction Inventory (Schramm & Hartmann, 2019), specifically relating to the amount of attention paid to others, and the depth at which they were processed. Further items were based on the In-group Identification Measure (Leach et al., 2008), which quantified the homogeneity, centrality, solidarity, satisfaction and self-stereotyping involved with making in-group/out-group judgements. Using recognised statistical techniques, we reduced the number of items and validated a 14-item set of five scales which have been repeatedly found to reliably capture the social experience of a concert.

To contextualise the data collected using the newly developed tool, we explored which variables, if any, could predict the social experience of a concert, including a range of concert features and interindividual characteristics. The significant relationships can be seen depicted in Figure 16, which is an augmented version of the theoretical framework depicted in Figure 15. Of those variables that we tested, we found that attending the concert with other people, observable interindividual traits such as participants age, and latent characteristics such as musical training when prior knowledge of the audience members was available, and the type of concert were all significantly influenced by the extent to which participants considerd a concert to have been a social experience. The type of concert relates to the repertoire being performed and the mode of presentation; for example, concerts with participatory elements were found to be perceived as more social.

Counter to our hypotheses, the results indicated that the social experience does not predict emotional response to the musical stimuli. However, there is precedent for this finding as previous research has found that the presence of others distracts an individual from the music (Egermann et al., 2011), thus weaking the emotion induction mechanisms which are known to be predicated on musical attention (Juslin, 2008). Despite this, the

overall enjoyment of a live music event was found to be predicted by the social experience, with those participants who rated their perception of the concert as being more social also reporting greater enjoyment of the event. While this is an interesting finding in and of itself, it is also counter to some previous scholars' assertions that a concert experience is synonymous with responses to the music: if one is influenced by the social experience but the other is not then we suggest that they are separate.

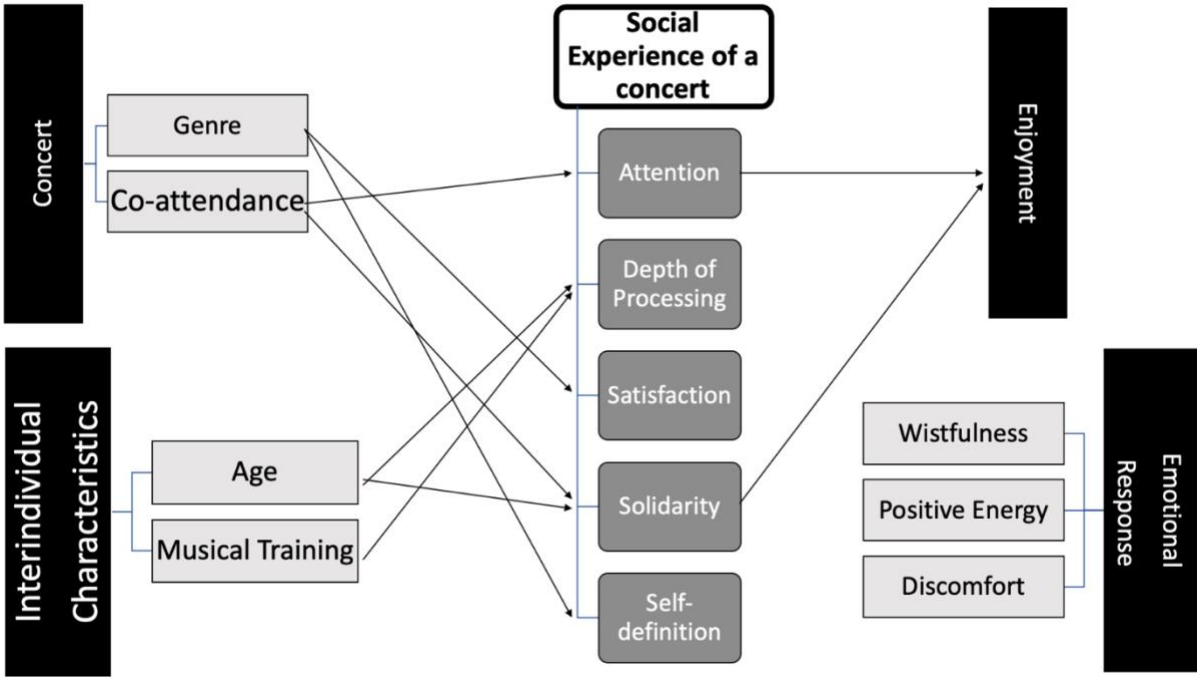

Figure 16. The path diagram displays the findings of the study described in Chapter 2.

