Adaptive audience engagement:

A critical exploration of engagement with (VR) art through bodily data

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

This transdisciplinary study introduces a new understanding of the processes of audience engagement with arts and starts with nuancing key concepts in audience studies. The research concentrates primarily on the audience experience of engagement, differentiating it from the facilitation of involvement by artists and arts professionals and the actions of audience development.

The research offers a highly original contribution to methodology in audience studies. Audience studies lack an approach to empirically study the complexity and dynamics of in-the-moment and real-life engagement that could combine analysis of signs of engagement in bodily reactions with audience reflections on their experience and contextual influence of the artworks themselves. The research fills this methodological gap by merging humanities and natural sciences perspectives into a novel analytical framework. I pilot a multilevel mixed design with an exploratory-explanatory focus based on the philosophical approach of critical realism that enables the integration of quantitative and qualitative data. I explore them through a critical narrative, looking for causal mechanisms.

The study introduces the technology of virtual reality and biometric sensors into the humanities analysis. Virtual reality (VR) has a double function – as an environment providing lab-like conditions for data collection (reducing external distractions and increasing the reliability of the study) and as (still perceived as a novel) art form which can attract new audiences. Wristband biometric sensors unobtrusively collect the audience's physiological reactions (heart rate and skin conductance) and illuminate processes of in-the-moment physiological engagement with arts. The research demonstrates that such a study is also feasible within the field of humanities. Yet, there are constraints to replicating such an approach as it requires multidisciplinary knowledge (or a team), IT programming support, and costly equipment.

The thesis explores and compares audience (bodily and reflective) experiences during two VR art projects. They illustrate directed (art in a closed form) and semi-directed (when artwork adapts to audience reactions) engagement. Audience reflections and the virtual reality artistic content provide contextual influences on bodily engagement processes and expose generative mechanisms in action. The data reveal that the data from participants' physiological reactions often support their post-experience assessment of the experience. This indicates that bodily data help to infer internal engagement with specific artistic content, even without participants' cognitive feedback. Yet, post-experience reflection provides salient clues for an understanding of an

engagement. The study concentrates on specific experiences of engagement, but its outcomes offer universal insights.

The literature review and the research analysis strongly indicate that bodily engagement is adaptive. It can take various forms in line with the functions of the art, so the findings support previous theories about artistic content shaping the audience experience. There are different types of engagement stretching between relaxed alertness and high arousal. Experience of engagement is, thus, not a function of the audience but a function of the audience during a specific artistic (and social) context.

The research suggests new directions for arts engagement studies. The findings question a few existing audience studies (and broader) conventions, for example, the claims that affinity with arts is a prerequisite for high-quality engagement or that increased audience agency contributes to deeper and more satisfactory arts engagement. The study also reveals new possible themes for arts audience studies, for instance, the contribution of situational interest to raising more enduring curiosity about the arts and the influence of cognitive bias. The analysis suggests matters for studying audience physiology, which go beyond existing humanities interests. In this way, the research offers several original contributions to the practice of the arts and knowledge across the humanities and natural sciences.

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List of figures and illustrative material

Presentations and solely published work included in this thesis

Presentations on conferences

1. Audience Links Xchange Conference, Stockholm, Sweden
   February 22, 2017
   Participation in the panel: *Audience by Choice*
2. European Capital of Culture Forum, Kaunas, Lithuania
   May 23, 2019
   Keynote speech: *Art & Technology for developing audience engagement.* Available from:
   https://www.youtube.com/watch?v=LVGzWI_IcPg.
3. Audience Research in the Arts Conference, University of Sheffield, UK
   July 4, 2019
   Presentation: *Understanding audience engagement for more effective audience development: insights from physiology and VR user experiences*
4. VR Days Europe, Amsterdam, Netherlands
   November 15, 2019
   Presentation: *XR audiences – can we (finally!) move out of the early adopters' phase?*

Work relating to or drawn from sections of this thesis has been published in the following solely authored publications:

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3. Wlazeł, A. 2022. Źródła i definicje audience development. In: Grenda, M. et al. eds. *Studia Kulturoznawcze Tom tematyczny: Publiczność w centrum uwagi. Dyskusje o audience development*. Poznań: Uniwersytet Adama Mickiewicza, pp.11–21.

Chapter 1
Introduction

The study is built on my more than twenty-five years' long involvement in the arts sector, passion for innovation in the arts and a mission to increase access to, and participation in cultural activities. The study originated from my long-lasting inductive observation and experience as an artist-filmmaker, art events organiser, audience development specialist, cultural policy consultant and audience member. As a photographer and filmmaker, I have a deep understanding of the creative practice and sufficient digital experience. I also have a broad overview of challenges that cultural institutions face with their management, programming, and marketing activities. Therefore, the aims of the PhD are, even if indirectly (as the study was not commissioned), shaped by the needs of the arts sector and subsequently adjusted to the requirements of the academic research.

The study explores audience engagement with art to inform, and better link, audience studies and audience engagement practice in times of digital technology expansions. The PhD divides audience engagement into the audience members' experience of engagement during the art event and acts of engaging the audience, so facilitation of audiences' involvement by the arts sector. The study focuses primarily on the first of the two "acts" above – audience experience of engagement. Specifically, after the literature review presented in chapter 2, I conceptualise the audience experience of engagement as an audience-dependent mix of automatic and reflective, affect-guided, adaptable processes constructed in relation to artwork based on audience members' personal and situational context. In essence: a specific experience of engagement relies on the dynamic interplay of an audience member's mind and body, art, and context of the experience. Both phenomena – actual engagement and its facilitation – coincide, but the understanding of processes of human engagement is indispensable for effective facilitation of arts experiences that might build desire for further attendance at art events. The separation of audience engagement into the audience members' experience of engagement and facilitation of audiences' involvement by the arts sector offers conceptual clarity and supports the development of a human/audience-centred perspective in studies of audience engagement with art.

Studies of audience experience of engagement do not straightforwardly fit in any of the academic audience studies fields (i.e. theatre, film, aesthetics), which lack a methodological approach to empirically study complexity and

dynamics of engagement that include analysis of human mind and body in the moment of an arts experience. Cognitive science informed a broad collection of theoretical, critical and historical studies of audience engagement, for example, in theatre and performance studies (e.g. McConachie, 2008; Kemp & McConachie, 2019) and empirical studies on the edge of academia and applied research (e.g. Redvall, 2017). But empirical approaches to arts audience research with audiences in a live context, which integrate an understanding of audience members' minds, bodies and the context, are scarce. The methodological approach of this study is unique and in contrast to previous empirical work in humanities and social sciences focusing mostly on observation or verbal recollection of an experience, or natural sciences which examine temporal intensities of bodily reactions, but its statistical analysis predominantly standardises and averages the experience. Cognitive neuroscience provides important empirical insights into engagement with art but is not yet able to precisely recognise and label bodily reactions without direct statements from research participants. Qualitative methods contribute to the understanding of the processes of engagement but do not support the reliability and validity of the study. At the moment, holistic, interdisciplinary and humanistic empirical research design that simultaneously provides information about specific experience of engagement and allows for comparisons with results of other studies is missing.

An empirical study of multi-dimensional audience experience of engagement requires building on interdisciplinary knowledge transcending boundaries of humanities and natural sciences. Therefore, I do not "borrow" concepts from other disciplines (which many researchers still declare) but make systematic academic choices on the ground of what is already known in relevant scientific areas. I enter territories of psychology and neuroscience as a humanities researcher, cultural practitioner, and expert in the arts sector that looks at those fields' findings through audience engagement with art-focused lenses. Building on humanities and natural science knowledge and methods, I specifically explore *extrinsic* (externally driven) and *intrinsic* (inner) aspects of audience experience of engaging with art to gain an understanding of the relationship between audience personal context, dynamics of bodily engagement with art and post hoc cognitive reflection about an artistic experience. The PhD is not a study of human cognition or aesthetics that uses arts as a case study. The emphasis is explicitly on how an understanding of the audience experience of engagement may support the facilitation of engagement with arts. I pilot a new multilevel mixed design (Creswell, 2015, p.47) built on knowledge from diverse disciplines but with a humanities focus.

Filling in this conceptual and methodological gap, my research empirically examines cognitive, emotional and bodily engagement of specific audience members experiencing specific artworks in two local contexts: personal (audience dependent) and situational (circumstances of the presentation dependent). My research design seeks to provide information about specific experiences of engagement but also searches for features that allow for some generalisations. That is because knowledge of particulars and specificities is useful for the facilitation of the engagement only if it allows for generalisations. I study audience engagement during technology-augmented art – virtual reality – experienced in the arts institutions' context. I selected virtual reality to diminish external distractions and increase audience immersion in art. Two virtual reality art projects provide insights into different levels of participants' authority over the experience and represent two more general structures of art projects: *directed* and *semi-directed*. The main assumption of the study is that digitally enabled and observed artistic experience generates data that might shed light on people's engagement with arts – in its reflective and remembered aspects but also its immediate, bodily aspects, specifically and more generally. Wearable electronic devices and software (broadly used by cognitive neuroscience) allowed me to capture and analyse bodily aspects of moment-by-moment engagement and enabled a meaningful comparison within and between engagement in two art projects. The main interest of the research is not the technology itself nor a specific art form but rather people and their engagement processes while they experience art. The explanatory-exploratory path selected for this study guides semi-structured experimentation with methods and tools and builds on both qualitative and quantitative approaches to paint a richer, multi-dimensional picture of audience engagement with the arts. Moreover, the study explores audience engagement frameworks incorporating the concerns of multiple stakeholders such as audiences, academic researchers, artists, cultural managers and policymakers. The PhD aims to tackle two issues – the methodological shortcomings of the art audience studies and challenges concerning declining audiences in the traditional art forms.

1.1 The necessity for a new approach

In the past century, arts organisations and cultural policymakers around the world have confronted the challenge of increasing and diversifying audiences. According to Eurostat, about 62% of the EU population reported at least one visit to a cultural institution in 2015, but only about 15–20% visited at least four

times a year[1] (Eurostat, 2021). In England, 76–77% of people attended or participated in artistic activities at least once, and in the season 2018/19, 63% participated three or more times a year (DCMS, 2019). But the two most highly culturally engaged groups, according to Taking Part data, account for only 15% of the general UK population. Unsurprisingly those groups hold higher socio-economic status (Neelands et al., 2015, p.33; Taylor, 2016). Lack of visible improvements in arts attendance might indicate that audience development is not just a marketing problem, although it is, in practice, mostly treated like this. The parallel birth of audience development and marketing's sub-field of arts marketing, the developments of which are attributed to the late 1960s (Morison & Fliehr, 1968; Colbert, 2017, p.1), have contributed to the confusion in the differentiation of both concepts. Marketing (or rather one aspect of marketing – the sale) has strongly influenced understanding of audience development in the arts sector; therefore, arts institutions rarely discuss "how to artistically attract, diversify, or retain the spectators" but focus rather on how to sell more tickets (Walmsley, 2019, p.160). Projects guided by ticket sales become one-off achievements and, in consequence, often lead to a temporary increase in spectators' numbers being successful from a marketing or organisational audience development point of view. However, such projects rarely contribute to a visible and lasting change in spectators' motivation and engagement – which means that from a human-centred perspective they might lead to audience engagement and development failure. In the times when audience development is considered inadequate (Wadeson, 2003; Lynch, 2011; Neelands et al., 2015; Brown, 2017), research of multifaceted engagement processes is gaining importance (Brown & Novak-Leonard, 2013; Edmonds et al., 2014; Walmsley, 2019).

The success in broadening and deepening participation in artistic activities starts with and depends on an understanding of audience behaviour grounded in empirical research (The Wallace Foundation, 2009; Blau, 1990, in Walmsley, 2019). However, scattered within academia, audience studies sits across several different fields – cultural studies, communication studies, museum studies, theatre studies, media studies, musicology, economics, behavioural economics, sociology and psychology. Each of the fields has its own approaches to audiences and research methodologies, so interdisciplinary work is challenging. Numerous overlapping areas of study contribute to the lack of clarity and diminish the progress and usability of academic audience research by the cultural sector increasing the distance between academic and

[1] The data vary across Europe.

applied research. Moreover, widespread conceptual ambiguity of audience-related vocabulary is part of the problem with the audience studies (e.g. Kawashima, 2000, p.10; Walmsley, 2019, pp.8–9). Fluid and evolving definitions of audience development and engagement swinging between marketing tools, management aims and policy priorities, individual relevance and social responsibility, democratisation and economic sustainability cause confusion in the arts practice, cultural policies and academia. They represent conceptual challenges for audience engagement research design that are additionally hard to prioritise: *psychological* challenges – to simultaneously acknowledge the needs of audiences and other stakeholders; *strategic* challenges – of a selection of methodologies (what to prioritise, how to build inter- or transdisciplinary approaches, what to measure/explore and how, and what to do with the data); and *ideological* challenges – of adhering to (or helping to form) policies (with political, ideological and financial changing pressures). There is a demand for intensified bridging disciplines and methodological innovation in academic (Sauter, 2000, pp.26–27; Barker, 2006; Thompson, 2007; Sauter, 2010; Mathieu et al., 2016; Walmsley, 2019; Sedgman, 2019) and applied audience research. Furthermore, a stronger connection between theoretical and applied research that has tactical implications for arts organisations (Brown & Ratzkin, 2011, p.12; Baxter, O'Reilly & Carnegie, 2013; Brown, 2017) has been deemed essential.

Audience engagement with arts in times of rapid technological and social transformations generates additional opportunities and challenges. Since the early 2000s, digital technology dominates the way people communicate, learn, work, relax and experience art. We are living in the age of quantum computing, thinking machines, augmented and virtual reality, the Internet of Things, deep learning, bots and intelligent digital assistants. The DCMS document previously mentioned acknowledges that in Great Britain the internet was used daily or almost daily in 2016 by more than 82% of people, compared with 35% in 2006 (DCMS, 2016). In 1970, Toffler had already predicted "future shocks" for humanity due to overstimulation (and other problems) caused by the use of technology (Toffler, 1970, p.325). Fifty years later, Leonhard (and others) still warn that technology will challenge "the very core of being human – shared values, beliefs and desire for happiness" and adds that "the next 20 years will bring more changes than the previous 300 years" (Leonhard, 2017, no pagination). The job market will dramatically change as almost half of existing jobs are at risk by computerisation within twenty years, as the Oxford economists studying employment have forecast (Livingston, 2017). As jobs will stop giving meaning, purpose, and structure to our everyday lives, values

systems will need to be built/found elsewhere (Livingston, 2017), for example, arts experiences. Another problem lies in the experiential industry (Toffler, 1970; Pine & Gilmore, 1998) and attention economy (Davenport & Beck, 2002; Williams, 2018) with its “commercialisation of sharing” (Bhatt, 2019, xxii), which have monetised our psychological traits and states already for years. They are now better supported by the Semantic Web 3.0, with algorithms that understand and meet user’s needs (Hendler, 2009, in Erragcha & Romdhane, 2012) and successfully manipulate people’s attention on a global scale. Although being offline is becoming fashionable in some social circles (Li & Bernoff, 2011, p.130), this trend will not surmount the digitalisation of people’s lives, especially as 2020’s pandemic drastically boosted the use of the internet and further accelerated digital progress. In the era of digital expansion but also information overload, distraction, manipulation and misinformation (Toffler, 1970; 1991; Crawford, 2015; Williams, 2018), continuation of routine work practices by arts organisations and slow progress in audience research becomes ethically, socially and financially unreasonable.

Before the 2020 pandemic, technology was considered the cause of limiting attendance in live performances and influencing spectators’ attention spans (Thomson, Purcell & Rainie, 2013, p.6). Now, it is mainly understood as an opportunity for engaging in live art, augmented by technology, for those who are not, or are rarely, participating. The overuse of digital technology in audience research may, however, enhance the marketing approach to audiences as just customers, and create a threat of meaningless data overproduction. On the other hand, ethically used technology offers new insights to audiences as people and not just as customers. Technology might, therefore, help the arts sector to respond to its long-lasting challenges. It could contribute to audience development supporting programme relevance, potentially attracting new or infrequent audiences interested in technological innovation, and assist audience engagement by providing knowledge about audiences’ interactions with art. Digital technology has the potential to support both audience development and audience engagement in art.

1.2 Research objective and questions

The research aims to provide a nuanced understanding of the audience experience of engaging with art by investigating a real-life arts engagement and the relationship between personal context, dynamics of bodily engagement, and post hoc cognitive reflection and their consequences for the facilitation of

the involvement in the arts. The thesis answers the following research questions:

1. What can bodily data collected through biometric devices tell us about the audience's physiological engagement with art?
   a/ What similarities and differences can be observed in bodily responses in different modes of engagement in the technology-augmented art projects?
   b/ What similarities and differences can be observed in the engagement trajectories of audiences having different and similar profiles and motivations?
2. What can the relationship between the audience's personal context, dynamics of bodily engagement, and post hoc cognitive reflection reveal about the audience's experience of (VR) art?
3. In what ways might a deeper understanding of the audience experience of engagement with arts support evolving theories and practices related to audience development and audience engagement?

The overarching aims are twofold: first, to inform audience engagement studies, and second, to better link them to audience engagement practice.

1.3 Epistemological concerns

Due to the understanding of audience experience of engagement as linking mind, body, art, and context, this PhD required a philosophical standpoint that could facilitate the integration of knowledge and methods from distinct scientific fields. According to neuroscience, "[b]ody-budget predictions" (predictions of body energy needs) loaded not with logic or reason but with affect, are the main drivers of experience and behaviour (Barrett, 2016, p.93). Core affect defined as "a state of pleasure or displeasure with some degree of arousal" can be considered as a "neurophysiologic barometer of the individual's relationship to an environment at a given point in time, with self-reported feelings as the barometer readings" (Barrett & Bliss-Moreau, 2009, p.172). Therefore, exploration of human experience should include objective data from measurements of physiological responses and needs to take into account the subjective experiences of emotion (Boehner et al., 2007, p.286) and memory (Varey & Kahneman, 1992; Kahneman, 2011). This informs the core of the PhD methodology that explores quantitative data coming from audience members' physiological responses (heart rate and electrical changes in the skin conductance) and movement, as well as qualitative material coming from audience explanatory contribution. In this way, the PhD integrates quantitative

and qualitative empirical material. Consequently, throughout the thesis, an emphasis on complementarity and contiguity of different disciplines' concepts is placed to accentuate not just the challenges but also the benefits and necessity of inter- and transdisciplinarity.