The main original contribution of this chapter, and arguably the most impactful in the thesis, is the psychometric validation of a new tool to capture the social experience. The five-factor model, which is grounded in theory and statistically validated, could help develop further understanding of the research field of music psychology, and contribute to the development of new ways to present concerts within the industry.

5.1.2 Study 2 - Exploring the social experience of live and digitally presented concerts (Chapter 3)

Having explored the social experience of a live concert, the main aims of the third chapter were to compare the social experience of different presentations of the same concert. First, it was necessary to validate the use of the Social Experience of a Concert Scales to capture the social experience of digital concerts. In many ways the digital concert adheres to the parasocial interaction theory, on which the scale was based, to a greater extent than a live concert. While interaction is discouraged in traditional live Western art music concerts, the digital presentation of them introduces a further barrier to discourse and thus emphasises the parasocial nature of audience perception. The fit indices of the confirmatory factor analysis corroborated this assumption, and the Social Experience of a Concert Scales was found to be a valid way of capturing the social experience of digital concerts. Once again, the significant findings are depicted in Figure 17, and these are summarised below.

First, the social experience of a live and a digital on-demand version of the exact same concert were compared. The results indicate that the physical presence of others results in a greater social perception than virtual co-presence. The potential for required action posed by the physical presence of others serves an evolutionary function (Bosch, 2018; Cottrell et al., 1968; Platania & Moran, 2001). The mere presence of others increased arousal in preparation for a fight/flight/freeze response (Zajonc et al., 1969); thus, the live concert was perceived as more social. However, we also found that it is possible to influence the collective experience of digital concerts through the facilitation of social interaction between participants. Using streaming platforms which invited user interaction, and initiating conversation, whether spoken, typed or through the use of emoticons, increased the social potential of an event.

In collaboration with previous analysis on responses from the same sample, participants were categorised based on their previous engagement and enjoyment of digital concert consumption (Egermann et al., In review). Those participants who were identified as being Digital Concert Enthusiasts were found to have a more social experience, based on the

main effects of our model. This grouping was also found to moderate the effect of social facilitation on the perceived social experience.

With a view to replicating the findings in the first study to digital concerts, we once again modelled the predictive effect of the social experience of a concert on the enjoyment of the event. In this case, enjoyment was conceived as being represented by an increase in positive activation and valence, and a decrease in negative activation. Overall, the social experience of a concert once again predicted the enjoyment of the event, with three factors significantly contributing to this effect, excluding depth of processing and self-definition. How similar people perceive members of the audience to be to each other (homogeneity) and to themselves (self-stereotyping) does not seem to influence their enjoyment.

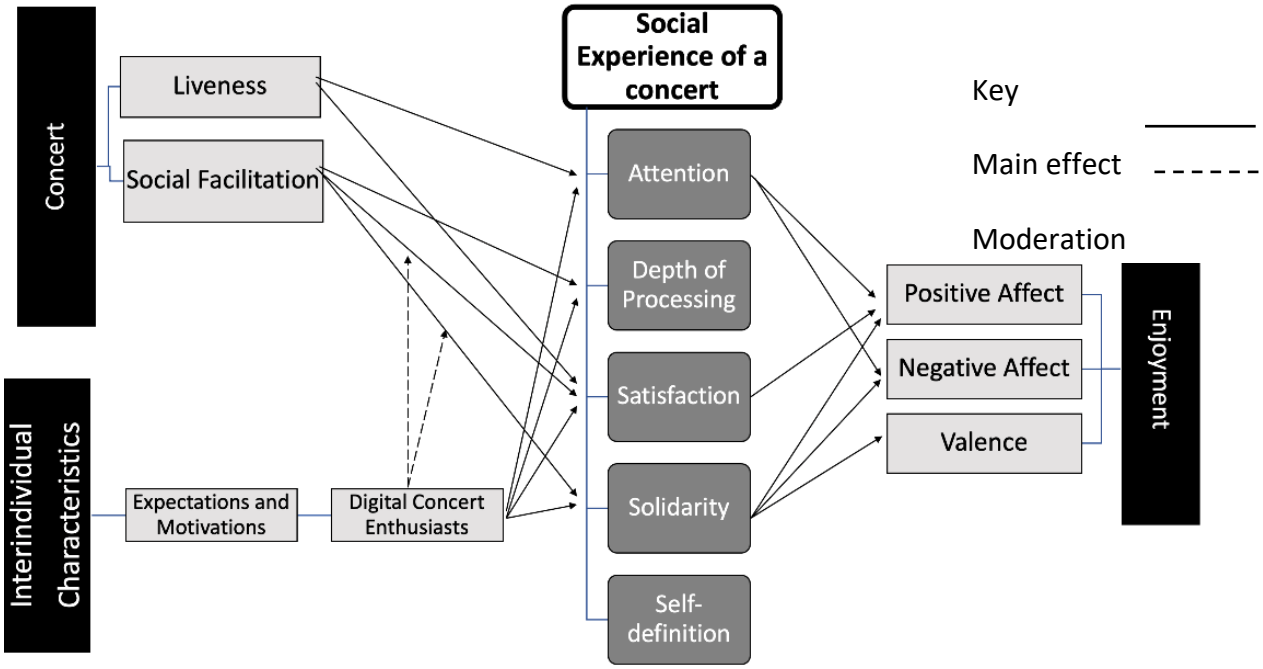

Figure 17. The path diagram depicts of the findings of the results of Chapter 3.

The results of this chapter provide the most systematic and controlled comparison of live and digital concerts, to our knowledge. The use of the same stimuli material allows direct comparisons to be made between these two modes of presentation due to the experimental control it affords. In addition to this, the focus on facilitating social interaction

within digital concerts is a novel approach, and provides evidence for achievable mechanisms to moderate digital presentations of music events to enhance the social experience. The finding that this increases participants enjoyment of the event indicates that concert programmers should consider doing so.

5.1.3 Study 3 - Presence, immersion and personality predict enjoyment and social experience of a virtual reality Western art music concert (Chapter 4).

Technology is constantly and exponentially evolving and as it does so, it becomes more accessible and affordable to an increasingly computer literate society. An example of this is the commercially available head mounted displays, through which virtual reality media can be consumed. Many entertainment sub-industries have embraced this, in particular ludology and narratology, and yet the arts entertainment industry, including music, has shown limited interest. Therefore, we took this as an opportunity to include a general exploration of the overall experience of a semi-immersive Western art music concert presented in 360^{o} via an Oculus Quest 2 head mounted display. The significant outcomes of which can be seen in Figure 18.

The key features of the virtual reality concert on which participants commented included the comfort, immersion, and intimacy of the experience. The codes identified in their responses were thematically organised into concert features, user experience, and the immersivity or perceived presence of the experience. Further to this, we explored the extent to which they considered the virtual reality concert to be social and found that the perspective from which the video was captured had hindered their ability to see those audience members who were present at the live concert. However, when considering both those audience members at the live concert, and people also watching the concert via virtual reality, participants were influenced by this combined asynchronous co-presence.

Personality has been found to be predictive of individual's reception to virtual reality by ludologists and in other similar fields of research (Srivastava et al., 2021); however, this has never been applied to virtual reality presentations of music. Therefore, we explored whether personality, as defined by the Big Five Personality Traits (Cobb-Clark & Schurer, 2012), predicts enjoyment, once again conceived of as a change in activation and valence. The results indicate that extraversion and openness to new experiences significantly predict enjoyment, which is in line with previous findings with other types of virtual reality stimuli. Having not previously explored the effect of personality on perceived social engagement in a

concert setting, we used the Brief Big Five Personality Inventory and the Social Experience of a Concert Scales to explore this relationship. Extraversion and agreeableness were found to be the only predictors of solidarity, satisfaction or self-definition.