Some methodology experts announced that the quantitative versus qualitative debate was mostly over (also) due to the rise of interdisciplines, such as cultural studies, cognitive sciences and neuroscience (Cooper et al., 2012; Maxwell, 2013; Repko & Szostak, 2017, p.5). But audience studies is still often at the forefront of the positivism versus interpretivism disputes. Yet, no science produces final truth and is entirely objective "since this objectivity is grounded in and validated by subjective methods" (Boehner et al., 2007, p.290; Maxwell, 2013). It depends on the context of the study if verifiable and logical proof of positivism is more appropriate than interpretivism's focus on the unique and subjective. Moreover, research (for example, those mentioned in the last part of the next chapter) has already demonstrated multiple times the importance and added value of the mixed method approach. Even if interpretivism and phenomenology are broadly used in qualitative art audience studies, they are not optimal for the complex exploration of the audience experience of engagement. Phenomenology (focusing on the conscious) and interpretivism (studying subjective meaning) do not offer the means to integrate objective, bodily data representing internal aspects of engagement. On the other hand, positivism's quantitative approach – focusing on absolute, average, and representative – rarely is in a position to consider the individual and relative context of the experience of the arts. I recognise a need to enrich the philosophical and scientific resources and bridge existing gaps (Thompson, 2007). Therefore, the PhD takes a critical realist perspective that does not elevate any of the methodologies but provides a specific framework that helps to integrate different epistemologies (Maxwell, 2013).

A multidisciplinary body of thought, critical realism (Bhaskar, 2008; 2010) places its ontological position in realism stating that the real world, independent of our perceptions, theories and constructions, exists. In audience engagement research this ontological position means that art is real and independent of our mental constructions. Interpretivism and phenomenology's idea of independent "multiple realities" socially constructed by different individuals (or societies) is replaced by a view that there are different valid perspectives on reality (Maxwell, 2012, p.9). Most critical realists consider, however, that mental states and constructs, e.g. meanings and intentions, are part of the real world, even though they are not directly observable. Such a position embracing abstract phenomena as part of the real world is rejected by both logical positivism and

constructivism (Maxwell, 2012, p.8). Still, critical realism represents (a form of) epistemological constructivism and relativism as “our understanding of this world is inevitably a construction from our own perspectives and standpoint” (Maxwell, 2012, p.5). The use of a critical realism perspective in arts experience studies signifies the acknowledgement that artwork is a real phenomenon, independent of our perceptions or constructions, and that different perspectives on that arts experience are valid. Critical realism “assumes that we can have no direct knowledge of the objects of our accounts and thus no independent entity to which to compare these accounts” (Maxwell, 1992, p.283). That does not exclude comparisons but indicates that none of the perspectives on reality can be considered as superior. The recognition of a stable reality of the artwork and diversity of audience experience of this reality offers foundations for a comparison of personal experiences of different audience members with the same work of art. Such an approach allows maintaining the individuality of both audiences and artists, and, importantly for the culture sector, does not threaten artists’ autonomy.

In this PhD, critical realism supports the integration of insights from soft and hard academic disciplines – social, educational, and audience studies as well as psychology, cognitive sciences, and neuroscience, among others. The critical realist worldview supports addressing and explaining events and problems in the most promising, suitable way. It acknowledges benefits coming from interdisciplinarity and inferences obtained through mixed-method studies. The critical realist position allows for studying audience experiences with arts, recognising their variations while acknowledging the steadiness of the artwork itself. Therefore, it may help to unveil similarities in diversity. Such a stance assists the research ambition to support arts practice and cultural policy by shedding light on specific and general engagement. The thesis sees critical realism as a solution for ongoing challenges of arts audience studies, one related to integrating interdisciplinary work and insights and another to interpreting personal and particular in a comparative and transferrable way (Walmsley, 2019, p.229).

1.4 Contribution to the field

The originality of this study lies in a combination of several elements:

(1) the interdisciplinary nature of this audience engagement research that draws knowledge from several fields: predominantly from neuroscience and psychology, but also human-computer interaction, education, film

and media studies, museum studies, aesthetics, cultural policy studies, and arts marketing;

(2) investigating arts experiences as a mind-body phenomenon in context;

(3) the integration of biometric research methods in humanities studies;

(4) the critical comparison of bodily engagement in different experience designs: directed and semi-directed; and

(5) the concentration on emerging know-how and technologies that generate opportunities for establishing an alternative exploration of audience experiences of engagement.

The PhD generates new knowledge through a more nuanced understanding of audience engagement with art linking external and internal – bodily and reflective – aspects. It can stimulate progress in audience studies and build bridges between diverse academic disciplines interested in the subject. The research's contribution to the critical studies of audience arts engagement lies in: conceptual clarification of engagement-related vocabulary and concepts, the emphasis on personal engagement processes framed by artistic and situational context, and a methodological approach integrating qualitative and quantitative methods and supporting transferability. Expanding understanding of audience experience of engagement may influence approaches to facilitation of audience engagement, theories and practice of audience development, arts management, and cultural policy. The study may raise the interest of researchers representing other disciplines in academia in humanities and natural sciences, for example, those using similar tools or looking at the complexity of engagement processes. It may, moreover, contribute to building confidence in the value of mixed and qualitative research methods in academia and the cultural sector. Crucially, the study is deeply audience friendly – the audience, with their reflective and bodily responses to the artworks, is at the centre of the exploration. A multi-dimensional and human-centred understanding of arts engagement may support the growth of (ethical) impact direction in the audience studies. Thus, the PhD has the power to simultaneously influence academic audience studies and arts practice.

1.5 Thesis overview

Chapter 2 serves as a starting point to explore issues requiring clarification and conceptual intricacies to be solved. The complexity of the engagement with art requires (and benefits from) a broader analysis of relevant concepts. Thus, the discussion in the literature review advances throughout the thesis. Such an

approach draws closer connections between the literature and its relevance to the topics explored in each chapter. Chapter 2 presents the research context within and beyond audience studies and frames the experience of engagement. It begins with positioning the research within audience studies and practice, clarifies the main concepts, differentiates audience engagement from audience development, and reflects on the engagement span. The second part of the chapter establishes foundations for studies of the experience of engagement by reviewing knowledge from diverse academic fields, especially neuroscientific research. There then follows an overview of the existing research methodologies, including academic research and applied studies, situating this research between and within the fields of audience studies and neuroscience. The chapter aims to demonstrate that an interdisciplinary approach is required to capture, in studies of audience engagement with art, the interplay between mind-body-context factors.

My methodological approach is operationalised in chapter 3, in which I present the philosophical framework, research methodology, design, and methods. This part comprises a justification of the selection of virtual reality art as a case study with two forms of engagement (directed and semi-directed experiences) that form the fieldwork component of this thesis. The chapter covers the descriptions of the artworks, the context of each case study, and methods for data collection and analysis. An information about ethics and informed consent follow. The chapter offers the information necessary for the interpretation of physiological reactions.

In chapter 4, I present my pilot studies, used as a testing ground for running the analysis that connects the bodily reactions and reflections on the art content. I practise the interpretation of physiological responses to several arts experiences of myself and a small group of participants.

Participants' experiences of two selected VR artworks and a cross-case analysis of directed and semi-directed arts experiences form chapter 5. I discuss, first, individual experiences, which I subsequently compare within and across cases. In chapter 6, the debate advances on a more general level. On that point, I explore the research data and results through previous findings identified in the literature review. I search for the parallels and divergences in engagement experiences of audiences with different and similar characteristics and motivations and the relationship between bodily data, audience profiles, and their post hoc cognitive reflection on an experience of engagement with art.

Chapter 6 includes key findings and their implications for academia and arts practice. It builds an understanding of the experience of engagement in contexts related to academic and arts sector needs and challenges.

The conclusion, chapter 7, summarises the main findings and adds a broader perspective and the consequences of the answers to the research questions for arts practice and audience studies. I reflect upon research challenges and limitations and discuss directions for further research there.

Chapter 2
The research context
– framing the experience of engagement

Chapter 2 presents the research context within and beyond audience studies and frames the audience experience of arts engagement. It begins with positioning the research within historical developments of audience studies and professional practice that enable differentiation of audience engagement from audience development. I clarify both concepts and reflect on the understanding of the audience and the engagement span. In the second part of the chapter, I review knowledge from diverse academic fields to collect information on what is already known about the experience of engagement. I build empirical foundations for my study between and within the fields of audience studies and neuroscience. An overview of the existing research methodologies in academic research from humanities and natural science, as well as applied studies, follows. The chapter demonstrates that an inter- or transdisciplinary approach is more effective in capturing the interplay of mind-body-context factors in studies of audience experience of engagement with arts.

2.1 Positioning the research within audience studies and practice

Although engagement is considered as a relatively recent concept (Barker & Turnbull, 2020) associated with digital communication revolution of the twenty-first century (e.g. Schwartz, 2005 & Stanley, 2005, cited in Carey & Jeffrey, 2006; Conner, 2016), people's engagement with arts and facilitation of this engagement is as old as the arts itself. The facilitation by artists of audiences' active reactions to art can be observed in many historical periods tracking back to antiquity (Bennett, 1997; Roselli, 2011; Conner, 2013). For example, Aristotelian theatre engaged diverse audiences empathically, hoping to trigger sympathy, pity and fear, leading audiences to self-discovery and catharsis (Karapetian, 2019, p.19). The theatre in times of Shakespeare was attended by rich and poor, and considered as incredibly good and engaging entertainment (Whitney, 2019). Audience education, so "improvement" of the public, to appreciate art was visible, for example, in the eighteenth- and nineteenth-century British public galleries (Taylor, 1999, xiii), Russian public theatre (Burgess, 1958) and European music festivals (Musical Times Publications Ltd., 1848; 1881; Benignus, 1852). Theatre artists in Europe sought out a working-class audience performing, in the 1920s, in industrial districts with an intention to stimulate their political actions (Bennett, 1997, p.27), and

performance art has actively engaged (and often provoked) the public since the 1950s. Guided and directed audience engagement with arts has taken place across the centuries and around the globe. Those examples alone indicate the variety of artistic, philosophical, and educational approaches to the facilitation of audience engagement with the arts; and suggest diverse aims of such actions. Our understanding of the audience's experience of engagement with the artworks is, however, still limited.

Rationalised approaches to understanding audiences and their engagement with art emerged in the mid-nineteenth century, the time of professionalisation and institutionalisation of science and art (Musical Times Publications Ltd., 1848; 1881; Benignus, 1852). The industrial revolution and booming economy's demand for skilled labour caused massive relocations of people. Arts institutions and audiences grew in number, and the intense social transformation increased alertness to audience composition, needs and behaviour. Since the beginning of the twentieth century, the number of studies concerning audience experience has grown exponentially in psychology and sociology (often combining knowledge from both fields). In 1915–17, Hugo Münsterberg theorised about film construction and its influence on the psychology of the cinematic spectator (Langdale, 2002). Marston ran physiological experiments on audience emotional reactions to film collaborating with the Universal Pictures in the 1920s (Olenina, 2020, pp.261–277), and sociological research of cinema effects on young people was also done in the United States in the 1930s (Cressey, 1938). At the same time, from 1917 to 1936, numerous Soviet experimental and interdisciplinary research laboratories in cinema, theatre, cultural and educational state institutions led medical, physiological and psychological investigation to ensure, for example, a positive effect of cinema on young people's mental and physical development (Toropova, 2017; 2020, pp.24–25). The aesthetics of the theatre and the processes of reception of performances were experimentally investigated in doctoral theses in the 1950s at the State University of Iowa in America (Morgan, 1951; Clark, 1951; Kretsinger, 1951; Mabie, 1952; Schoenmakers, 1990, p.96). For example, the Meier Audience Response Recorder was used in one of them to determine whether certain spectator variables affected the reception process, which was useful for playwrights "to plan the arrangement of dramatic material so that uninteresting and most interesting periods of a play fall into a pattern which achieves greatest effectiveness in performance" (Mabie, 1952, p.240). At the beginning of the twentieth century researchers began to focus on the audience experience in musical institutions (Parker, 1924, p.229), museums (Gilman, 1916), theatre (Bennett, 1988; Fokht-

Babushkin, 2010), media (see Butsch, 2000; Chaffee, 2000, p.317; Likert, in Napoli, 2011, p.46) and the film industry (Eisenstein, 1957; Fokht-Babushkin, 2013). In line with the social responsibility values of that time, one of the intentions of the researchers' work was to help cultural professionals to understand and design more effective audience experiences. Early-twentieth-century audience studies were considerably interested in the quality of the audience experience of arts.

Now, scattered within academia, audience studies is of interest in several different fields – cultural studies, communication studies, museum studies, theatre studies, media studies, musicology, economics, behavioural economics, sociology, and psychology, as well as neuroscience and studies of human–computer interaction. Each of these areas has its own approaches to audiences and research methodologies, and the outcomes of one specific discipline's analyses are often unnoticed by other academic fields. Across academia, many audience studies have been completed but as unexamined further could not be used to a broader advantage (DiMaggio, Useem & Brown, 1978, i). Audience research studies grew in number but "got stuck at the level of accumulation", as they are considered as not exhibiting clear directions and ambitions (Barker 2006), generally over-rely on theoretical approaches and have not been audience friendly (Freshwater, 2009; Walmsley, 2019, p.5).

Studies of aesthetics, for instance, have not led to an effective understanding of engagement with arts. Empirical aesthetics "has exclusively focused on single elements, without [or rather rarely] embedding those elements in complex, realistic stimuli such as artworks" (Specker et al., 2020, p.3). In a study empirically testing all developed scales of "aesthetic effects" authors used high-resolution digital reproductions of abstract painting presenting it as a whole artwork, as a combination of colours or lines, and single colours or single lines (Specker et al., 2020, p.10). That is because since the eighteenth century there has been a strong conviction that viewers would universally associate an artwork's key forms with specific qualities, e.g. the colour red being associated with warmth and aggressiveness. The study, however, indicated that "in general we cannot assume the universality of aesthetic effects" (Specker et al., 2020, p.10). Even when experts (art history students) and non-experts (psychology students) were compared the only consistent agreement in this study was about the aesthetic features of the whole artwork. But those labelled by authors of the fourteen "aesthetic effect" scales (derived from art literature and empirical aesthetics) as "aesthetic" qualities were actually more universal aspects of effects such as consistent recognition between warm and cold, happy-sad, and heavy-light features (Specker et al., 2020, p.10). Ultimately,

there is no consensus on what aesthetics is. Yet, it is evident that such studies are not limited to arts or even beauty (Pearce et al., 2016). Some empirical aesthetics researchers propose a change of the subject from artistic to hedonic experiences (Skov & Nadal, 2020a, p.630). Others already practise them by studying, for example, the aesthetic interaction of opening a wine bottle with two different corkscrews (Lenz, Hassenzahl & Diefenbach, 2017). The conclusion that traditional aesthetics is not appropriate for contemporary exploration of the experiences and practices of the arts as it does not reflect the dynamic nature of arts experience is not a new issue (Berleant, 1991, pp.3–4). Aesthetics approaches did not fit the aims of my project.

Media and literary studies provide a limited understanding of dynamic processes of engagement with art. Yet, media studies offer insights into the effects of engagement and perceived by the audience, functions of the content. Literary studies add another perspective, the focus on the work of art. Rooted in film effects studies in the 1920s (Lowery & DeFleur, 1988, in Jensen & Rosengren, 1990, p.210), media studies progressed from “relatively simple models of persuasion and prospective attitude change to more sophisticated and layered models as scholars successively address the conditions and contexts of communication effects” (Neuman & Guggenheim, 2011, p.169). The effects of media or film were supposed to be identical regardless of the perceiver, as it was assumed that everyone received and perceived the content in the same way. Widespread disappointment with the results of attempts to measure the effects on people of their exposure to mass media campaigns led to the development of a variety of uses and gratifications theories. That meant a shift from passive to active user experience and acknowledgement that different people might have a different experience of the same content due to differences in their social circumstances, personalities, patterns of past mass media consumption and their effects (Katz, Blumler & Gurevitch, 1974, p.509; Blumler, 1979, p.10). Uses and gratification theories did not deal with the interpretation of media content concentrating on the active user. The acknowledgement of an active role of the perceiver is also visible in Hall’s encoding and decoding theories, which describe the processes of sending and receiving media messages (Hall, 1973). In cultural studies, which Hall represents, the centre of the research lies in the social and cultural practices in which both media and audiences are embedded (Jensen & Rosengren, 1990, p.212). Currently, functional analysis in media studies often connects the effects and uses-gratifications (Blumler, 1979), and cultural studies enrich reception by adding to it the cultural contexts (Jensen & Rosengren, 1990, p.212). On the other hand, in literary studies, interpretative theories of acts of

reading underlined the individuality of reception processes (Bennett, 1997, p. 34). The reception studies emerging from literary studies were interested in "meaning as an inherent quality of the text" (Reinhard, 2007, p.11) rather than the dynamics and influencers of reception processes of specific people in specific experiences. From Freud's work grew the interest in responses of the unconscious mind forming a subjective, or psychoanalytic, approach to the act of reading (Bennett, 1997, p.36, Holland, 2011). That approach underlined the intense individuality and singularity of a literary experience studied through the free associations (Holland, 2011, xi). The individual disciplines within audience studies largely oppose the views of other audience studies sub-fields, which restricts bridge-building in research of different aspects of the same phenomenon. Yet, from an interdisciplinary perspective (i.e. looking at the findings rather than philosophical and methodological differences), each audience studies sub-field (especially, as I demonstrate later, film and museum studies) offers complementary knowledge that supports building pathways towards understanding the engagement phenomenon.

The shift in economy from industrialisation to computerisation caused another radical change in personal and social life of people and the twenty-first century is now being considered (by cyber-optimists) as the "Age of Engagement and Participation" (Stanley, 2005 & Schwartz, 2005, in Carey & Jeffrey 2006). In the media studies (Barker & Turnbull, 2020) and art sector practice (e.g. in the European Commission's 2021 Creative Europe call for proposals) the engagement emerges as a relatively new buzzword. However, in the arts, engagement has often been used as a synonym for attendance (e.g. McCarthy & Jinnett, 2001), participation (e.g. Brown, Novak-Leonard & Gilbride, 2009, p. 15), or explanation of audience development (Maitland, 2000, p.5; Jancovich, 2015, p.9). Widespread conceptual ambiguity of audience-related vocabulary including multiple audience development, enrichment and engagement understandings in the academia, in cultural policy and in the arts sector (Baker 2000, p.3) is part of the problem, as shown in the audience studies of recent decades (i.e., Kawashima, 2000, p.10; Walmsley, 2019, pp.8–9). Before advancing further, two nebulous concepts of audience development and audience engagement, often used as synonyms, require clarification and separation.

2.1.1 Decoding audience development in context

Audience development as a strategic concept has appeared in the arts marketing and public relations practice in the United States in the mid-twentieth

century. The changed scale of industrial production and services required new approaches supporting commercial buying and selling; customer development as a marketing undertaking took priority (Kotler, 1972; Weingarden, 2016), leading to the formulation of marketing and managerial tactics labelled as *audience development*.