The literature review of virtual reality presentations of various media types highlighted the importance of immersion and presence when considering engagement with this technology. Immersion is defined as the level of engagement a user's experiences with the virtual world. It is influenced by the ability of the virtual environment to provide sensorial stimuli that mirror reality and is influenced by the technology and stimulus material available. Presence is defined as the extent to which an individual feels they are in the virtual world, and absorbed by it, forgetting their physical reality. Perfect or total immersion and presence occur when the brain is unable to differentiate between virtual simulation and real stimulation. The difficulty of differentiating these concepts transcends expertise and they are often conflated conversationally, and in the research. As such, any mention of one, in the responses of participants, was cautiously treated as representing both. However, we chose to use a measure of presence to quantitatively test its predictive power on the social experience of a virtual reality concert. The results indicate that social presence, and physical presence predict various social experience factors, but self-presence does not.

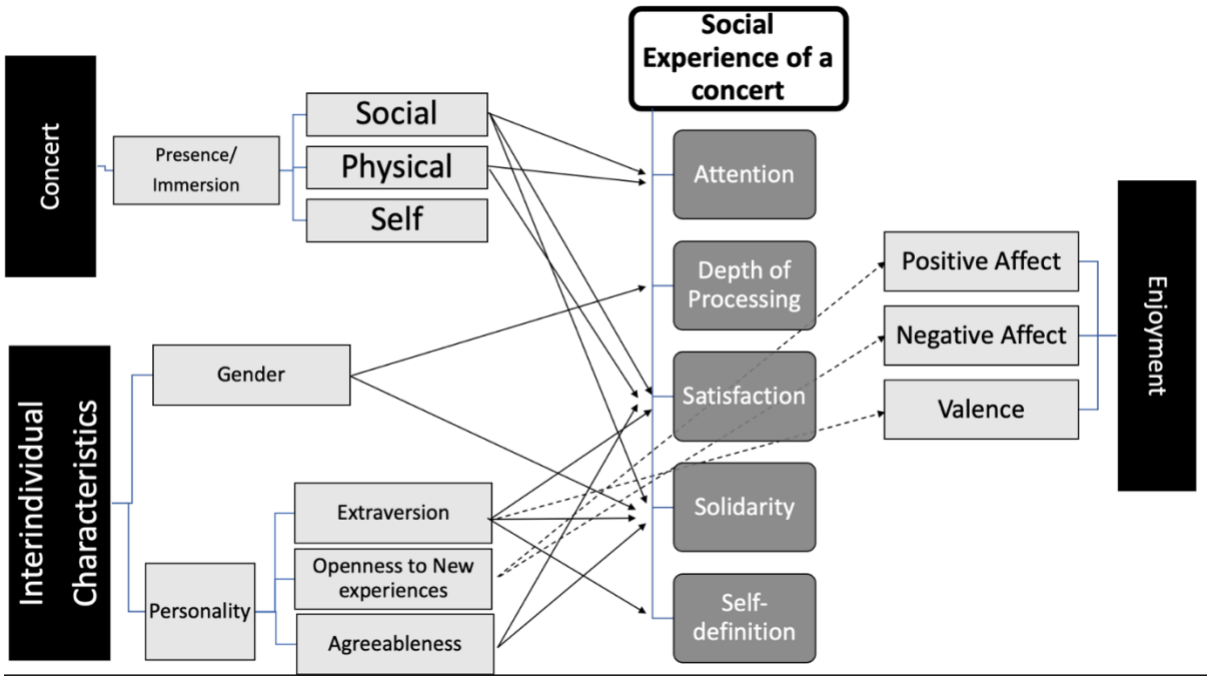

Figure 18. The path diagram shows the significant results from Chapter 4.

The absence of a meaningful body of literature on the virtual reality presentation of concerts means that much of this chapter was exploratory and used findings from other fields to explain the results. However, the benefit of being one of the first studies to do so, is that the results offer considerable new insights on the topic. To have replicated our own previous findings on the social experience of a Western art music concert in a virtual reality context show that the relationship between concert factors, personality, and the social experience are maintained when music is presented in this way. A key takeaway from this study is that there is an appetite for concerts presented in virtual reality and programmers and curators could consider ways to adapt their musical presentation to suit the technology.

5.2 Thematic discussion, Implications and Future Research

The theoretical framework defined in the introduction identified two predictors of the social experience of a concert: personal characteristics and concert features, and two outcomes: enjoyment of the event and emotional response to the music. These will be discussed in this section, and implications and suggestions for future research will be considered.

5.2.1 The influence of concert features on the social experience of a concert

There are many ways in which the presentation of a concert can be manipulated, and it has previously been acknowledged that those who commission Western art music concerts have shown limited interest in doing so (Wald-Fuhrmann et al., 2021). Staging and dramaturgy are carefully and creatively considered when producing new theatre productions, dance shows, operas, and fine art exhibitions. However, these factors are rarely considered in the presentation of Western art music. There are some factors which may go some way to explaining this, including the practicalities of moving around a stage with cumbersome instruments, or the number of performers on stage in the case of a symphony orchestra. The limited contribution that concert curators have previously made include projection to accompany the performance (Morris, 2000; Uhde, 2020), audience participation (Toelle & Sloboda, 2021), pre-concert talks with performers or composers (Dobson, 2010; Garrido & MacRitchie, 2020), and perhaps backstage tours of the more distinguished establishments (Nopper & Lapierre, 2005). With audiences of Western art music often cited to be declining (Tröndle, 2019), and audience development at the forefront of programming in the sector, the reluctance to engage with creative presentations is counterintuitive.

Providing an explanation and solution to the so called ‘classical concert crisis’ is beyond the scope of this thesis. However, to contribute to the field of knowledge we have undertaken a detailed investigation into the social experience, and the ways that this can be used to enhance the concert experience. One of the key parameters on which we focused was the ways in which a concert can be presented to facilitate greater social interaction.

To an extent, the genre of the repertoire is important. Within Western art music there are many sub-categories of music and of those that we investigate in Chapter 2, the chamber orchestral concert and lecture recital were found to result in the highest social experience scores. However, this cannot necessarily be attributed to the repertoire performed, as these concerts both contained audience interaction and significant spoken introduction from the performers. The chamber vocal concert was regarded as more social than the solo recital, and the chamber instrumental was overall perceived as being more social than the orchestral concert. This implies there is an optimal size of ensemble, and that is the chamber ensemble range. These findings can be converted into recommendations for programmers who are seeking to establish a more social experience: they should seek to programme chamber ensembles who build audience interaction into their performances.

In addition to the concert, attending with other people unsurprisingly predicts an increased social perception. If people attend with others, they are more likely to pay attention to them and feel positively bonded. Many concert venues already provide multi-sale discounts or promotions to encourage people to attend together, but this evidence further supports this marketing strategy.

One of the most significant barriers to concert engagement is accessibility; in terms of cost, geography, and lack of a 'way in' in particular (Dobson, 2010; Dobson & Pitts, 2011; Hagen, 2017; Kaptijn, 2019; Van Steen & Lievens, 2009). A logical way to reduce cost and remove geographical barriers is to make concerts available online, for a reduced cost, and at a time and place that is suitable for the audience. This may also encourage people to 'give it a go' and become a 'way in' to concerts (Price, 2017). The theatre, sport and opera sectors have gone much further in exploring digital dissemination of their outputs, compared to the popular and Western art music industries. Showing sports fixtures on television and the internet is common practise (Birmingham & David, 2011; Hutchins et al., 2019; Kim & Kim, 2020), but screening theatre productions in cinemas is also becoming more recognised (Baía Reis & Ashmore, 2022; Mueser & Vlachos, 2018). It is not fair to say that there was no attempt to use these channels prior to the pandemic, but only the largest companies and venues were doing so; for example, the Berlin *Konserthaus* (Droste et al., 2018), or the Royal

Opera House in London (Yoon, 2017). With these notable exceptions there was limited availability of digitally disseminated Western art music.

This thesis has found evidence that while the digital presentation of concerts does not achieve the same perception of a social experience as a live concert, it is possible to enhance this through facilitation of interaction between participants. It has previously been found that utilising the chat functions of streaming platforms increases agency, presence, and the social context of an event (Onderdijk et al., 2021). We have extended this by exploring the use of the SpatialChat platform in which participants can communicate through written text comments, emoticons, and conversation. This was particularly effective when interaction was initiated by a facilitator, but as people become more accustomed to the format this could become less necessary. All this serves to encourage venues to continue the use of digital dissemination of their concerts beyond the COVID-19 pandemic, during which time many turned to this mode of delivery out of necessity.