Initially, the audience development phrase was used to describe the activities aiming to broaden audience groups for film and theatre. The film industry, for example, used the term in relation to building relationships between movie theatres and students via collaboration with universities at the end of the 1950s (Chamberlin, 1960). The aim of audience development to expand the base of clients is visible in Morison and Fliehr's *In Search of an Audience: How an Audience Was Found for the Tyrone Guthrie Theatre* (1968). The first book describing audience development purposefully omitted artistic quality and programme selection decisions, although the authors were aware of the key influence of these factors on attendance. Their job as public relations and audience development directors "was only to educate an audience to appreciation of [existing artistic] policy" (Morison & Fliehr, 1968). At the same time, starting in 1962, Alvin H. Reiss distributed an arts management newsletter (printed in 1970 as the *Arts Management Handbook*) that included a series of audience development examples of how to attract, measure, and analyse spectators. Reiss also advocated for establishing a role of an "arts-and-society researcher", someone combining knowledge of fine arts and social science to influence social change (Reiss, 1970, pp.165–167). Also, in 1966, the Theatre Communication Group started organising audience development workshops for theatre professionals (Mabry & Zeigler, 1966). All these actions were part of a broader phenomenon, including the birth of the not-for-profit theatre movement in the US (and outside of New York), which was expanding the traditional marketing methodology used by commercial Broadway theatres to build an audience for other repertoires. Two approaches to audience development within the arts sector accompanied audience development theory and actions from the very beginning: first, taking care of building/expanding the audience (or market) for the arts; and second, advocating for social change. Blending organisational and people-centred perspectives in one concept of audience development still confuses both audience theories and practice.

Audience development undoubtedly stimulated discussions in the arts sector, cultural policy and academia about the relationship of arts institutions with their current and potential audiences. Yet, the lack of distinction between two similar concepts of audience development (greatly marketing oriented) and the sub-field of marketing arts marketing to this day confuse cultural practitioners. Arts

marketing and marketing have been considered in the cultural policy literature as the instruments of managerialism, commercialisation and corporatisation of the arts. That is frequently articulated, for example, in Steven Hadley's book (2021) about early audience development policy actions in the United Kingdom. Those views seem to be built on the popular perceptions of marketing or the market rather than on a deep understanding of advancements in marketing theories. In the UK, audience development became a phrase more acceptable for the arts sector due to the perceived lack of economic aims attributed to marketing (Hadley, 2021, p.224). Audience development definitions usually embrace different areas of arts institutions' work in "marketing, commissioning, programming, education, customer care and distribution" (Arts Council England, 2010, p.3). However, audience development and the ways it is applied to this day predominantly rely on marketing.

The number of issues that audience development has had to accommodate extended with the discussion about customers' co-creative acts when "any form of interaction is labelled 'co-creation'" (Walmsley & Franks, 2011). The idea of the primacy of customer experience over the product with activated customers co-creating (Prahalad & Ramaswamy, 2004) or creating (Grönroos, 2011) value through their own experience, well conceptualised in the strategic management field, is elusive in arts marketing academic literature (Walmsley, 2013; Cova & Dalli, 2018). The co-production of goods and services (that customers need) by companies and customers guided by the company's wish for a competitive advantage in innovation does not replace a general managerial focus on "cost, quality, and speed" (Leavy & Moitra, 2006). Those ideas are hard to translate into the context of the arts where the position of the artist-creator is (and should be) strong, the artistic product is ephemeral, and financial resources scarce. Moreover, the interpretation and assessment of created or co-created value are not straightforward. In audience studies and arts practice, the term co-creation is used as both physical action and mental activity. It might, for example, describe customers' participation in (art) design or production (Grönroos, 2011; Brown, Novak-Leonard & Gilbride, 2009, p.15) or acts of consumers' imagination completing the work of art by meaning-making and "'co-production' of artistic value" (Boorsma, 2006, p.76). Proposals to participate in artwork co/creation often appeal only to a niche segment of established risk-takers (Walmsley, 2013). On the other hand, the concept of the creation of value through meaning-making is close to a neuroscientific stance of the brain constructing a human experience, which I explore later. But what audience development practice can learn from the studies of individuals' value creation is still unclear.

Co-creation as subjective meaning-making during an arts experience is associated with ”the philosophical turn to the relational view of art” (Boorsma, 2006, p.76). Such understanding is close to relational aesthetics (Bourriaud, 2002), which also underlines experience (rather than a product). “Relational art” builds on human interactions with the social context rather than on the assertion of art being “an independent and private symbolic space” (Bourriaud, 2002, p.5). Such a position of the contemporary art curator and art critic is understandable. However, an emphasis on the subjectivity of experience and art as “a forever unfinished discursiveness” (Bourriaud, 2002, p.11) constrains opportunities for structured audience engagement research. Relationship marketing, which emerged in the 1980s (Rentschler et al., 2001, p.123), provided another solution, suggesting that companies build loyalty schemes and long-term relationships with customers (Rentschler et al., 2001). In the culture sector, the source of success (and the main challenge) has been putting it into practice and selecting a model of participation (or co-creation) beneficial for the audience and the institution while being in harmony with the artist and artwork and an institutional brand. The concept of *presumption* introduced by Toffler also in the 1980s as an idea of the “do it yourself” economy (Nyirő, Csordás & Horváth, 2011, p.117) in audience studies literature blends production and consumption, also leading to advocacy for co-creation. However, in business, the term *production* encompasses every aspect of a company’s work, including the product’s design (Grönroos, 2011). Designers' rights, and products, are not the primary concern of the business. In the arts, they are. However, an agreement between marketing, educational and programming departments (postulated by most audience development strategies) about who should and how to propose and co-create experiences with the audiences to create value for all the parties concerned is rare. A shift towards a more relational view postulated or even announced by some academic authors has “thus far failed to transcend the product-led approach”, both in the academic field of arts marketing and mainstream arts marketing activity (Walmsley, 2019b, p.37).

Underlining the opposition of product-led strategies (supported by the arguments about artists’ belief in the sacred nature of arts) and audience-centric approaches is not beneficial for the arts sector’s work. Both managerial and philosophical understandings of creation/co-creation of value challenge the role of the artists in the processes of art and experience creation. Yet, which aspects of an audience-centric approach in the arts are better than (which) product-led strategies for long-term audience development has not been demonstrated. Moreover, H. Igor Ansoff, mathematician and creator of strategic

management theories, developed (in 1957) a product/market matrix to help firms to develop strategies to understand the risks of different options (forecasting) and strategically support growth based on the company's mission. Ansoff's matrix refers not to the product or the markets; but product-markets relations (Ansoff, 1957). "Management for growth" does not dictate the economic direction only. If an organisation replaces the word "market" with "current or desired audiences" (which many audience development specialists do), Ansoff's matrix enables them to assess and plan the art audiences' relations and manage risk in planning artistic programmes for diverse social groups. Still advocated, the development of long-term relationships between institutions and audiences is now more difficult due to the statistics indicating that diversity of arts attendance, instead of loyalty, is (currently) the trend (Sharrock, 2016). One could also argue that building a relationship between institutions and audiences is another tricky and vague concept, which would be unnecessary if organisations were empathetic towards audiences. There does not need to be an opposition between the product and the audience. Yet, in recent decades it has not been a prevailing opinion that arts institutions' role is to care about the arts and the audience and develop strategies to build arts–audience and audience–arts relations. There is an opportunity and the need to acknowledge changing audience behaviour and search for new approaches.

In recent decades, the policy area has had the biggest influence on the understanding of audience development. Audience development definitions reflect the funding bodies' expressed objectives, i.e. that public subsidies have to be spent in the most socially, financially and artistically effective way (Gray, in Belfiore, 2012, p.104). The development of strategies that can successfully tackle such diverse expectations and objectives proves to be a challenge for the culture sector. Moreover, a management specialist could easily claim that widely used audience development definitions do not refer directly to audiences but represent a classical "organisational development model" – an interdisciplinary, continuous and systematic process of implementing effective change inside an organisation, encompassing corporate culture, management and operational systems, resource management, product and services, and markets (Flamholtz & Randle, 2009, p.3). Such a managerial approach replaced Arts Council of England's earlier mission of "sustaining and expanding existing or regular audiences or visitors, creating new attenders and participants, and enhancing their enjoyment, understanding, skills and confidence across the art forms" (Rogers, 1998). Nevertheless, cultural policy's audience development definitions function as quite generic but encouragement

for cultural organisations to reflect on all aspects of their work with the audiences.

However, the functional ambiguity (Gray, 2015, p.78), selective use of evidence in policymaking, and routine funding schemes (Jancovich, 2015, p.11) may contribute to a lack of satisfactory audience development outcomes. As functional ambiguity (be it an inherent structural feature or deliberate choice) is widespread in cultural policy in general (Gray, 2015, p.78), it might also contribute to increasing the ambiguity of audience development approaches. This ambiguity gave arts organisations flexibility in their audience development programmes which, from their perspectives, might be welcomed. However, such flexibility might have contributed to the failure of long-term change in arts attendance patterns. Still, there is a doubt if, successful or not, short-term audience development projects, for example, those funded by ACE at the beginning of the 2000s, can be held responsible for the arts attendance statistics twenty years later, as suggested by Hadley (2021, p.228). As there is no clarity about audience development in (not only) funding guidelines, it is not surprising that the vast majority of applicants to the Arts Council funds in the UK define audience participation (and development) as a process of informing the public about the arts offer through marketing and distribution (Jancovich, 2015, p.9). This *informing* approach is insufficient even from the marketing theories point of view. The policymakers might also be partly responsible for the arts sector's resistance to evaluation. Demands from funding bodies and governments drive evaluation mostly towards summative, quantitative and economic modes that might serve external purposes and be subject to different political agendas (Matarasso, 1996; Holden, 2004; Candy, 2014; Jancovich, 2015). Expanding Hadley's observation about cultural policy evaluation (2021, p.235), the question remains open – by what criteria could both audience development and cultural policy be judged a success or failure?

There are also voices that state that the concept of audience development was compromised due to its "fundamental ethical problem" caused by producing change (developing people) without the informed consent of those involved (Matarasso, 1996, pp.5, 24). Development is the process by which someone or something grows or changes and becomes more advanced, so it may, especially in conjunction with the word *audience*, presuppose the presence of a developer (cultural institution or artist) and a developee (an audience member), someone who knows better (the one in power) and someone who is assumed *not* to know. This causes some understandable opposition: "The basic premise of audience development, or access, or community outreach, or whatever we want to call it, is patronising and corrupt. It is predicated on the assumption that

the public has got it wrong" (Dave O'Donnell, cited in Baker, 2000, p.6). Meanwhile, audiences state that they do not need to be "developed" as they have the capacity to engage with art (Pitts & Price, 2019, p.19). Some cultural professionals develop their work to support the audience in self-guided or voluntarily personal development in the art perception and interests. Others advocate for a form of positive nudging as "some changes in the choice architecture could make [people's] lives go better (as judged by their own preferences, not those of some bureaucrat)" (Thaler, 2008, p.10). Still, ethical concerns endure as ambiguity and (tacit) patronising nature of the audience development phrase are not easy to discharge. The widespread lack of differentiation between audience development and engagement negatively impacts the functionality of the concept of audience engagement and my study.

2.1.2 Differentiating audience engagement from audience development

The change of focus in the marketing from audience development to audience engagement since the rise of relationship marketing in the 1980s (Rentschler et al., 2001, p.123) and experience economy in the late 1990s (Pine & Gilmore, 1998) has not led to a clearly defined difference between the two concepts. The views on audience development and the views on audience engagement, both bringing together marketing, education and artistic programming, the former "to broadening the base of audiences and visitors" (Brown & Ratzkin, 2011, p.13); and the latter to expand the impact (Brown & Ratzkin, 2011, p.2) and "enrich lives" (Arts Council England, 2010, p.3) demonstrate little difference in both concepts. Any distinction between audience development concerned with *reach* and audience engagement concerned with individual *impact* has been largely omitted.

The interpretation of audience engagement as "a mission driven commitment to increasing the impact of the artistic experience" (Brown, 2017a, no pagination) places audience engagement within the scope of many audience development definitions and actions as a "deepening strategy for helping people make sense of the art" (Brown, 2017a, no pagination). That formulation mirrors the audience development description by early audience development practitioners in the UK (Rogers, 1998; Maitland, 2000, p.5) and drives both audience engagement and audience development towards audience education. Brown treats audience

engagement as a substitute for “enrichment programming” or “adult education”[2] (Brown, 2017a, no pagination). Association with educational issues might be risky for the engagement as steering towards ethical concerns of audience development mentioned before. Nevertheless, the aims to “reach” and to “impact” could form a base for two directions in arts-related audience development/engagement studies giving clear aims to the dispersed field. Audience development and the reach-related theories and studies of who and who not could primarily stay connected, as Walmsley suggests (Walmsley, 2019, p.227), to sociology and cultural policy studies, while how to find and convince audiences, could be mainly covered by the field of marketing and behavioural economics. Art-related impact of attendance – the how and why of the engagement processes – could be associated more with audience studies based on psychology and neuroscience, pedagogy and humanities studies of an arts experience. This, in fact, can be observed in academia but is not clearly articulated due to the unsatisfactory distinction between, or even interchangeable use of, development and engagement. In general, establishing a clear difference between both approaches appears to be advantageous both for academia and the arts. Audience development and audience engagement require individual attention.

As indicated earlier, the phrase *audience development* was used in the late 1950s by public relations and marketing professionals to describe the activities aiming to broaden and diversify audience groups. Later, since the mid-1990s also in America, the Community Partnerships for Cultural Participation Initiative of the Lila Wallace–Reader’s Digest Fund (currently part of the Wallace Foundation) has been helping art, culture, and other organisations “to broaden, deepen, and diversify” participation in their communities (Walker et al., 1999, p.1). The phrase “to broaden, deepen, and diversify” has been repeatedly used in nearly each audience development definition used by the art sector (e.g. McCarthy & Jinnett, 2001, p.14; Bollo et al., 2017). When audience development is considered inadequate (Wadeson, 2003; Lynch, 2011; Neelands et al., 2015; Brown, 2017), distributing that triple mission between audience development and audience engagement might offer a modification of focus and conceptual clarity.

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[2] In his Audience Involvement Spectrum (Brown, Novak-Leonard & Gilbride, 2009, p.15), presented later, Brown considered audience engagement as the synonym of arts participation. That is a perfect reminder that establishing one universal understanding of the concept, acceptable across time, is rather difficult.

In line with the initial formulation and the views of some contemporary researchers (mostly) from media studies, I consider audience development as actions aiming (for different reasons) to broaden and diversify the organisational audience base. Developing a new approach to audience engagement requires additional consideration that recognises the difference between institutional and human perspectives of the audience experience.

2.1.3 Audience engagement: experience of engagement and facilitation of involvement

The term *audience engagement*, in comparison to *audience development*, in principle, acknowledges the move from passivity to activity, and from people being treated as objects to being perceived as autonomous, sensitive and constructing their own experiences as subjects. However, there is little agreement on what engagement is (Calder, Isaac & Malthouse, 2013, p.1; Brown, 2017a; Walmsley, 2019), both in academia and the arts. The distinction between attendance, participation, involvement and engagement in general is not easy to discern. Operational or psychologically driven interpretations of engagement might be recognised, while some researchers (e.g. Walmsley and Brown, discussed later) try to create a cohesive representation of the construct. From a research perspective, the clarification of the engagement concept is necessary to explore the processes that arts institutions are trying to facilitate. Separating studies of audience engagement during the experience of the artwork from facilitation of involvement is advantageous for art audience studies as it opens avenues to (also) studying the relations between the facilitation of engagement and audiences' experience of engagement.

The art sector focuses on the operational representation of the engagement. For many arts organisations, even a simple act of attendance or the length or frequency of attendance is a satisfactory sign of audience engagement. Academics suggest just the reverse, that "for many audience members, attending an arts event may never become an arts experience because engagement does not occur, either during an event or afterwards" (Conner, 2013, p.37). That is because, for many academics, engagement signifies some type of emotional or affective relationship between an audience member and an arts event and/or arts organisation (Conner, 2013, p.2; Walmsley, 2019). This relationship can be stimulated by providing interpretive assistance in lectures, open rehearsals, guided tours and online fora (Brown & Ratzkin, 2011, pp.2, 18), and audiences' active participation in meaning-making events, for example through participation in pre- and post-event art talks (Conner, 2013). Such activities are also often treated as audience engagement actions.

Those understandings indicate the role of arts institutions in the facilitation of arts involvement. However, some audience encounters with at least some forms of art (for example, dance) are affective rather than interpretative (Reason, 2016, p.84), and the lack of understanding might be unnecessary for enjoyment (Kawashima, 2000, p.70). Therefore, the intellectual form of meaning-making, also facilitated by arts organisations, may have a role but is not a prerequisite for the quality of engagement in arts. Considering attendance and participation in arts, and its supporting events, as an engagement drives its exploration in the culture sector toward quantitative considerations.

On the other hand, engagement has been explored from an audience's perspective (which is the mission of my research). It is perceived as a complex, rich and multi-dimensional phenomenon, that takes place on many levels: physical, social, intellectual, emotional, sensual and spiritual (Walmsley & Franks, 2011, p.5). In the Attention Value Model developed in museum studies, engagement is assumed to be the third level of attention, after captivation and focus (Bitgood, 2010). This level is considered as the most difficult to attain as it involves "deep processing of […] content and sensory, intellectual, or affective immersion" so learning, thinking and feeling (Bitgood, 2010, p.116). Engagement can be understood as an active process of "audiencing", e.g.

> of producing, through lived experience, of their [audiences'] own sense of their social identities and social relations, and of the pleasures that this process gave them (Fiske, 1992, p.353)

or "the work of the spectator […] acts of attention, of affect, of meaning-making, of memory, of community" (Reason & Lindelof, 2016, p.17). Tepper suggests treating "engaging" as a verb, which acknowledges

> that citizens actively connect to art — discovering new meanings, appropriating it for their own purposes, creatively combining different styles and genres, offering their own critique, and, importantly, making and producing art themselves. (Tepper, 2008, p.363).

Marketing scholars Calder, Isaac and Malthouse underline the experiential nature of engagement that differentiates it from involvement and loyalty (2013, p.4). In their view,

> engagement […] arises from experiencing a product in pursuit of a larger personal goal […] [and] reflects the qualitative experience of what consuming the product means for the person. (Calder, Isaac & Malthouse, 2013, p.1).