The final recommendation that can come from this theme of the thesis is the continued exploration of the use of virtual reality for presenting Western art music concerts. Any previous attempts seem to have only done so for educational purposes (Hwang et al., 2017; Orman et al., 2017; Serafin et al., 2017), where interaction with the performance or performers is in some way possible. But many people who currently attend concerts do so without this expectation of participation, and so the pressure to produce an interactive concert is lessened. That is not to say that it would not be interesting to explore more visually creative presentations of the concert, including augmented visuals, or the option of multiple viewpoints (Antoshchuk et al., 2018; Droste et al., 2018). An interview study of regular concert attendees found that many respondents indicated that they would attend more virtual reality concerts if they were available (Bouckaert, 2021). Of course, the production of professional level digital recordings, particularly immersive or semi-immersive virtual reality 360^{o} productions is associated with some cost; in terms of equipment, production, the existing venue, music licence, and performer costs but it would be worth funding bodies considering these ventures for receipt of funding. Therefore, this could be considered in future research, and within the industry.

5.2.2 The influence of interindividual differences on the social experience of a concert

The presentation of the concert is only influential on the social experience if there are people present with whom to conceive of having a social experience. Audience research often seeks to categorise people; for example, attenders vs. non-attenders (Dobson, 2010; Dobson & Pitts, 2011; Hagen, 2017; Kaptijn, 2019; Van Steen & Lievens, 2009), based on the audience segmentation model (Audience Agency, 2022; Peterson, 1992), or some other locally derived metric. Categorisation or segmentation is simply the aim of grouping audience members to enable a venue or company to tailor their programming, marketing, and communication to their key demographic. While we may discuss 'the Western arts music audience', the reality is this is made up of multiple groups, who have many different interests and expectations.

In this thesis, we have grouped or categorised participants in various ways. In Chapter 3 this was based on previous engagement and enjoyment of digital concerts. In a pre-study survey, participants rated various parameters of their digital concert engagement and were allocated to one of three groups based on a latent profile analysis of their responses (Egermann et al., In Review). The three groups that emerged were called Digital Concert Enthusiasts, Digital Concert Traditionalists and Undecided and Unengaged Concert Users. We found that their group membership predicted the extent to which they would have a social experience, and moderated the extent to which a social experience could be facilitated, in a digital concert setting. Further to this, in Chapter 4, we grouped people based on their personality traits and found that once again, this predicted their social experience of the virtual reality concert, and their enjoyment of it.

The categorisation of audiences is a well-established practise by the industry; therefore, the attempt to do so in this study is not particularly novel. However, there is no previous attempt to use this to predict the social experience of an event. Future research could explore the effect of membership in the audience segmentation categories on the social experience of concerts to draw the research closer to the industry.

Any form of categorisation is problematic to an extent because it discounts the individual experience of those that are attributed into a category. We live in a society that is increasingly open to the spectrum of human experience, and thankfully so. Two interindividual differences were considered in Chapter 2 of this thesis, and these were considered on a spectrum rather than in categories: age and musical training. Both were found to significantly predict the social experience of a concert and while they could be used to group audience members, perhaps it is also indication that future research should seek to explore a broader spectrum of individual experiences, and take a more constructivist approach to the study of the social experience of concerts.

5.2.3 The influence of the social experience of a concert on the overall enjoyment of a concert

The previous sections are predicated on the assumption that increasing the potential for a social experience is something for which we should be striving. However, our findings indicate that this is not just an assumption as social experience has been consistently found to predict enjoyment of an event. Greater enjoyment intuitively results in repeated engagement.

Anecdotally, musical conservatives would say that they attend concerts solely for the music, and the music should be played according to its traditional forms, harmonic language, or any other generally accepted compositional techniques (Wilson et al., 2014). They are intrinsically motivated to engage with concerts, and the presence of others should be minimised and occupy as little focus and attention as possible. However, those who experience this preference are not in the majority, indeed there are not enough of them to sustain the Western art music industry. Therefore, this further indicates that venues, curators, and artists should be exploring ways to enhance the social experience of a concert.

In this thesis, we have measured enjoyment either with a single item (Chapter 2), or as a change in activation and valence (Chapters 3 and 4). Neither is optimal for capturing

this information, a single item lacks internal validity, and the latter infers that an increase in activation and valence is a result of enjoyment, but it is not necessarily the case. Therefore, future research could also seek to verify these findings with a more robust measure of concert enjoyment.

5.2.4 The influence of the social experience of a concert on emotional responses to the music

The study of emotional responses to music is one of the most significant subdisciplines of music psychology. In many ways, this thesis was conceived as the impact of the presence of others on emotional responses to music. However, it has organically transitioned into a broader conceptualisation of responses to music events for two key reasons. The first is that in Chapter 2 the social experience of a concert was not found to predict emotional responses to music (O'Neill & Egermann, 2022). All subsequent data was collected as part of the Experimental Concert Research or Digital Concert Experience projects and despite numerous discussions, no satisfactory measure of emotional or aesthetic response to the music was employed in the surveys, in my opinion. Had the findings from Chapter 2 indicated that the social experience does influence emotional responses to music perhaps we would have been inclined to advocate for the use of a validated method of measuring emotional responses to music. Indeed, it may have been an error not to do so as other research has found that social experience does predict feelings of being moved, and awe in response to digital concerts (Swarbrick et al., 2021), that social factors influence emotional responses (Juslin, 2008; Scherer & Zentner, 2001), and evidence of a collective emotional experience (Mackie & Smith, 2015). The theory of collective effervescence, which was discussed in the general introduction of this thesis (see Section 1.2.1), and seems to result in group bonding and emotional energy in individuals is further evidence of a connection between these two phenomena (Cottingham, 2012). Based on the findings of this thesis the social experience of a concert does not predict the intensity of valence of emotional responses to music; however, further investigation is significantly theoretically indicated.

5.3 General Limitations

Chapters 2, 3, and 4 include a discussion of the limitations associated with each study, and these will not be repeated here. However, the main limitation of this research is the focus on Western art music. In the preface, it was stated that in many ways, this remains the music that is considered 'worthy' of being studied, and yet it can neither be said to represent the appetite of 21st century audiences, nor the breadth of music that has been produced across the world and throughout history. This thesis displays a significant lack of equality, diversity, and inclusion in the types of music that are studied (all written by white, western, cis-male composers), and the demographics of the audience (particularly in terms of education, race and affluence). Therefore, the poignancy with which the focus on Western art music is highlighted throughout does not serve to headline this genre. But rather to acknowledge that the findings of this research should not be assumed to apply to different concert presentations that are associated with different genres, diverse audiences, and a range of time periods.

The findings of this thesis should be challenged and extended by future scholars, and the Social Experience of a Concert Scales could be validated for use in a boarder spectrum of concert settings. For example, jazz, pop, and rock gigs that are bound by very different social expectations of behaviour which facilitate interaction, or in other performance arts events such as theatre and dance. There is also an increasing interest in amateur performance which is a much more prevalent mode of engagement with music than the traditional concert halls and virtuosic performers, in part due to the community and social aspects, and the scale could also be validated for use in capturing that experience. That is not to say that Western art music does not have a place in the 21st century, and perhaps that findings from this study, might contribute to the diversification of presentations that have emerged during the COVID-19 pandemic.

5.4 General Conclusion

To conclude, this thesis set out to explore the social experience of Western art music concerts and thus, to make an original contribution to the field of knowledge. Since no tool for quantitatively measuring the phenomenon existed, a new tool for capturing this was developed and psychometrically validated for use in live, digital, and virtual reality contexts. Subsequently it was found that the social experience predicts the overall enjoyment of a live, digital, and virtual reality event. In addition to this, there are concert features which can facilitate a more social experience, including mode of presentation, liveness, and perception of presence within a virtual environment. Finally, individual characteristics were also found to influence the social experience.

This thesis was presented in five main chapters, which describe three studies, and contextualised by a general introduction and discussion. The presence of others is generally implied by the presentation of music in concerts, and the enhancement of the social experience one of the ways in which Western art music could evolve, and thus survive.

1

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Appendix 1: Factor loadings from the Confirmatory Factor Analysis.