Experimental psychologists studying engagement with arts appreciate the dual aspects of engagement: one relating to the richness of the experience and another visible in the degree of mental processing that creates that experience

(Richardson et al., 2020, p.6). In the same direction, O'Brien, working in the field of human–computer interaction, defines *user engagement* as a "quality of user experience characterised by the depth of an actor's investment in the interaction; this investment may be defined temporally, emotionally, and/or cognitively" (O'Brien, 2016, p.22)[3]. Those understandings suggest that the personal, artistic and situational context of the experience are important factors forming the audience experience of engagement.

Ben Walmsley and Alan Brown – key experts in audience engagement (the former working in academia and the latter in applied research) have tried to bond organisational and personal perspectives. Walmsley (2019) has considered engagement as part of a (circular) process leading to spiritual and aesthetic enrichment rather than an end goal in itself. It seems that by describing engagement as

> a series of psychological and psychobiological processes that emancipate and empower audiences and generate deep connections by enabling audiences to become an invaluable part of the art-making process (2019, p.231),

Walmsley has tried to connect the personal aspects (cognitive science perspective and aesthetics) with organisational drives (relational marketing and cultural democracy). Walmsley's interpretation suitably underlined the dynamic mental and bodily processes but, in this formulation (not generally), excluded many possible and legitimate audience motivations to engage with the arts. Those might include not only spiritual and aesthetic enrichment, but also, for instance, learning, building social relations, "collaboration and connectivity, civic participation, knowledge transfer, or health behaviour change" (O'Brien & Cairns, 2016, xiii); intellectual stimulation, emotional resonance, and social bonding (Brown & Novak-Leonard, 2013, pp.226–227); and audiences wishing to relax and escape, be emotionally moved, and to discover something new (Brown & Ratzkin, 2012, p.3). This stimulates the question of whether (and how) it is possible to address engagement complexity through research.

The second complex understanding is visible in the *Audience Involvement Spectrum* included in the report of Brown and colleagues (Brown, Novak-Leonard & Gilbride, 2009, p.15). The spectrum aimed to provide "a simple depiction of five overlapping stages of involvement" (Brown, Novak-Leonard & Gilbride, 2009, p.6) and describe various forms of arts participation in which

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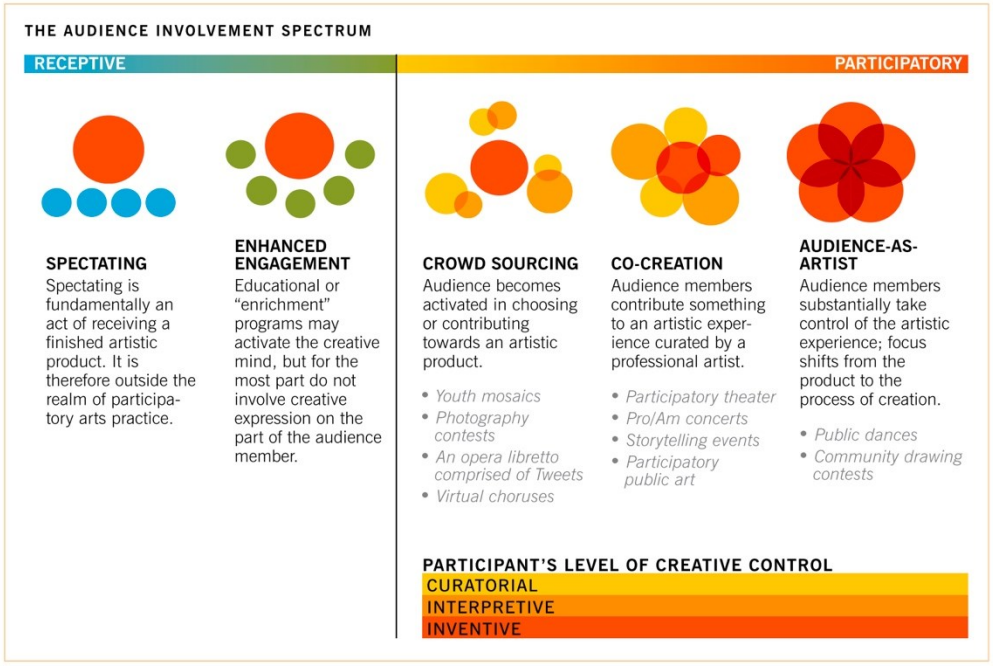
[3] Other user engagement definitions are quoted, e.g. in O'Brien and Cairns, 2016, pp.2–3.

people play an expressive role. The authors treat art engagement as the synonym of arts participation (Brown, Novak-Leonard & Gilbride, 2009, p.5), which might suggest that the participatory part but not the receptive part of the spectrum (which authors added for context) should be treated as describing engagement. At the same time, the authors also recognised emotional and intellectual engagement as part of the arts experience. The report used participation, involvement and engagement as synonyms and lacked a focused or differentiated understanding of the concept of engagement.

Figure 2.1 *Audience Involvement Spectrum* (Brown, Novak-Leonard & Gilbride, 2009, p.15)



Moreover, while the model reviewed "creative control" it provoked a question about audiences' actual level of control over arts institutions' programming decisions. As Sherry R. Arnstein noticed: "There is a critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process" (Arnstein, 1969, p.216). Even if Arnstein's *Ladder of Citizen Participation* cannot rationalise the complex interrelationships between artist and participant (Bishop, 2012, p.279), as Lynne Conner noticed, the Spectrum model "both invite[s] and resist[s] audience sovereignty when it comes to controlling the artistic product" (Conner, 2013, pp.144–145).

Both Walmsley's definition of engagement and the *Audience Involvement Spectrum* demonstrate a conceptual challenge with the notion of co-creation. Their explanations of co-creation embraced either audiences' physical involvement in art production (like in Brown's et al. Spectrum) or audiences'

mental processes, which make people “an invaluable part of the art-making process” (Walmsley, 2019, p.231). This difference may potentially be explained by the researchers’ distinct background: Brown’s pragmatic, and Walmsley’s academic interpretivist perspective. Distinct aims and contexts of those analyses resulted in different conceptualisations of engagement that are not mutually exclusive. The acts of (physical and mental) collaboration in artistic co-creation differ from the acts of (physical and mental) experience of the artwork that remain unchanged. Using the label of co-creation only for audience collaboration in artistic creation would support conceptual clarity. Then, acts of meaning-making would not mean audiences co-create art but that they create the experiences of the artwork. This simple distinction of different forms of engagement brings clarity and guides the development of relevant methodological approaches.

The two clusters of previously cited descriptions indicate that engagement is a bidirectional process. Still, its conceptualisations often “talk past one another” without realising they are concerned with different stages of the processes (Sayer, 1992, p.113). The personal experiences of engagement and institutional facilitation of involvement are interrelated. However, the relations between the facilitation and sensations of engagement are not (yet) sufficiently delineated and explored. In art audience studies, treating audience members’ experiences of engagement separately from or in conjunction with the facilitation of audience involvement offers new paths for exploration.

Clear recognition of the double meaning of audience engagement covering both individual experience of engagement and its facilitation brings to the front one more subject that is rarely attentively looked at – the time frame and span of audience engagement. Two issues cast a shadow on it: one is the ambiguity of the term *audience* (Walmsley, 2019, p.231) and the second is the marketing focus of audience development. However, there is no, and potentially will never be a consensus about what an audience is, what an audience does, and when one starts and stops being an audience member.

2.1.4 Audiences

Although the term *audience* has existed for over 2,000 years it is often unclear who we mean when we are talking about audiences. The diversity of concepts about audiences relates to particular scholarly interests and is caused by the diversity of contexts of audience studies (Mathieu et al., 2016, p.470). The audience has been considered, for example, “Limited, elusive and unstable” (Klaić, 2012), a “loose and vast social formation […] inherently instable,

endlessly shifting, dissonant and elusive" (Tomka, 2016, p.5) or, to give another example, a role that people perform temporarily, producing representations of audiences (Butsch, 2008, p.3). Walmsley wondered also: "How do people transform into an audience and how might they best prepare for this transformation?" (Walmsley, 2019, p.3). Additionally, the interchangeable use of audience and customer influenced and was the effect of a dominance of neoliberalism and economic objectives. This made an audience a commodity in itself (Smythe, 1994, p.207), which has been contested, also by the public (Kotler, Kartajaya & Setiawan, 2017). Also assigning audiences one type of role – for example "to provide resonance and meaning" (Stanislavsky, in Walmsley, 2019, p.3) or being a critic, community, consumer or co-creator (Heim, 2015) – seems to reflect the arts sector's, but not necessarily audiences', perceptions. Considering audiences as autonomous human beings is not always visible in audience studies.

Each audience member has multiple identities (Alasuutari, 1995), and each of these identities has different needs and motivations (Brown & Ratzkin, 2011, p.22). This explains the existence of a variety of audience classification and segmentation models. For example, Brown and Ratzkin defined performing arts and museum audiences on the basis of "their overall appetite for engaging and their preferred methods of engagement" as (1) Readers; (2) Critical Reviewers; (3) Casual Talkers; (4) Technology-based Processors; (5) Insight Seekers; and (6) Active Learners (Brown & Ratzkin, 2011, p.23). Another cultural audience psychographic segmentation by research company Morris Hargreaves McIntyre defined people on the basis of "the deep-seated values and beliefs that frame the way one engages with culture" (2021, no pagination). The company differentiated people into eight *Culture Segments*; audiences: (1) seeking "Stimulation"; (2) happy in own specific cultural "Perspective"; (3) representing the "Essence" – confident and independent, core cultural visitors; or focusing on (4) "Expression" creative and community oriented; or searching (5) "Entertainment" so looking for popular and mainstream fun opportunities; (6) people busy but seeking ambitious "Release"; (7) pursuing "Affirmation" through diligent and cautious choices; or (8) people chasing "Enrichment", seeing present through the past in high-quality content from trusted sources (Morris Hargreaves McIntyre, 2021, no pagination). However, different people on different occasions may choose different ways of engaging or "a given audience member may exhibit the characteristics of more than one typology at a given point in time" (Brown & Ratzkin, 2011, p.23). Those classifications can serve designing marketing tactics. For the study of audience experience of

engagement, those categorisations of multiple identities present a complex challenge.

The oldest, but still the most frequently used in the cultural sector, understanding of the term audience suggests an attentive, receptive but rather passive set of listeners or spectators gathered in a public setting (e.g. Butsch, 2008; McQuail, 2010). Studies of passive audiences and discussions about audiences being active or passive, having agency or no power, have been held in the arts practice and diverse academic audience studies for several decades (Bruner, 1982 & Valsiner, 1998, in Ratner, 2000; Greene, 1995, in Reason, 2013, p.106; Carpentier, 2011; McConachie, 2013; Conner, 2013; Walmsley, 2019, pp.27–29). For example, some considered audiences passive if people just attended an experience directed by someone else (Gibson, 1986, p.282; Pine & Gilmore, 1999). Presently, “the majority of audience researchers […] accept that sitting quietly in a darkened auditorium does not equate to a passive experience” (Walmsley, 2019, p.66). Still, the debates about passive and active audiences are sustained due to, for example, psychological experiments with a passive audience, which examine perception in static (person in a fixed position to restrict the movement) circumstances or “passive reactions” related to unintentional mental processes (e.g. Bargh & Chartrand, 2000). The division between active and passive is not precise in any area of consciousness research. Yet, as I demonstrate later, cognitive insights strongly support the theories of active spectatorship and collapse the notion of passive audiences and disconnected observation (McConachie, 2008).

Audience development practice often forgets that people might engage with the arts not only in the frameworks designed by a specific arts institution. The boundary between arts events’ attenders and non-attenders is not evident and the progression from non-attendance or rejection to frequent attendance should not be seen as a one-way sequence (Kawashima, 2000, pp.72–73; Brown, 2017) or be a reason to depreciate the people. Someone who is considered as a “first-timer” or “Low Frequency Attender” might be a frequent audience member elsewhere (Brown & Ratzkin, 2012) or have a more nomadic participation style, thus preferring novelty to loyalty.

In this thesis, I differentiate the audience from audiences. I consider the audience (in the singular) as a temporary group of people unified by the same arts experience (based on Ogburn & Nimkoff, 1946), while audiences (in the plural) are several groups of people each sharing specific characteristics, divided by the diversity of reception or by social or cultural positioning (Moores, 1993, p.2). However, I study audience members primarily as individuals – with

all the simplicity and complexity it conveys. What is important is, similar to Bordwell, I do not treat the audience member as a particular person or "ideal reader" but as an active entity that takes part in a directed arts experience (Bordwell, 1985, p.30). The empirical understanding of individual and audience (a temporary group of people unified by the same art event) experience may support the comprehension of audiences' (groups of people sharing specific characteristics) experiences.

2.1.5 The arts experience and its timeframe

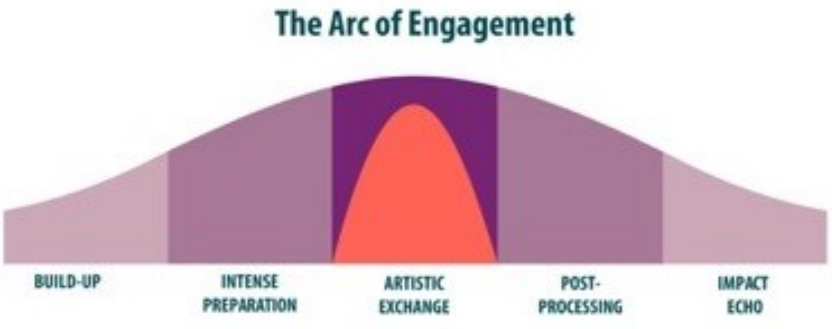
The recognition of when engagement starts and ceases depends on specific research questions and the design of particular studies. Academic research demonstrates varied perspectives, being interested in an art event and/or the extended timeframes of the total experience. In this thesis, the human experience during the art event is explored rather than the *total* customer experience.

The experience economy (Pine & Gilmore, 1998) and marketing concentrate on a broad total experience and pay almost no attention to the involvement in a core, in this case, artistic, event. The experience economy supports the design of memorable experiences and concentrates on just staging experiences' touchpoints to sell products or services better. Also, marketing is looking at the audiences, or rather customers, from an all-inclusive perspective of a broader timeframe that serves executive goals for planning, implementing and evaluating projects and organisation's mostly non-artistic work. It encourages organisations to take into consideration the whole process audiences-customers are going through from decision-making, through the act of attendance, until the post-event processing and memory sharing (Kotler, 1967; Kotler & Scheff, 1997; Brown & Ratzkin, 2011). The memory sharing extends the timeframe exponentially as it can last a lifetime (Barker, 2006; Brown & Ratzkin, 2011, p.7). But in practice, marketing primarily concentrates on trade opportunities, that is, pre-experience leading to the sale transaction phase. Thus, the main reason and main act of the experience is noticed but rarely concentrated upon in the experience economy and marketing actions.

The engagement models specifically developed for the arts sector, even if they also embrace the total experience, put more light on the core act of an arts experience. The timeframe in the *Arc of Engagement* model proposed by Brown and Ratzkin (2011) has included two contextualisation stages – (1) the "build up" and (2) "intense preparation", the apex of the arc – (3) an "artistic exchange" when "the transference of emotion and meaning between the artist

and the public" takes place, and two final stages of meaning-making with (4) "post-processing" and (5) "impact echo" (Brown & Ratzkin, 2011, p.7).

Figure 2.2 *The Arc of Engagement* (Brown & Ratzkin, 2011, p.7).



Another model concerned with online engagement, the *Arts Attendance Journey* by the Australia Council for the Arts, included (1) awareness, (2) research, (3) booking, (4) preparation, (5) at the event, and (6) after the event phases (Brown & Ratzkin, 2011, p.13). These two frameworks covering the total experience that includes the art event may support understanding of the entire journey audiences are taking with the organisation. Describing antecedents and descendants of the experience may help arts institutions to facilitate better audience involvement but still do not say much about the engagement during the act of experiencing the art.

During an arts experience, audience engagement is time bound and structured. It builds on artistic content and structure but relies also on the audience member's dynamic mental and biological processes during the experience. This has been recognised since the 1900s (Berlyne, 1971; Kandel, 2012). Dewey held that "*an*" arts experience has pattern and structure (Dewey, 1980, p.44), but that the practical, emotional, and intellectual factors in an experience cannot be clearly defined and separated from one another as varied parts of an experience are linked (and do not just succeed one another) moving "toward a consummation and close, not merely to cessation in time" (Dewey, 1980, p.55). The continuous and active interplay of the perceptual, material, environmental, formative factors and performative forces contribute to a dynamic unity of experience (Berleant, 1991, pp.3–4). Csíkszentmihályi's theory of optimal experience (1988), or conditions for a state of "flow", and Csíkszentmihályi and Robinson's view on receptive aesthetic experience forming *The Art of Seeing: An Interpretation of the Aesthetic Encounter* (1990) brought back some attention to the features of the experience and influenced many engagement models. Flow was conceptualised as an intrinsically rewarding state of complete focus during an activity, the state without conscious awareness of

oneself and one's surroundings, in which thoughts, feelings, wishes, and actions are in concert (Csíkszentmiháyi & Csíkszentmihályi, 1988; Csíkszentmihályi & Robinson, 1990; Nakamura & Csíkszentmihályi, 2009). Like in Dewey's *Art as Experience* (1934), which differentiated "structured arts experience" from ordinary and shapeless experience (Dewey, 1980), flow could be achieved in an activity having a clear set of goals and progress (Csíkszentmihályi & Robinson, 1990, p.123). Studies of audience engagement rarely discuss time-bound dynamics (Dervin, 1989, p.60) and insufficiently explore factors interacting during complex processes unfolding in time of audience arts experience (Belfiore & Bennett, 2007, p.225).

Yet, for facilitation of engagement, clearly marking engagements' – short- or long-term – span and their interrelations is necessary. The audience experience during a specific art event may be considered a short-term (but encompassing the whole art event) engagement closely linked to the concept of situational interest (Krapp, Hidi & Renninger, 1992; Renninger & Hidi, 2011; Ainley, 2017). The analysis of short-term, temporary engagements with art may support the comprehension of their cumulative role, meaning the development of interest (or interests) and long-term involvement with the arts. In this research, the concentration on the time during the experience of engagement provides a backbone to arrange, group and scaffold cumulated knowledge, providing a clear direction for audience engagement study.

2.2 Basis of audience experience of engagement with art

Audience experience of art is considered a complex issue. It is often believed that a complex problem requires a complex approach and that in a complex system a whole is greater than the sum of its parts. That is because the organisation of the complex system influences the interactions between its parts, and also those interactions impact the system. Dewey assumed that different parts of arts experience have different levels of influence on audiences' engagement (Dewey, 1994), and, potentially, some elements may have no influence. The psychological and aesthetic experiments explore (usually) separated factors of aesthetic activities, suggesting that those parts have a distinct role in the experience. Those studies do not take into consideration the artists' intentions. Artistic means that creators choose often serve a specific purpose. In the artworks in classical form, as Eisenstein explained: "[t]he object of imagery and the law of structure, by which it is represented, can coincide" (1949, p.151). Selected artistic means – for example, the image, the structure, the musical background – usually have the

same aim to make the “sorrowful sorrow”, “joyful joy”, “a marching march” (Eisenstein, 1949, p.151). Even if the artist breaks this pattern, this disruption usually also serves a purpose. The audience engagement processes go beyond the artist’s intentions and are more complex. When describing media audience, Butsch noticed that:

> [a]n audience practice may be at one level resistant and another incorporative, at one level active and another passive, at one private and individual and another public and collective. (Butsch, 2000, p.281).

The inner processes are non-linear and compounded. Yet, science has already demonstrated that the conceptualisation of a complex problem does not need to be intricate. Even if, in principle, there are millions of variables in the world that could influence each other and contribute to our experience, most of the time our mind (and rationality) is bounded and can focus on dealing with only one or a few problems at a time (Simon, 1983, p.20). Yet, which issues are worth exploring in the human experience of engagement with art to support its facilitation is still unclear.

2.2.1 Permanently active audience

Cognitive insights strongly support the theories of active spectatorship (McConachie, 2008). According to neuroscience, the brain of the perceiver is the real architect of the experience (Gallese et al., 2004, p.396; Johnson, 2007, p.388; Barrett, 2016, p.3) and a prediction machine that tries simultaneously to deal with the past, present and the future (e.g. Friston et al., 2009; Clark, 2013; Barrett & Simmons, 2015; Thornton, 2017). The predictive processing theory, which is gaining broad recognition among neuroscientists, explains that our brain is “constantly attempting to match incoming sensory inputs with top-down expectations or predictions” (Clark, 2013, p.1). It is also understood that the environment constantly triggers a reaction in the brain influencing our physiological/bodily responses as cognition nowadays considers the body as playing a crucial role in perceptual processes (Varela, Thompson & Rosch, 2016; Lakoff & Johnson, 1999; Shapiro, 2004, p.225). Everything we perceive through the body is represented by and constructed upon mental concepts (Lakoff & Johnson, 1980; Barsalou, 1983; Barsalou, 1999, in Turner, 2011, p.117; Barrett, 2016, p.3) categorised in our brains in milliseconds continuously, even without any external stimuli (Swanson, 2012, in Barrett, 2016, p.6). Our body and the brain are permanently active.

If humans engage with the outer and/or inner world permanently, it suggests that we also permanently engage while we experience art. The predictive

processing framework (also known as predictive coding) “depicts perception, cognition, and action as profoundly unified and, in important respects, continuous” (Clark, 2013, p.7). As far as our mental activity is concerned, although various types of mental processes are conceptualised, two types – immediate and reflective processing – are broadly recognised (e.g. Sloman, 1996; Öhman, in Lang et al., 1997; Smith & DeCoster, 2000; Wheatley & Wegner, 2001; Kahneman, 2011; Evans & Stanovich, 2013). Our thoughts and actions are routinely guided by intuitive, fast thinking rather than slow, logical reasoning (Kahneman, 2011). The immediate processes do not involve conscious thinking and are quick, automatic, intuitive and affective (processing type, or system 1), while reflective processes are slow, deliberative, cognitive and emotional (processing type/system 2). Even if those two types are largely studied there is a strong consensus that a combination of automatic and controlled mental mechanisms is rather the case (Bargh, 1994; Bargh & Chartrand, 1999; Kahneman, 2011, pp.24–25; Melnikoff & Bargh, 2018). Here, the predictive coding framework fits well as it models the brain’s work comprehensively, combining three processing layers in one framework. The lower – unconscious – level automatically processes simple data (e.g. sensory stimuli, affective signals, motor commands), and two higher levels are more voluntary – higher processes categorisations (e.g. recognition of objects, classification of emotions, or selection of action), and the highest level (agentic or personal) processes mental states (e.g. experience of emotion, conscious goals, planning and reasoning) (Reichl, 2018). All mental and bodily processes, automatic and reflective, constantly support our engagement with art or can lead to temporary or permanent disengagement(s).

2.2.2 Inner drivers of experienced engagement with art

Applying this to an arts context, if we consider people as permanently mentally and bodily active, then disengagement during an arts experience could mean that the engagement continues but has shifted from art to other, outer or inner, issues. This indicates an important role of internally or externally directed attentional processes in the moment of an experience. In audience studies, Greene (1995) and many others treated attention as a rational, conscious and cognitive activity (Lang et al., 1997). Bitgood, studying museum visitors, perceives attention as a “three-stage continuum involving capture, focus, and engagement” (2013, p.12). These represent not only a direction of attention (that can be changed) but also an intensity of attention (that is variable and may also take the form of passive attention) (Dobrynin, in Dormashev, 2010, p.297). In Bitgood’s view, each stage of this continuum – capture, focus,

engagement – is sensitive to a unique combination of variables and motivated by

> the interaction of personal factors (personal value, interest, past experiences; perceptual, cognitive, affective, decision-making processes) and setting factors (social influence, architectural and exhibit design). (Bitgood, 2013, p.17).

Bitgood's views presenting attention as both conscious and nonconscious are, in general, in tune with cognitive perspectives.

The immediate effects of attention are to make us perceive, think, distinguish, and better remember, as well as involve shortened reaction time (James, 1892). Two types of attention are recognised: (1) goal-directed, guided by top-down processes or (2) stimulus-driven, steered by bottom-up processes (Lang et al., 1997; Egeth & Yantis, 1997). Top-down – voluntary or self-directed attention – is constructed on intentions, purposes and the capacity to actively constrain distractions of competing stimuli. Audience goals can be simple or multifaceted; they may include a short-term wish to enjoy or discover something new, or more complex and long-term developmental ambitions. Voluntary attention is susceptible to fatigue as it entails mental effort (recognised already by James in 1892). Bottom-up involuntary attention is a spontaneous and effortless response to sensory or intellectual stimuli driven by interest. There is a growing consensus that attention relies on a dynamic combination of top-down and bottom-up processes (Egeth & Yantis, 1997; Kandel, 2012; Firestone & Scholl, 2015; Nadal & Skov, 2017). Predictive processing framework sees attention's function as the optimisation of prediction's precision where "top-down signals convey predictions and bottom-up signals convey prediction errors" (Seth, 2013). Simply speaking, higher mental and more voluntary (top-down) processes predict actions in the immediate future while the environment (experienced through senses and body, so-called bottom-up processes) causes prediction's confirmation or signal errors when our brain guesses wrongly. When predictions are confirmed, the changes in body energy level are minimal; when predictions are wrong, demand for energy is higher (for example, when we sense/experience something for the first time). The role of attention is to minimise prediction errors and optimally use physiological resources necessary to keep us alive (de Bruin & Michael, 2017; Reichl, 2018; Cepelewicz, 2018). We optimise our energy by shifts of attention and cognitive shortcuts – unconscious and fast intuitive predictions – heuristics and biases (Tversky & Kahneman, 1973; 1974; Kahneman, 2011). They ease the cognitive load of making a decision and might operate (also) while responding to artistic stimuli. Attention relies on a

dynamic combination of top-down/internal and bottom-up/stimulus-driven (Kandel, 2012; Firestone & Scholl, 2015; Nadal & Skov, 2017) processes. The internally driven top-down processes link attention with agentic and personal contexts. Therefore, the analysis of the experience of engagement might benefit from the knowledge of pre-experience motivations and participants' personal contexts. They might help to understand the shifts of bodily energy and examine the interplay of top-down/internally and bottom-up/stimulus-driven processes.

Those personal contexts might refer to conscious issues, for example, interests, goals and motivations, and not always conscious issues, for example, personality traits. The human brain is characterised by neuroplasticity (Hebb, 2002) and adaptability “that chooses behaviours in the light of its goals, and as appropriate to context” (Simon, 1992, p.160). Multiple goals coexist at any moment of time and attention allocation is based on changing internal goals (Deouell & Knight, 2005, p.339). Expressed motivations are important, though, as they affect decision-making processes but also the experience itself as some elements of experience are important and relevant for some goals, but irrelevant for others (Kahneman, 2011, p.387). For example, a customer’s behaviour and needs differ from an audience member’s conduct and desires (Harmeling et al., 2017), even if this is the same person. As an audience, one might express a need for artistic quality or intellectual/emotional stimulation; as a customer, the same person would require value for money and good customer service; and as a human being, the person would require a bench in the museum to rest during the visit. If our multiple identities have at times different needs and motivations, research of experienced engagement (and facilitation of engagement) should potentially include awareness of the multiplicity of audience members’ goals and needs regarding the specific activity.

However, people are not always rational (March, 1978; Kahneman & Tversky, 1979; Simon, 1997) and the reason is mostly unconscious (e.g. Barrett, 2009, Lakoff, 2009; Kahneman, 2011). Bitgood’s museum visitors’ studies support the small-cost theorem, which indicates that “people are more sensitive to cost (time, effort) than utility” (Bitgood, 2013, p.64). That finding is in tune with Kahneman and Tversky’s prospect theory: under conditions of uncertainty or risk (which experience of art might be seen as by less frequent attenders), people tend to think in terms of expected gain or loss comparing to a reference point (e.g. current wealth or psychological state) rather than absolute outcomes like in the utility theory in economics (Kahneman & Tversky, 1979). People are loss averse and, if the results of an action are uncertain, prefer to lose less than

gain more. They will “choose a low-cost alternative that may have a lower benefit over a higher-cost alternative with a higher benefit” (Bitgood, 2013, p.70). It also means that while making choices people might compare/predict not the deferred gains (e.g., as described by Bourdieu, social aspirations to climb up the social class or lifestyle ladder) but first the effort predicted for taking the action. For example, if an audience member is at home at the moment of a decision to attend or not an artistic event, the comparison may be made between a prospect of a relaxing evening at home and a level of risk, or fatigue, associated with the arts experience. The anticipated effort related to engagement concerning an event may play a role in the decision-making process. On the other hand, according to O’Brien (O’Brien, 2008; O’Brien & Toms, 2008), the level of mental effort of, for example, attention, intellectual and emotional engagement during the event also contributes to the post-experience assessment of the experience. Those theories and findings are in tune with predictive coding, which sees internal resources/energy use optimisation as a default body and the brain’s function (Friston, 2009; Friston et al., 2009; Thornton, 2017). All costs including “the cost of paying attention should be as small as possible” (Bitgood, 2013, p.64). Even though rationality (especially in its understanding by economics) is commonly assumed to guide the behaviour of individuals, it has been demonstrated that humans are not always prudent and logical in their decision-making (March, 1978). That is also because people do not always aim to increase their pleasure or profit (Kahneman & Tversky, 1979) and do not always have all the necessary information and capacities to make an optimal (for them in the specific context) decision (Simon, 1997). This latter aspect refers to Simon’s models of bounded rationality, which sees decision-making not as strategies leading to maximal utility but to satisfactory outcomes. Bounded rationality acknowledges “the limits of human cognitive capacity for discovering alternatives, computing their consequences under certainty or uncertainty, and making comparisons among them” (Simon, 1997, p.68).

What audience members pay attention to might signal past experiences as attention and memory are interdependent (Chun & Turk-Browne, 2007). Affective feelings (in a range from pleasure to displeasure) and their strength, the *arousal* (fluctuating between calmness and agitation), represent the state of the body. Personal appraisal of those feelings and the interpretation of their strength builds on past experiences. That memory-influenced appraisal is of the essence, as according to Kahneman and predictive coding framework, the decision-making power rests on the remembering self and not the experiencing self (Kahneman, 2011). But, to be useful, memory has to be recalled through

the presence of appropriate reminders (Kandel, 2008, p.218). Access to the information stored in audiences' memory is triggered by clues provided by the situation and/or its context (Simon, 1992; Barrett & Bar, 2009; Kahneman, 2011, p.14). The cues can activate memories of past experiences within the same setting or similar experiences in another domain (Maxwell, 2004, p.253). That directly leads to processes and impacts of learning on memory. Neuroscience with the help of molecular biology realised (in the 1990s) that there are separate processes for initiation and maintenance of memory (Kandel, 2008, p.270). It is assumed thus that changes in body physiology might be associated with the consequences of audiences' personal context and top-down processes marking salience (personal relevance) and awareness (attention and understanding) (Chater et al., 2018, p.816) during the bottom-up experience of external artistic stimuli.

2.2.3 Bodily engagement – signs of engagement in physiology

Everything in the human body fluctuates in response to changing situational demands, and the brain must constantly balance and integrate internal and external signals (Andreassi, 2000; Barrett & Bar, 2009). Perception through senses (so exteroceptive processing) of external and detailed information of, for instance, contrasts, colours, textures, etc., continuously builds on our knowledge and past experiences (Barrett & Bar, 2009; Kahneman, 2011). The sensory intake is modulated (in the early stage of perception) by attention, expectations, working memory, long-term memory, and context (Nadal & Skov, 2017). Also, interoception – the "sensory cues from the body that represent the object's value in a particular context" (Barrett & Bar, 2009) – regulates the body's energy budget and guides affective predictions of the brain. As far as internal processing is concerned, continuous interoception infused with affect is considered more influential than perception through the senses (Barrett & Bar, 2009; Barrett, 2017, p.79). The general function of physiology – the maintenance of the bodily energy budget (continually influenced by internal and external factors) through balancing between low- and high-cost reactions – is also in operation during the artistic experience.

The analysis of physiological changes in the body relative to an external stimulus/event involves examining two additive processes: slow changes of a tonic level and short, spontaneous, phasic fluctuations. They correspond with the general functions of physiology – low-cost permanent monitoring of the environment and high-cost rapid reorientation, e.g. to salient, emotional events. Those two aspects of exogenous, stimulus-driven attention are essential for

survival (Carretié, 2014, p.1228). The mobilised physiological resources serve the regulation and coordination of responses to psychological stimuli (Andreassi, 2000). The (state of) preparedness for the action, the body activation, or arousal before and during the experience should be visible in physiology. Some researchers consider arousal as visible in electrical responses of the skin – EDA (Latulipe et al., 2011; Peräkylä et al., 2015). Others see it in both increased EDA and heart rate (Hopkins & Fletcher, 1994; Lang, 1994; Richardson et al., 2018; Voutilainen et al., 2018; Richardson et al., 2020). However, there is no agreement on which physiological reactions confirm arousal.

Physiology is modulated by several facets, such as individual characteristics and state, or/and the affective nature of the stimulus. It can have various consequences. How we feel (so: affect) shapes our visual experience and directs action in the immediate future (Barrett & Bar, 2009, p.1331; Kahneman, 2011, p.81; Barrett, 2017, pp.71–73). The spontaneous and highly emotional response to a stimulus can be resisted, as “attention can be moved away from an unwanted focus, primarily by focusing intently on another target” (Kahneman, 2011, p.23). Research has shown that positive motivation and affect relate to cognitive narrowing (Gable & Harmon-Jones, 2010; Threadgill & Gable, 2019). Emotions can significantly change the message as sometimes it is not important what is said, but how it is said (Sebe, Cohen & Huang, 2004). That may apply not only to stressful situations but also to art features. Carretié’s scoping review of fifty-five experiments indicated that emotional stimuli produced a significantly greater (magnitude of) physiological change than neutral stimuli (Carretié, 2014). The affective load of the content enhances prospects for detecting and interpreting general (tonic) levels and big and fast (phasic) changes in physiology both representing the affective state. Those are necessary for an understanding of temporal dynamics of physiological responses to the artworks.

2.2.4 Art as the driver of experience of engagement

During an artistic experience, the external stimulation comes mainly from the artwork through its expressive, formal-compositional, aesthetic, and cognitive content, which is “intentionally designed to trigger a range of affective, perceptual, and semantic responses” (Seeley, 2015, p.25). Artistic content and form influence engagement as art “frequently insist on experiences of engagement by provoking us into movement or action or by forcing us to adjust our vision and imagination” (Berleant, 1991, p.15). Generalising about audience

experience without considering the structure and characteristics of the artwork often leads to inaccurate conclusions (Schoenmakers & Tulloch, 2004, p.19). While this is still common practice, in this study, the expressive, formal-compositional aspects and content of the artworks are considered salient factors of the audience experience, influential drivers of attention, and the prominent (but not sole) cause of audiences' cognitive, emotional and bodily engagement. The artwork is an important aspect of analysis as it is frequently demonstrated that the pattern of psychophysiological responses varies with stimulus properties (Lacey, 1967, in Boucsein & Backs, 2008, p.35). Artistic (experience) gives the structure to personal engagement processes.

Engagement processes are dynamic and, to a different degree, directed in both structured-traditional and open-ended contemporary artworks. The experience of conventional art builds on coherent, tried and tested patterns of composition, internal coherence of narration, canons of beauty, dramatic structures and storytelling. Here, the involvement of the audience is guided and orchestrated so the experience can be coherent, possibly directed into the flow, and leading to the outcomes that were intended by the artist (Hirschman & Holbrook, 1982, p.98; Cubitt, 1998, p.141). Contemporary arts, on the other hand, often use chaos, open models of interaction and open outcome (Cubitt, 1998, p.143; Bourriaud, 2002), and often consist of "unplanned or physically incomplete structural units" (Eco, 1962, in Kwastek, 2013, p.52). If the experience of art has structure, then, according to Matarasso, it is possible to set standards for its delivery and to measure its outcomes (Matarasso, 1996, p.24). Scientific realists would add that in such situations it is also possible to replicate the outcomes (Tilley, 1993). Then, researching directed audience engagement would be relatively simple, as it would be assumed to be linked to artistic processes and experience goals set by the artists. However, such an approach omits other variables impacting the experiences of engagement with arts.

There is a wide diversity of arts experience configurations, and arts experience design can support continuity or diversions in audience engagement. Based on Aristotle's *Poetics* and Shakespearean drama, Freytag described a dramatic structure in five acts (Freytag, 1900), Syd developed a three-act structure for a feature film (Syd, 2005) and Daniel divided those acts into sequences that each can be viewed as a "mini-movie" (Gulino, 2004). Those structures are predominantly aimed at directing the audience's emotional involvement. Busselle and Bilandzic working in media and communication studies identified several causes of distraction in narrative engagement. Some, such as flaws in the plot, lack of coherent and plausible narrative realism, or inconsistent character's behaviour, as well as breaking familiar genre conventions, might be

generally associated with the text (Busselle & Bilandzic, 2009, p.326) but also other narration-based artworks. Those aspects relate to structural aspects of experience. But audience studies rarely empirically explore the audience experiences as dynamic processes or discuss varying modes, intensities, and levels of experienced engagements, which may occur spontaneously or directed in structured experiences. Models of engagement developed in the field of human-computer interaction (HCI) address some aspects of the dynamics of arts engagement.