Factor	Indicator	Estimate	Std. Error	z-value	p	95% Confidence Interval Lower	Upper	Std. Est. (all)
Satisfaction	I was glad to be in the audience	0.57	0.085	6.687	< .001	0.403	0.737	0.59
	It was pleasant to be in the audience	0.777	0.066	11.697	< .001	0.647	0.907	0.81
	Being in the audience gave me a good feeling	0.926	0.059	15.811	< .001	0.811	1.041	0.95
Attention	The audience repeatedly attracted my entire attention	0.636	0.092	6.907	< .001	0.455	0.816	0.62
	I closely watched how the audience behaved	0.723	0.085	8.474	< .001	0.556	0.89	0.71
	I did not really notice the audience	0.698	0.058	11.957	< .001	0.584	0.812	0.69
	I rarely paid attention to the audience	0.733	0.063	11.721	< .001	0.61	0.856	0.73
Self-Definition	I had a lot in common with the average audience member	0.672	0.082	8.173	< .001	0.511	0.833	0.69
	I am similar to the average person in the audience	0.808	0.075	10.793	< .001	0.661	0.954	0.83
	Members of the audience has a lot in common with each other	0.537	0.081	6.595	< .001	0.378	0.697	0.55
	People in the audience are similar to each other	0.615	0.082	7.523	< .001	0.454	0.775	0.61
Solidarity	I felt a bond with the audience	0.738	0.077	9.593	< .001	0.587	0.889	0.76
	I felt solidarity with the audience	0.785	0.071	10.996	< .001	0.645	0.924	0.8
	I felt committed to the audience	0.627	0.085	7.392	< .001	0.46	0.793	0.64
DoP	I can still remember what the audience looked like	0.889	0.055	16.056	< .001	0.781	0.998	0.89
	I have a picture of the audience is still vivid in my mind	0.793	0.067	11.833	< .001	0.662	0.925	0.79
	I formed only a fleeting observation	0.576	0.067	8.641	< .001	0.445	0.706	0.58

Appendix 2: Table showing the factor covariances of the factors extracted from the confirmatory factor analysis.

Factors			Estimate	Std. Error	z-value	p
Depth of Processing	↔	Satisfaction	0.268	0.083	3.228	.001
Depth of Processing	↔	Attention	0.642	0.077	8.314	< .001
Depth of Processing	↔	Self-Definition	0.198	0.1	1.976	.048
Depth of Processing	↔	Solidarity	0.47	0.084	5.582	< .001
Satisfaction	↔	Attention	0.145	0.092	1.576	.115
Satisfaction	↔	Self-Definition	0.46	0.089	5.147	< .001
Satisfaction	↔	Solidarity	0.392	0.087	4.504	< .001
Attention	↔	Self-Definition	-0.048	0.095	-0.504	.614
Attention	↔	Solidarity	0.33	0.091	3.626	< .001
Self-Definition	↔	Solidarity	0.492	0.094	5.226	< .001

Appendix 3: Social Experience of a Concert Scales.

[Statement regarding who is referred to by the term "the audience".] Please rate your agreement with the following statements where 1 = entirely disagree and 5 = agree entirely.

[Satisfaction]

I was glad to be in the audience
It was pleasant to be in the audience
Being in the audience gave me a good feeling

[Attention]

I closely watched how the audience behaved
I did not really notice the audience*
I rarely paid attention to the audience*
The audience repeatedly attracted my attention

[Self-Definition]

I had a lot in common with the average audience member
I am similar to the average person in the audience
Members of the audience had a lot in common with each other
People in the audience were similar to each other

[Solidarity]

I felt a bond with the audience
I felt solidarity with the audience
I felt committed to the audience

[Depth of Processing]

I can still remember what the audience looked like
I still have a vivid picture of the audience in my mind
I formed only a fleeting observation*

* Item to be reverse scored

Appendix 4: English Translation of the PANAVA-KS

Adapted from Schreiber and Jenny (2020)

How do you feel at the moment?

(Pus a cross in each row at the point which best corresponds with your feelings)

	3 – very	**2**	**1**	**0 - undecided**	**1**	**2**	**3 - very**	
Satisfied								Dissatisfied
Full of energy								No energy
Stressed								Relaxed
Tired								Wide awake
Peaceful								Angry
Unhappy								Happy
Listless								Highly motivated
Calm								Nervous
Enthusiastic								Bored
Worried								Free of Worry