2.2.5 The models of experienced engagement

Several engagement models developed for interactive digital art are also relevant for general art engagement studies. They discuss, looking at an artwork from the audience's perspective, the structure of the artistic encounter. The term *engagement* essentially encompasses a broader range of aspects of the artistic experience than *interaction*, another term with multiple meanings.

Researchers working in the field of HCI differentiate interaction from engagement, using the term interactive about an object and its properties; and engagement as the activeness (not just physical) of the person. Interaction, in contemporary performance studies, is used, for example, as social participation or dialogical interactivity (Fenemore, 2017, p.39):

> Dialogically […] all art is interactive – the artwork exists somehow between 'object' (in its widest sense) and 'viewer/experiencer', so that an object might exist but its value doesn't, except in that it is viewed and on viewing alters. (Fenemore, 2017, p.38).

Such a position is hard to operationalise for studies and the facilitation of audience engagement. It concentrates on the value and space between two objects and not on the subject(s) of the dialogue. Engagement, as the activeness of the person, different from interaction, may cover actions that do not have to be reciprocal, so (also) those in which the audience does not physically change the artwork but co-creates its own experience of it. It does not negate the value of "dialogical interactivity" but does not discuss or contest the value of the artwork and the audience.

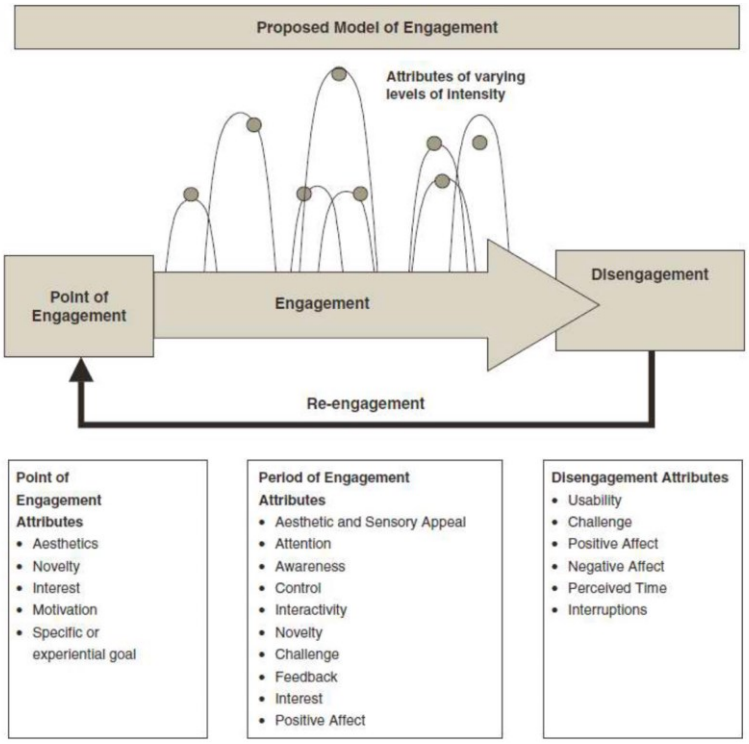
Several models of interaction that also look at engagement from a human perspective were developed in HCI. Bilda (2008) has recognised four interaction stages of the engagement process with interactive systems: (1) adaptation, overlapping with (2) anticipation and (3) learning, followed by (4) deeper understanding (Bilda, 2011; Edmonds et al., 2014, p.19). Artistic practitioners Loke and Poonkhin Khut (2014), designing audience experience

with Live Art (mediated by digital technologies), have developed the Facilitated Interaction Framework exploring “the interactions between physiological processes, bodily sensation and subjectivity” (Loke & Poonkhin Khut, 2014, p.93). They have recognised four stages of experience and participation in aesthetic experience in which facilitation by artists and witnessing by others are integral components: entry phases of (1) “welcoming” and (2) “fitting and induction”; (3) the core experience of “the ride”; and the final (4) exit stage of “debriefing”: reflection-on-experience, and “documentation”: the contribution of experiential artefacts (Loke & Poonkhin Khut, 2014, p.93). The model embraces not just the core but also activities that directly precede and immediately follow an experience, still related to the core part of an experience. Its last phase creates additional layers of audience engagement with art giving participants a space for reflection “on the internal world of felt experience” and opening “the transformative possibilities offered within facilitated aesthetic experiences” (Loke & Poonkhin Khut, 2014, p.93). This framework was inspired by the interaction-centred framework by Forlizzi and Battarbee (2004) and by the interactional trajectories (“a journey through a user experience”) of Benford and colleagues (Benford et al., 2009). In those frameworks, interactivity and collaboration within user experience are orchestrated according to dramaturgy and drama structure. Benford’s framework has also inspired the creation of a six-stage local trajectory for an Acropolis Museum experience, aiming to alleviate the storytelling and flow of the visit. This trajectory includes stages of (1) Connect (to Plot), (2) Approach, (3) Engage, (4) Experience, (5) Disengage, (6) (Re-) Connect (to Plot) (Roussou & Katifori, 2018, p.28). Hybrid interactive user experiences conceptualised by mentioned authors link life with digital and combine four facets of the experience: space, time, roles, and interfaces (Benford et al., 2011, p.11). The multi-dimensional formula might also be useful for other arts engagement models.

Also, in HCI, O’Brien and Toms have conceived a comprehensive behavioural Model of User Engagement that presents components of user engagement as well as its holistic representation (O’Brien & Toms, 2008, pp.957–958; O’Brien & MacLean, 2009, p.2; O’Brien, 2016b, p.14). Although unique, the model shares attributes of concepts such as “flow”, aesthetic experience, play, and information interaction. Researchers have described different stages of engagement comprising (1) a point of engagement – often triggered when something resonated with participants' interests, motivation or aesthetic appeal; (2) sustained engagement – marked by participants' attention and interest maintained in the interaction, for example, by novelty, adequate challenge or perceived control; (3) disengagement – caused by internal decision (i.e. lost

interest or social pressure) or external factors (i.e. being interrupted or because of having usability issues); and, potentially, (4) re-engagement – often caused by positive past experiences (O'Brien & Toms, 2008, pp.948–951).

Figure 2.3 O'Brien & Toms: Model of Engagement (2008, pp.957–958)



O'Brien and Toms's model demonstrates a great complexity of engagement processes with their affective, behavioural, and cognitive aspects. The rising and falling attributes communicate different intensities during an engagement episode (O'Brien, 2008; O'Brien & Toms, 2008). O'Brien considers them a natural part of the interaction trajectory and believes that their intensity contributes to users' overall evaluation of the experience. The model demonstrates what Csíkszentmihályi himself clarified: "the experience of flow is on a continuum between almost imperceptible microflow events, and the truly memorable occasions of deep flow" (Csíkszentmihályi, 1992, p.183).

Interactive art models usefully underline that attributes of art that initiate engagement may differ from those required to sustain it and those that lead to re-engagement (Bilda, 2011; Edmonds, 2011, p.455; Bengler & Bryan-Kinns, 2015; O'Brien, 2016b, p.19). Bilda divided participants' demonstrated engagement into three levels: immediate, sustained, and creative (Bilda, 2011; Candy, 2014, p.42). Design of experience in interactive art striving towards obtaining audience "immediate engagement" requires capturing instant attention and a good balance between challenging and easy-going tasks. Design for "sustained engagement" needs to excite curiosity and be accessible

to the general audience. To evoke “creative engagement”, design should, for example, include unexpected changes in an experience to keep renewing audience involvement (Candy, 2014, p.42). The difference between issues *capturing* and *sustaining* attention has also been identified in the psychology of learning and museum studies. Dewey has discussed issues related to catching and holding learners’ attention (Dewey, 1913, in Rotgans & Schmidt, 2017), and museum studies have recognised exhibits and exhibitions’ “attraction power” (or “attractors”) and “holding power” (“sustainers”) (Bitgood, 1989; Bollo & Dal Pozzolo, 2005). In those studies, catching and sustaining engagement refers to different actions. Bilda’s conceptualisation of three – immediate, sustained and creative – levels may refer to the “build up” of an engagement of one person. Yet, engagements might differ, so passing through those three phases might be unnecessary for a satisfactory experience.

2.2.6 Diversity or similarity of processes?

The diversity or similarity of processes of engagement with art have rarely been systematically approached by audience studies. Dewey has believed that *an* experience has pattern and structure and, therefore, common patterns could be found in various experiences (Dewey, 1980, p.44):

> experiencing like breathing is a rhythm of intakings and outgivings. Their succession is punctuated and made a rhythm by the existence of intervals, periods in which one phase is ceasing and the other is inchoate and preparing. (Dewey, 1980, p.56).

On the other hand, Sedgman considers audience experiences of performances as fascinating, but individualised and messy (Sedgman, 2016). However, many disciplines (not only) within the realm of natural sciences would only partially (conditionally) agree.

The sense-making approach in communication studies does not consider human actions as capricious or their variation as cacophonous. In Bordwell’s “active viewer” hypothesis, the film viewer makes causal inferences based on narrative cues (Bordwell, 1985; Kovács & Papp-Zipernovszky, 2019). Inferential mental activity of the audience during classical narrative having a strong causal structure and non-classical narrative with episodic structure differs (Kovács & Papp-Zipernovszky, 2019, p.27). But inferential mental activity of different audience members experiencing the same classical in form film narrative is highly similar. This is similar but not identical, as occasionally viewers’ individual mental processes might take a leading role, and this may also have a further impact on their mental construction of the narrative (Kovács & Papp-Zipernovszky, 2019, p.27). An interpretative analysis of audience reception and

Hall's theories on the active process of sending and receiving media messages, the encoding and decoding actions, also underlined often unpredictable role of a receiver (Hall, 1973). However, when transcribed to the arts context (cautiously, as art is not just about the message), Hall's categories of codes – dominant, professional, negotiated and/or oppositional (Hall, 1973, pp.16–17) – can be associated with social-historical familiarity, knowledge of art codes and principles of storytelling, which indicate that we actually can predict some of the audience's understandings.

Audiences, due to factors driven by evolution, culture, education, or socially driven learning in infancy, may have similar understandings of some concepts and the experience. It is assumed that some artistic stimuli might leave "little room for truly individual aspects of subjective aesthetic experience to emerge" (Vessel, Starr & Rubin, 2012, p.1). Also, neuroscientific studies of empathy/simulation provide empirical evidence that the arts experience is not an individual and totally unique act of each spectator (e.g. Zimmermann & Richardson, 2018). At least some similarities in (also psychophysiological) engagement paths across participants are likely to be observed (e.g. Vessel, Starr & Rubin, 2012). But individuals are constructing, creating, and sometimes repeating "communicatings" upon unique and constantly evolving conditions of human states in a specific moment in time and space (Dervin, 1989, p.65). Fundamentally, "[v]ariation and commonality exist simultaneously; they may reflect different aspects or levels of a complex reality" (Höijer, 2008, p.288).

Similarities or regularities of engagement processes must be demonstrated rather than assumed, though. Sedgman's statement exposes challenges within audience studies methodologies in this regard. Audience studies have difficulty with the analysis of processes in dynamic conditions and lack a basis for developing comparative theory (Dervin, 1989, pp.60–61). The experience of engagement can have similarities due to cultural or professional codes used by the artists and recognisable by the audience, and due to some aspects of environmental conditions during the specific experience. The differences in the experience of engagement may be mostly related to the audience's characteristics or personal context. The challenge remains in identifying facts, differences and similarities that matter (more) in the facilitation of engagement from those that do not. This study assumes that if audiences are active entities taking part in a directed (to a different degree) artistic experience (Bordwell, 1985, p.30), then comparisons of different people's experiences with the same art project can reveal variances in those experiences. Still, processes of individual engagement can also be influenced by a specific to the situation context.

2.2.7 Context of the engagement

If audience experience is a “whole brain-body phenomena in context” (Barrett, 2016, p.16), then the context of an experience becomes a component of the study. In an arts experience study, the most important context is the art itself, while situational context fused with personal context – individual attitudes, such as specific art interests – influence aesthetic experiences (Gartus & Leder, 2014). Personal context – or, rather, contexts – influences attendance decision-making processes and the audience experience of engagement. Marketing audience segmentation frameworks collect (objective) socio-demographic data as well as information, for example, about people’s “attitudes, lifestyles, leisure behaviour, motivations, and specific program interests” (McCarthy & Jinnett, 2001, pp.53–54). But personal context – audience interests, previous experience, psychological characteristics, and pre-experience state (mood) – are not objective qualities or permanent states. As engagement during an art event is a process, the situational and (some aspects of) personal context may influence the decision about participation and the initial phase of the experience. Yet, they may lose their prominence during the experience. That suggests that the context is not a stable but a fluid state. Several other approaches to context, objective and subjective, offer insights into factors influencing arts engagement.

Pragmatics-driven communication studies (examining language and communication adapted to social situations) do not treat contextual properties as external or “objective”, but as personally relevant “participant construct” (Widdowson, 2004 & van Dijk, 2006, in Mathieu, 2012, p.75). Pragmatics has recognised cognitive, linguistics, social and cultural dimensions of context as dynamically and permanently constructed (e.g. during the conversation) “being the object of constant revision and adjustments by participants” (Mathieu, 2012, p.75). Linguistic pragmatics have conceptualised context as accommodating both a structure and a process (Verschueren, 1999, in Mathieu 2012, p.75). Thus, the personal context (usually declared by the audience) depends on people's understanding and appraisal of themselves, in general, and in the moment of the experience. If we acknowledge that audiences create meanings related to a specific work of art, we need to accept that they also construct meanings regarding themselves. Brown and Novak's research indicated that high levels of personal context, named by them “readiness to receive” (built on three constructs: context, relevance, and anticipation), are not proven to cause higher levels of impact, due to variability in the quality of the performance. Yet, they have suggested a positive correlation between personal context and the impact of the experience (Brown & Novak, 2007, p.10).

Researchers in the fields of empirical aesthetics and psychology of aesthetics often study specific aspects of framing contexts (Leder & Pelowski, 2021). Several studies have indicated that the situational context of a presentation matters, for example, appreciation of the artwork increases if it was presented in a museum rather than a laboratory (Grüner, Specker & Leder, 2019) and in a cinema rather than at home (Fröber & Thomaschke, 2019). Viewing times of artwork were significantly longer in the museum than in the public space context (Gartus, Klemer & Leder, 2015). There have been experimentations with effects on the aesthetic preference of the preceding context in the form of other artworks (Mullennix, Kristo & Robinet, 2018), and visitors' physiological responses being influenced by changes in an exhibition design in a museum (Tschacher et al., 2012; Tröndle & Tschacher, 2012). Those studies confirmed that exhibition design matters and the location within the exhibition could affect the mental processing of adjacent artworks, producing context effects on arts appreciation (Mullennix, Kristo & Robinet, 2018). Also, Akpan and colleagues experimenting with ten variances of spatial and social properties of a presentation of an interactive installation indicated "that place trumps space" (Akpan et al., 2013, p.2213). Researchers found that a conducive social context can overcome a poor physical space and encourage interaction. On the contrary, an inappropriate social context could repress visitors' interaction in rooms usually supporting engagement. Another framing effect was associated with the knowledge of the title of an artwork, which increased the time of viewing and participants' liking of the paintings (Bubić, Sušac & Palmović, 2017). Presentation and social context influence processes of engagement.

Experimental psychology, cognitive science and quantitative research consider context as an objective influence on the issue studied or unwelcome source of variation (Greene, 2012, p.760). In psychophysiological experiments context relates mostly to experimental conditions which can also be considered as framing effects. In physiological experiments, circadian rhythm (optimising our body's processes through our internal clocks) and participants' pre-experiment behaviour (coffee or alcohol drinking, climbing stars, or lack of sleep) is recognised and examined to exclude their impact on the experimental conditions. The influence of the framing effect has to be considered during data analysis as it might impact the generalisation of the findings.

The context is a paramount issue for comparison of the results with other investigations. Specific historical, political, and societal contexts restrict comparison, but not in my research, as experiences happened concurrently in the same cultural context. If a study of audience art engagement considers the art and situational contexts equal, then the personal context of each audience

member becomes the crucial variable. Some researchers have assumed that experimental results obtained in a particular local context negatively impact generalisations beyond that context (Shadish, Cook & Campbell, 2002, p.341). Yet, Maxwell has noted that (usually) little attention is paid to how "the process that resulted in the experimental result in that specific context operate in different contexts" (Maxwell, 2020, p.10). The generalisation about circumstances of arts engagement can build on an inquiry – what arts engagement of people with specific personal contexts can say about the engagement of different people with similar and different (and in what way different) contexts. Also, which individual factors are relevant for studies of short-term engagement with arts is yet unclear. Aspects of personal context – memory, previous experience, psychological states – were already discussed in this chapter. I will return to them in the next chapter while defining the pre-experience context. However, individual capacities for meaning-making (often used in audience studies for audience segmentation) require separate consideration.

2.2.8 Capacities for meaning-making

Psychologists working on processing fluency and most audience scholars agree that the capacity of perceivers influences the quality of their aesthetic response. The audience, according to Dewey, needs to be prepared for the act of perceiving, and the consistent nurturing of interest is necessary (Dewey, 1980, pp.53–54). Csíkszentmihályi and Robinson believe that visitors need specific skills to have an aesthetic experience, and a good balance between the challenge and those skills is needed for "flow" to happen (Csíkszentmihályi & Robinson, 1990). That would mean that people consider art as beautiful or experience as satisfactory when they find it in tune with their capacities, so easy, but not too easy (Nakamura & Csíkszentmihályi, 2009, p.94), to process. Edmund Burke Feldman has suggested that the capacity to engage in reflective dialogue about an arts experience empowers the audience, while Maxine Greene has seen "informed engagement" as an essential part of the arts experience (Radbourne et al., 2013, p.105). It has also been suggested that audiences can derive pleasure from understanding a work of art even if they do not particularly like it (Russell & Milne, 1997, in Silvia, 2005, p.350; Conner, 2013, p.31). It has usually been assumed that the more educated or prepared individuals are, the more positive aesthetic response they have (Reber, Schwarz & Winkielman, 2004; Boorsma, Conner, Heim, Hodgson, O'Toole et al., in Walmsley, 2019). Hence, many studies have examined the difference in the experiences of engagement of professional and lay audiences. That could

also mean that successful (in the audiences' view) decoding of dominant, professional, negotiated and/or oppositional codes (Hall, 1973, pp.16–17) may be advantageous as it can provide or increase personal satisfaction and stimulate a wish for future engagement. Connecting the quality of arts experience to audience members' knowledge and skills justifies institutional missions to educate the audience. Intellectual meaning-making may have a role but is not the only or sole prerequisite for quality engagement in art.

The lack of understanding of the "codes" may be unnecessary for arts enjoyment (Kawashima, 2000, p.70). Audiences' encounters with at least some forms of art (for example, dance or music) are affective rather than interpretative (Reason, 2016, p.84). Tröndle & Tschacher's research has indicated that:

> art affinity influences visitors' aesthetic expectations prior to the museum visit but is clearly less predictive of their actual experiences, physiological reactions, and spatial behavior in the museum. (Tröndle & Tschacher, 2016, p.74).

There has been a recurrent conviction that individuals high in openness to experience, one of five personality traits, more often enjoy and appreciate the arts (McCrae, 2007; Silvia, 2007; Chamorro-Premuzic et al., 2010, p.202). Openness to experience, however, has been considered the personality trait most difficult to grasp (McCrae & Costa, 1997). Those studies have demonstrated that different factors may stimulate the reactions during the experience and final assessment of the experience.

Meaning-making – understood as audience members' reception and interpretation of the artistic text – is a prominent field of research within media and cultural studies. Reception theory understands audiences as actively engaged in a process of making meanings and debates acts of interpretations, evaluations, and creation of interpretive strategies (Hall, 1980; Livingstone, 2007). Livingstone suggests that audience (media) reception should cover dynamics of interaction between text and reception, giving due emphasis also to questions of ideological, cultural and socio-demographic context (Livingstone, 2007, p.12). Artworks, however, contrary to media messages, have and accept multiple meanings, and there is no single way of interpreting and responding to them (White & Hede, 2008). In the audience-centred study of an arts experience, it is not fundamental to know what an artwork means, for example, to most of the audience, as more relevant is what it means to a specific audience member. However, the concentration on the dynamic, diverse, complex, endless, and constantly evolving phenomenon of interpretative or constructive individual meaning-making could shift the

research too much towards longitudinal analysis and the much criticised “anecdotal” direction in art audience studies (Davis & Michelle, 2011, in Schrøder, 2012, p.801; Walmsley, 2019, p.53). “Interpreting an act of interpretation” (Sedgman, 2017, p.315) is “always contingent and contextual” (Walmsley, 2019, p.45), so restricts generalisability. Experience is not judgement (Noë, 2004, p.188). Likewise, this study of audience experience of engagement does not represent the judgement of people’s interpretative, general or momentary capabilities. If the term *audience engagement* acknowledges the move from passivity to activity and from people treated as objects to being perceived as constructors of their own experiences, then the audiences' rights to personal meaning-making regarding arts need to be acknowledged. Otherwise, even when guided by best intentions, a study of the audience experiences of engagement could sustain the top-down (artists and arts institutions know better) approach to audiences. However, academic audience studies more often explore interpretations than other perspectives on engagement.

2.3 Studying experience of engagement – existing methods

Audience studies in the arts have been booming in the last decade (Walmsley, 2019a). Although the field is predominantly dominated by cultural studies and media studies (Walmsley, 2019, p.26) a trend toward interdisciplinary integration in the arts, humanities, and sciences is (again) visible in audience research, as multidisciplinary audience studies build upon a multiplicity of theoretical schools and methods from diverse disciplines. The rising practice of using concepts, theories, and methods across disciplines by disciplinarians themselves is one of the features of modern science (Klein, 1999, in Repko & Szostak, 2017, p.35; Denzin & Lincoln, 2018). However, many scholars “borrow” concepts “quite eclectically, without taking into consideration the fact that they may be based on various basic implicit assumptions” (Höijer, 2008, p.275). Academics from film and media studies, as well as arts management and marketing related studies, are perceived to lead more utilitarian analyses, while the work by cultural studies and performance scholars gravitate towards conceptual and abstract issues (Walmsley, 2019, p.48). The links between different fields of audience studies are missing and “core ideas and concepts of audience research are also heavily challenged in other [audience studies] fields” (Mathieu et al., 2016, p.466). Natural science disciplines that use art to analyse human cognitive processes largely do not consider themselves as part of audience scholarship. Studies with mixed perspectives have been undertaken (Höijer, 1998, p.166), but the prospective meta-analysis is difficult

as differences in semantics cause communication (and interaction) difficulties across academic disciplines. The same term can be understood and used differently in different scholarly fields (and indeed in different schools within them), the time and the place of the study (Dewey, 1980, p.245; Bachelard, 2002, p.28; Höijer, 1998). Multidisciplinary study of audience experience of engagement needs to build on an understanding of differences between purposes, methodologies, research designs, contexts and timeframes of different academic environments (Bickman & Rog, 2009, x; Pepperell, 2018). As studies of audience engagement are closely related to art practice, recognition of results of applied research that examine acts of engagement to support audience development naturally enriches the exploration of engagement. Their results are often quoted also in academic literature in humanities (e.g. Radbourne, Glow, & Johanson, 2010; Conner, 2016; Walmsley, 2019a) and natural sciences (e.g. Tung Au, Ho, & Wing Chuen Chan, 2017; Burns et al., 2019).

2.3.1 Qualitative studies of the experience of engagement

Most qualitative methods in audience studies rely on audiences' post-experience subjective reviews. It is often declared that such reports are not reliable as they can only capture features of experience that respondents are aware of, depend on their interpretation of concepts and communicative skills, and cannot distinguish the genuine response from the one incorporating standard or perceived as expected answers (Pagulayan et al., 2002, in Mandryk & Atkins, 2007, p.330; Foreman-Wernet, 2013 & Armbrecht, 2012, cited in Carnwath & Brown, 2014, p.90; Christensen, 2018, p.351). Post-experience reports often sum up audience opinions rather than reflect on the multitude, diversity and dynamics of possible reactions during an arts experience. They are also disposed to the *peak-end effect* as experience is strongly influenced by its peak and last emotion (Varey & Kahneman, 1992; Kahneman, 2011). This last issue, although seen as the bias of post-experience reports, signals a potentially important feature of the artistic experience – the individual relevance and the strength of the experience elements. Those aspects have been rarely empirically studied in the humanities. Nevertheless, it has been broadly recognised that the cognitive processes of attention, contemplation, and memory are powered by motivations and emotions (Simon, 1983; Elliot, 2008; Potter & Bolls, 2015). In this regard, qualitative methods contribute to the understanding of the processes of engagement. But they only tell us part of the story that is consciously constructed by the audience, while "most of what we do and think and feel is

not under our conscious control" (Eagleman, 2011).

2.3.2 Audience experience of engagement through bodily reactions

Contemporary neuroscience, due to its technological advancements, can better demonstrate the changes in the permanent inner processes during an arts engagement. Modern biometric devices, used, for instance, in cognitive psychology experiments and film and media studies, offer support for continuous and real-time exploration of audience involvement during an arts experience providing an opportunity for increased objectivity of arts engagement studies.

In academic natural sciences, psychological experiments using body-sensing technology in controlled (in or outside laboratory) settings have provided an important basis for audience experience of engagement research. Many of these experiments had opposing findings or were run on small or homogenous groups of participants, largely composed of university students. Moreover, experiments usually reductively studied separate parts of human (e.g. aesthetic) experience (e.g. Calvo-Merino et al., 2008; Sbriscia-Fioretti et al., 2013; Kirsch, Dawson & Cross, 2015) – while it is believed to be "balance and relationship of parts which make up a whole" (Makin, 2017, p.184). At the same time, psychology (e.g. James, 1892; Engel, Friston & Kragic, 2015) and psychophysiology (e.g. Cacioppo & Tassinary, 1990) have indicated the complexity of human experience and its relation to a multitude of variables and contexts. As a reaction to art cannot be easily controlled and exposure timing and physical intensity cannot be carefully calibrated, exact reproduction within and between experiments and laboratories cannot be assured (Edmonds et al., 2014).

Moreover, in general, the interpretation of biosignals, especially those related to engagement with the art both in and outside the laboratory, is still unclear (Latulipe et al., 2011). It may only be confidently stated that physiology presents changes in the body's state. But, for instance, it does not identify a precise emotion, and emotional stimuli do not consistently evoke the same activation of one or the other branches of our nervous system (Cacioppo et al., 2000, p.187; Boucsein & Backs, 2008, p.35; Kreibig, 2010; Barrett, 2017). An aversive stimulus may cause heart rate response to be acceleratory, deceleratory, or unchanged compared with pre-stimulus levels depending on the contexts (Cacioppo et al., 2000, p.187; Barrett, 2017). A few studies of arts perception through biosignals recently conducted outside the laboratory context in more usual settings have provided ecological validity and indicated that

emotional responses to art *in vivo* may be stronger than in the laboratory (Brieber et al., 2014, p.6; Levitin et al., 2018). Laboratory experiments might identify meaningful relations between responses and experimental manipulations, but what physiology can tell us about real-life situations with a more complex arrangement of stimuli is still limited[4] (Boucsein & Backs, 2008, p.35).

Nevertheless, the literature review identified hundreds of studies presenting orderly and psychologically meaningful relations between physiological responses to art and experimental manipulations. For example, Lang has found that when participants assessed pictures, pleasantness ratings, heart rate, and facial muscles tended to load onto one factor, valence (revealing intrinsic attractiveness or averseness), while interest ratings and skin conductance tended to load on arousal (seen here as stimulation to a point of perception) (Latulipe et al., 2011, p.1847). Bhattacharya and Petsche, using EEG (electroencephalography) phase synchrony analysis, have demonstrated differences in synchronisation during the perception of visual arts by artists and non-artists (Bhattacharya & Petsche, 2002). Aesthetic chills have been confirmed as a marker of peak emotional responses to music (Sumpf et al., 2015) and Grewe, Kopiez and Altenmüller's (2009) analysis of response to music has revealed peaks in subjectively assessed intensity as well as objectively observed physiological arousal (demonstrated in skin conductance response and heart rate) regardless of gender, age or the level of musical education. Experiments using fMRI (functional magnetic resonance imaging, a non-invasive method for brain studies) have shown that listening to music synchronises brain responses across listeners (e.g. Abrams et al., 2013, in Levitin et al., 2018). Similarly, the study of theatre audiences' heart rates and electrodermal activity by the UCL Division of Psychological and Language Sciences (2017) has revealed that the theatre spectacle experience "produced common physiological reactions in the audience members overcoming group differences" (UCL, 2017). Latulipe, Carroll and Lottridge (2011) have confirmed that Galvanic Skin Response (GSR, also known as electrodermal activity of the skin, EDA) data is a reliable (and interesting for arts professionals) indicator of the audience's emotional arousal to the performing arts. Cognitive neuroscience studies, therefore, have provided much needed empirical insights

[4] As a positive example, Boucsein and Backs' (2000) work with respect to workload and stress in the field of ergonomics can be given. Scientists made a summary of the sensitivity and reliability of all psychophysiological measures in this field. (Boucsein & Backs, 2008, p.35).

into engagement with the arts. However, natural sciences have not yet been able to precisely recognise and label motivations and emotions without direct statements from research participants.

2.3.3 Researching engagement in arts practice

In arts practice information collected by analogue or digital means for managerial and marketing purposes generally did not provide knowledge of audience engagement with art (Radbourne et al., 2009; Walmsley, 2011; Radbourne et al., 2013). Analogue research methods (questionnaires, focus groups, experiential reflection) used by the arts sector collect visitors' feedback and reflections and often examine general satisfaction levels. It is believed that they rarely assess experience "outside of trading areas" (Bourriaud, 2002, p.2) or go beyond marketing departments' audience satisfaction measures (Brown & Novak, 2007). However, this was not always the case.

The scale of the phenomena of deeper investigations of engagement in the arts' practice is hard to capture, but there were (at least) exceptions. For example, to investigate how visitors use museum spaces, the University of Cambridge Museums created thermal plans based on structured observations of visitors by a large group of trained volunteers (Harknett, 2018). Qualitative inquiry in the various forms of creative facilitation was also used by arts marketing consultants (Baxter, O'Reilly & Carnegie, 2013). They turned to, for example, metaphors to explore "rich meaning", re-immersed people in a specific arts experience through drawings and guided visualisations, or tried to understand the experience context and origins of participants' attitudes, values and motivational triggers through timeline drawing (Baxter, O'Reilly & Carnegie, 2013). Those approaches are not new as visual methods have been employed within the media industries for many years (Buckingham, 2009, p.634). Producing and broadcasting companies experimented successfully with multiple techniques to understand the audience's reactions during film watching. For example, the Danish Broadcasting Corporation's Media Research Department (DR) extensively experimented with user tests. Their work included traditional focus groups, "semi-qualitative testing" involving online streaming of a television series episode, and a subsequent online survey with some open questions (Redvall, 2017, p.16). Before moving to neuroscientific methods Danish researchers run, for example, "mentometer tests" (Redvall, 2017, p.15). Those included continuous collection on a slider quantitative representation of viewers' self-reports during the act of watching which formed a basis for discussions about moments when viewers'

experiences “peaked” or “flatlined” (Redvall, 2017, p.15). DR researchers decided to move away from questions about *what* and *why* towards viewers’ descriptions of emotions, as television series rely on audiences’ emotional engagement. For Heiselberg, the head of the research team, that was important as it kept viewers “on the emotional rather than the rational playing field” (Redvall, 2017, p.16). DR studies demonstrated an audience-centric approach in the research of film structures and content. They balanced artistic, academic and commercial aims and combined professional and innovative, built on up-to-date scientific knowledge, approach with usefulness for television and general arts practice. Those examples demonstrate that the audience experiences of engagement have also been successfully studied in the practice of the arts.

Nevertheless, the most used digital tools measuring engagement in the arts provide information about ticket buying patterns and frequency of attendance. Box-office data may assess also, or rather, for example, the effectiveness (or lack thereof) of communication campaigns or sales tactics or be highly influenced by the audiences’ economic status. Moreover, methods used for managerial and marketing evaluation can be biased in a multitude of ways. For instance, loyalty bias and sampling challenges are well documented as high-frequency attendees more often respond to audience surveys (Brown & Novak-Leonard, 2013, pp.229–230). As practitioners’ research is particularly context specific, it usually cannot be a base for generalisation to a broader context. However, the same can be said about many academic audience studies.

2.3.4 Mixing methods

Humanities and natural sciences researchers have approached audience arts experiences from theoretical and experimental perspectives and diverse forms of mixing (and clashing) both standpoints. For example, in theatre and performance studies, Gareth White reviewed elements of audience experiences “how ‘we’ react to performances and […] invitations to participate” (White, 2013), building on theories from theatre studies and discussing them (also with artists) in specific performances. Cognitive theorists, e.g. in theatre (McConachie, 2008; 2015; Shaughnessy, 2013; Falletti, Sofia & Jacono, 2016) and film studies (Plantinga, 2016; 2019; Gallese & Guerra, 2022), being stimulated by scientific evidence, developed and re-framed theoretical approaches, contributing to a “cognitive turn” in the humanities. For instance, Josephine Machon, a scholar of contemporary performance, developed a theory of (syn)aesthetics referring to studies of the neurocognitive condition of

synaesthesia – a neurological complication of a crossover between the senses (Machon, 2009, p.15). Her theory of (syn)aesthetics discussed a characteristic of the (syn)aesthetic performance style, in which artists used “a variety of artistic principles, forms and techniques, manipulated in such a way so as to fuse the somatic and the semantic in order to produce a visceral response in the audience.” (Machon, 2009, p.14). On the other side, art is also a subject of study in neuroscience and neuroaesthetics. The multiple aspects of embodied cognition involved in performing and perceiving arts have inspired scientists to use art as an instrument for studying, e.g. links between motor control, expertise and action-perception in dance (Calvo-Merino et al., 2008; 2010; Cross & Ticini, 2011; Bläsing et al., 2012; Jola, Ehrenberg & Reynolds, 2012; Orgs, Caspersen & Haggard, 2016) and music (e.g. Molnar-Szakacs & Overy, 2006; Lahav, Saltzman & Schlaug, 2007). Yet, neuroscience studying arts does not directly and infallibly contribute to the engagement studies and the practice of the arts, even if it claims so. In this respect, for example, the results of a study by Calvo-Merino and colleagues (2010) that “provide[d] preliminary support” for a claim “that ballet dancers' physical experience shapes their ability to discriminate movements they are adept at performing” (Bläsing et al., 2012, p.305) and studies of mirror neurons with professional and lay audiences added nothing new to (qualitative) knowledge about the experience of dance and music. Results of neuroimaging studies of dancers’ (Calvo-Merino et al., 2005) and musicians’ (Lahav, Saltzman & Schlaug, 2007) responses in the mirror neuron system, the brain “region [that] may be the source of predictive models of upcoming events in sequential processing” (Molnar-Szakacs & Overy, 2006, p.239), provided empirical evidence for common sense. Professional dancers’ and musicians’ brains should be able to predict better aspects of the art in which they have extensive training. Their brains’ predictions during the experience of an unfamiliar artistic discipline should be (expectedly) less visible. The mirror neurons are also a concern of theories of *embodied simulation* (also known as *embodied* or *kinesthetic empathy*, or *emotional contagion*) – when doing and watching produce similar neurological responses as “the same mirror neuron structures are activated in the observer as in the person observed” (Gallese, 2008; 2009). Yet, if mirror neurons are constitutive (Freedberg & Gallese, 2007) or not (Casati & Pignocchi, 2007) of aesthetic response is still debated. As Anjan Chatterjee, neuroscientist and author of *The Aesthetic Brain: How We Evolved to Desire Beauty and Enjoy Art* (Chatterjee, 2014) noted, one should distinguish investigations probing the brain from those probing aesthetics (Chatterjee, 2011).

The understanding of audience engagement during arts experiences greatly benefits from studies using a mixed-method approach as they reveal (often unexpected) aspects of processes and effects of the engagement, which cannot be revealed by a single method. For example, contrasting self-reported engagement measured with the narrative engagement scale (measuring narrative understanding, attentional focus, emotional engagement, and narrative presence) (Busselle & Bilandzic, 2009) with physiological responses revealed that while participants considered themselves as more concentrated and engaged with film narratives, their physiological responses exposed more cognitive and emotional engagement with audio narratives (Richardson et al., 2020, p.7). Another, transdisciplinary investigation combining qualitative audience research and functional brain imaging (fMRI) examined the aesthetic experience of watching dance with and without music (Reason et al., 2016). It indicated that hearing dancers breathing while watching their movements lead to increased, across all spectators, perception of audience members' own body (so-called: body to body effect) (Reason et al., 2016). This bodily perception was reported by participants as increased regardless of whether spectators enjoyed the performance (Reason et al., 2016). A different experiment on the experience of frequency and intensity of music-evoked chills (goose bumps) combined a large-sample survey and a psychophysiological experiment (measuring skin conductance response) took into account also (self-reported) music preferences (Mori & Iwanaga, 2015). In general, it is acknowledged that people differ in their bodily responsiveness to stimuli, and this study suggested that higher "reward sensitivity" is a predictor of the chills evoked by music. "Reward sensitivity" is a component of temperament and personality; and represents a tendency to detect, pursue, learn from, and derive pleasure from positive stimuli (Goodnight, 2018). As chills lead to highly pleasurable emotions and psychophysiological arousal they contribute to audiences' assessment of experience of pleasure (Mori & Iwanaga, 2015, p.484). In another study, Wang and colleagues used several methods simultaneously during a specially prepared experiment, a live performance. Audience skin conductance data was synchronised with video footage of performers and the public, and the questionnaire gathered information from the audience to evaluate the emotions that the performance evoked. The research enabled scholars to describe the nature of audiences' theatre experience and map out a minute-by-minute unfolding of the performance in terms of psychophysiological engagement (Wang et al., 2014, p.1909). Similarly, in an HCI project, so-called biometric storyboards were developed to visualise the relationships between game events, player feedback and changes in a player's physiological state (Mirza-

Babaei, 2013). Museum research by Tröndle and colleagues tracking movement, heart rate and skin conductance, followed by emotional and aesthetic evaluations of specific artworks by 576 museum visitors demonstrated that the social behaviour of museum visitors had a decisive influence on art reception, providing clues for more effective exhibition design (Tröndle et al., 2012; Kirchberg & Tröndle, 2015). Presented examples prove that the use of both qualitative and quantitative methods offers deeper insights into audience engagement with art.

These mixed-methods studies experimented with artistic content, manipulated by the researchers. My study extends this methodology. I decided to explore real-life audience experiences during an arts event that was unchanged. Yet, the key was to design a natural experiment using mixed methods and to permit the exploration of dynamic and interacting processes of audience engagement.

2.3.5 Methodological challenges

Consensus that experience, including aesthetic or arts experience, depends on attributes of a person, an artwork and context unifies many relevant academic disciplines: cultural policy (Belfiore & Bennett, 2007), media studies (Livingstone, 2007, p.12), empirical aesthetics (Leder & Nadal, 2014), psychology (Dewey, 1980, p.256), neuroscience (Barrett, 2016, p.16) and HCI (O'Brien, 2016b, p.14). Yet, a more detailed approach to the study of experiences of engagement with art combining analysis of dynamic interaction between audience members thoughts, emotions and bodily reactions in relation to art and other elements of the environment although acknowledged does not straightforwardly fit in any of academic audience studies fields.

The wide range of things that the concept of engagement covers explains the equally large number of possible approaches and research methods, "which are diverse, exciting, context-dependent, and mirror current trends and practices" (O'Brien & Cairns, 2016, xv)[5]. Academics in humanities in different qualitative ways, for example, through discussions, interviews, ethnographic observation, "thick description", deep hanging out, or creation of visual matrixes obtain insights into the artistic experience. However, to my knowledge, no qualitative studies have discussed dynamic audience bodily responses

[5] A comprehensive review of research methods used to measure user engagement with technology can be found in *Measuring User Engagement* by Lalmas, O'Brien and Yom-Tov (2015) and up-to-date review of diverse engagement studies in the arts are presented in *Audience Engagement in the Performing Arts* by Walmsley (2019).

investigated via biofeedback. By contrast, many psychological and psychophysiological experiments have increasingly used, also in a qualitative way, questionnaires, scales or checklists to better understand quantitative data (Schindler et al., 2017, pp.5–6). Yet, psychological (e.g. affect, personality, emotions' assessment) and aesthetic experience evaluation scales (e.g. art reception survey), virtual reality (e.g. sense of presence), immersive user experience and audience impact questionnaires have limited usability for studying dynamic processes of audience engagement with art. They have focused on too narrow or unclear issues, present no longer valid approach, use a too extensive questionnaire form or have unsatisfactory relevance for this research purpose. The User Engagement Scale Short Form (O'Brien, Cairns & Hall, 2018), measuring the quality of engagement with technology, reflects the processes of engagement and thus may also support the exploration of audience engagement with virtual reality art. The scale examines focused attention, perceived usability, aesthetic appeal, and reward factor and was statistically validated, which means that it measures what it is supposed to measure. Nevertheless, reliable and replicable research methods and approaches serving audience engagement studies and the practice of the arts are scarce.

Only a few comprehensive studies of experiences of engagement with art in a real-life setting have covered extrinsic (externally driven) and intrinsic (inner) aspects of engagement. Those studies by interdisciplinary research teams included humanities researchers, neuroscientists and arts professionals experimenting with diverse methods measuring and assessing audience reactions (Stevens et al., 2007; Tröndle et al., 2012; Reason et al., 2013). That is because the compound exploration of extrinsic and intrinsic aspects of audience experience of engagement implies an inter or transdisciplinary approach traversing humanities and natural sciences. There is a large volume and diversity of theoretical and empirical arts experience studies within diverse branches of humanities and natural sciences in the past 150 years. Yet, there has been little research on the relationship between the audience's personal context, in-the-moment bodily engagement during, and post hoc cognitive reflection about an arts experience in a real-life setting. Without a multi-dimensional and transdisciplinary approach, audience studies will continue the exploration of some factors of the engagement but cannot capture the multifaced nature of the experience of engagement.

Exploratory study of multi-dimensional implicit and explicit audience experience of engagement requires a transdisciplinary approach and contribution from humanities and natural sciences. None of these fields can individually capture

and comprehensively understand audiences' experiences of engagement with arts. Biometric devices used, for example, in the above mentioned experiments offer support for continuous and real-time exploration of audience involvement during an arts experience and supplement qualitative insights into that experience. They provide an important opportunity for increased objectivity of arts engagement studies offering more direct and fine-grained insights into (not only bodily aspect) of audience experience (Martella, Gedik, Cabrera-Quiros, Englebienne, & Hung, 2015). Moreover, all presented mixed methods studies confirmed that the relevance of academic studies for the practice of the arts increases when the research team includes representatives of the arts sector. However, Belfiore and Bennett acknowledge that the complexities of the arts experience make the development of a rigorous but easy to implement and generally replicated protocol for the assessment of the (impacts of the) aesthetic experience impossible (Belfiore & Bennett, 2007, pp.262–263). A holistic, multidisciplinary, but humanistic empirical research design that simultaneously provides information about specific experiences and allows for comparisons with results of other studies is missing. There is a gap in research design that this PhD research addresses.

2.4 Refining the research area

As I demonstrated, many academic disciplines have agreed that arts experience depends on the attributes of a person, an artwork and context, and the audience being active even if it sits still during the event. Yet, studies of the relationship between dynamic physiological engagement, the personal context and reflections of the person, and the artwork in real-life contexts are scarce. Experience of engagement is complex, but if rationality is bounded, then it is silent to study which aspects influence the arts experience less and more. In such a way, it shall also be possible to identify what leads to more favourable engagements. As digital technology has capacities to support audience research and audience interest in arts, the following research questions guided my study

1. What can bodily data collected through biometric devices tell us about the audience's physiological engagement with art?
   a/ What similarities and differences can be observed in bodily responses in different modes of engagement in the technology-augmented art projects?

b/ What similarities and differences can be observed in the engagement trajectories of audiences having different and similar profiles and motivations?

2. What can the relationship between the audience's personal context, dynamics of bodily engagement, and post hoc cognitive reflection reveal about the audience's experience of (VR) art?
3. In what ways might a deeper understanding of the audience experience of engagement with arts support evolving theories and practices related to audience development and audience engagement?

As audience studies lack methods to analyse and compare short-term and time-bound individual experiences, I had to create a new research design that allowed that and integrated insights from the natural sciences and humanities approaches.

Chapter 3
Methodology & Methods

In this chapter, I present the philosophical framework and research methodology. I explain the original research design and methods for data collection and analysis, which integrate, through critical realism's framework and looking for causal mechanisms' narrative, qualitative and quantitative data. This part comprises a justification of the selection of virtual reality art as a case study with two forms of engagement (directed and semi-directed experiences) that form the principal component of this thesis. The chapter covers the descriptions of the artworks and the context of each case study. This part ends with information about my ethical approach to participants' data.

3.1 Research design

In line with the PhD's aims and tactical decisions, the research encompassed transdisciplinarity and mixed methods integrating qualitative and quantitative approaches and sets of data, as neither quantitative nor qualitative methods were sufficient to capture the complexity of the engagement. As discussed earlier, methods of analysis vary in humanities and natural sciences, following their different worldviews, principles, and opinions on what constitutes good science. Quantitative research typically requires the development of hypotheses before the study and obliges following pre-defined rigorous steps of data analysis based on statistics (Sayer, 1992). Qualitative research, on the contrary, accepts continuous analytical processes that can begin during data collection and influence ongoing data gathering (Pope, Ziebland & Mays, 2000). My mixed research was not just creating the hybridity of different methods but strived towards cumulation in understanding using both analytical perspectives (Pawson, 2008, p.120). As suggested by many academics specialising in research methodologies (e.g. Greene, Maxwell, Pawson), mixed methods generate a dialogue "between thinking of the world in terms of variables and correlations and in terms of events and processes" (Maxwell, 2010, p.3) and links process and variance theories (Mohr, 1982, in Maxwell, 2010). Even if the study is under the significant influence of one paradigm – the humanities, an inevitable tension between "the desire to maintain a qualitative depth in the analysis and the need to establish a systematic framework for organising the data" (Lewis, 1991, p.95, in Schrøder, 1999, p.48) was permanently present in my work.

To underline that purpose of the study was more important than the method, I labelled my multilevel/multiphase study (Creswell & Plano Clark, 2018) based

on case studies as exploratory-explanatory research. The case study approach supports in-depth, multifaceted explorations of complex issues in their real-life settings when an investigator has little control over events (Yin, 2006). I combined exploration of the engagement phenomenon through its direct observation in its natural and raw form – exploratory case study, with “attempts to discover and analyse the many factors and conditions that can help us to build a causal explanation for the case” – explanatory case study (Lune & Berg, 2017, p.176). I examined real audiences’ real-life arts experiences in their ordinary locations and settings as “it is notoriously difficult to generalize laboratory findings to real-world situations” (Hutchins, 1995). I did not manipulate the artworks and rejected experimental design that requires control over behavioural events (Yin, 2006, p.6) to maintain the integrity of the arts. Therefore, the construction of my research (inspired by a quasi-experimental design with a control group and pre-post comparisons) can be considered a kind of natural experiment. In empirical research, comparison groups provide data about what would have happened in the absence of treatment or intervention (Shadish, Cook & Campbell, 2002; Fu et al., 2016, p.16). A similar structure exists in the before-and-after case study procedure. However, those research designs are usually applied to clarify post-experience changes, develop theories on the impacts of the events, examine procedural efforts, or support the creation of future interventions (Mills, Eurepos & Wiebe, 2010, p.51). My PhD encompassed two case studies and exploration of their (within) sub-cases that I treated as a form of a control group for one another. Although the outcomes of the study might include insights into designing future interventions, the general intention of the study was to explore and explain sub-cases (audience experiences) within two cases (two artistic projects) to provide a deeper understanding of a broader phenomenon. That is why the study also included self-observant pilot analyses during tests of biometric tools, which added first-hand insights from my own artistic experiences. The incorporation of those different perspectives supported the exploratory and explanatory objectives of the research.

3.2 Critical realism

It is helpful before progressing further into details of the methodology to provide a closer overview of my philosophical standpoint – critical realism. Although critical realism considers objective perception impossible it supports the possibility of testing assertions against evidence about the nature of the phenomena (Bhaskar, 2008; Putnam, 1999; Maxwell, 2012, p.5; Maxwell & Mittapalli, 2010, p.158). In this regard it shares many characteristics with

philosophical pragmatism – it accepts those approaches that increase our understanding of the world and demonstrates pragmatic orientation towards the methods (Maxwell & Mittapalli, 2010, p.152).

Critical realism supports systematic integration of objective (quantitative) bodily data and subjective (qualitative) audience reflections. They are both beneficial. Qualitative methods support validity due to their focus on the depth of the phenomena, and quantitative methods provide greater reliability because of their more formalised procedures of data collection and analysis (Schrøder, 1999, p.49). Qualitative methods help to overcome the quantitative biases intrinsic for universalising and tame tendency to reduce complex actions to a "simple combination of simple behaviours which in turn are regular responses to set stimuli as if each stimulus and action had the same meaning regardless of context" (Wilder, 1967; Sayer, 1992, p.200). On the other hand, quantitative methods can, for example, indicate not anticipated relationships, support qualitative findings with systematic quantitative evidence for diversity (Easton, 2009, p.538; Maxwell & Mittapalli, 2010, p.160) and offer a high level of measurement precision (Frey et al., 1991, p.99, in Schrøder, 1999, p.49). In my study, mixing qualitative and quantitative methods compensated for the inherent limitations of both methods and provided a way to deal with complex issues using the strengths of both approaches. Integration of qualitative and quantitative data required clarification of differences in both methods' understandings of causation, diversity, validity, and generalisability – concepts central to the critical realist perspective and, therefore, to this study.

3.2.1 Causes and reasons

Critical realism deals with explanations of phenomena, rather than just description, and seeks to expose the generative mechanisms of the matters under study. A full explanation of human action, according to critical realism, is impossible without discussing both causes and mental reasons (Sayer, 1992; Bhaskar, 2008; Maxwell & Mittapalli, 2010). There is, however, a difference between causation in quantitative and qualitative research. Paradoxically, the positivist interpretation of causality as the regular association of events or variables still dominates also among qualitative researchers. That probably causes their deep opposition towards this concept (Maxwell, 2012). For critical realism, however, causality does not mean regularity as "what causes an event has nothing to do with the number of times it has been observed to occur" (Sayer, 1992, p.110). A knowledge of *how* the process works include inference of its generative mechanisms as well as an understanding of what it is about

the object that enables the operation of those mechanisms (Harre & Madden, 1975; Sayer, 1992, pp.104–106). That indicates a need for recognition of the nature of objects (or relations) – their causal powers and liabilities (or dispositions, propensities, trends, or tendencies) (Harre & Madden, 1975; Sayer, 1992, pp.104–106; Bhaskar, 2011). For example, people have the causal power to attend arts events (as well as, e.g., work, think, and speak) and a multitude of causal liabilities, for example, susceptibility to social influence or marketing actions. Causal powers are permanent. It is, however, contingent whether they are (ever) activated or applied as they exist independently of their effects (Sayer, 1992, p.107). If causal power or liability is activated, the actual effects of causal mechanisms will subsequently depend upon the presence and configuration of conditions in which they work (Sayer, 1992). The causal power of attending an arts event might be activated by, for example, (contingent) social influence but the experience itself depends on the set of other contingent conditions and their configuration. The study of causal mechanisms is challenging as a phenomenon may be produced by different causes, and some of them might interfere with one another. But, if an organisation wants to produce the desired outcome, it needs to understand its generative mechanisms and create conditions under which the desired effect might be produced (Sayer, 1992, p.107). Even if the characteristics of the humans (and audience members) are unknown, considering their causal powers and liabilities together with experience causative circumstances allows bypassing the (ethically problematic) notion of (human) quality (Harre & Madden, 1975) in discussions about audience agency. My research (through the use of qualitative methods) added audience members' mental reasons and their effects into the discussion about arts as a cause of fluctuation in the bodily experience of engagement (visible in the quantitative data).

3.2.2 Diversity

Attention to the diversity of persons, views, behaviours, or contexts is a salient component of every part of the critical realist's research. Especially during the data analysis, it entails a deliberate search for variability and an attempt to understand the significance of diversity (Maxwell & Chmiel, 2014, p.11). Focus on diversity challenges quantitative practice considering regularities and general patterns as the primary reality (Maxwell, 2012a, p.2). For critical realists, diversity is not a potential bias (Maxwell & Chmiel, 2014, p.10) but a real, existing phenomenon (Maxwell & Mittapalli, 2010, p.159).

Moreover, if our understanding of the world is constructed from a perspective dependent on contexts, the position of the researcher in this study cannot be considered objective or value free. The researcher's background and identity – in this case, my long-standing involvement in the arts as an artist, arts events' organiser, and audience development specialist – is treated as a valuable component rather than confounding bias (Mills, 1959 and Glesne & Peshkin, 1992, in Maxwell, 2013, pp.69–70). There is an understanding that diverse views on the experience of audiences, artists, promoters, and the researcher might only be roughly accurate or not fully exposed. But for critical realism, each of these perspectives is valid and part of the world we want to understand. The research thus encompassed diverse but equally valid views on the engagement of the audience members, the artists, and the researcher.

The matter of diversity also influenced my attitude toward the study's audience members and their characterisation. The assumption that a behaviour results from fundamental and stable properties of the person is still present in audience segmentation models. However, psychology often challenges such an understanding (e.g. Mischel, 1968; Chaplin, John & Goldberg, 1988; Simon, 1992) central in the "traits vs. states" debates. "Trait concepts permit people to predict the present from the past; state concepts identify those behaviours that can be controlled by manipulating the situation" (Chaplin, John & Goldberg, 1988), so acknowledge an impact of the features of the situation. A straightforward generalisation of a person's behaviour in one instance to their behaviour in another situation is not reliable. In social psychology, the absence of attention to context has been labelled the fundamental attribution error (Ross & Anderson, 1977) or correspondence bias (Gilbert & Malone, 1995; Choi, Nisbett & Norenzayan, 1999). In my artistic experience study, I paid attention to audience members' personality trait of openness to experience, the only trait somehow associated with the satisfaction of the arts experience (Reber, Schwarz & Winkielman, 2004; Silvia, 2007; Silvia et al., 2009). I also recognised the importance of acknowledging the diversity of audience members' states (e.g. the mood, anticipation, or arousal) and the context in the moment of the experience. It is salient, as physiology recognises, that internal bodily reactions of the same person can be frequently different even under identical experimental conditions (Wilder, 1967). The attention to diverging manifestations of a diversity of persons, opinions, behaviours, and contexts was, therefore, a sound component of different parts of the research, especially a selection of audience members for in-depth interviews and analysis of quantitative and quantitative information.

3.2.3 Approach to validity and transferability

Critical realists' attitude towards validity, as much as the previously explained view on diversity, supported the improvement of generalisation or transferability of the research. The validity, as a property of inferences (Shadish, Cook & Campbell, 2002), must be considered in the specific context of a particular study. That is why a realist perspective on validity focuses the mixed-methods attention on the probable threats to the conclusions drawn in a specific study. These conclusions are determined by the context and purposes of that study and by the methods used (Maxwell & Mittapalli, 2010, p.159). Threats to validity (construct validity) can be overcome by conceptual clarity and adequate theoretical foundations for the investigation (Schrøder, 1999, p.42), which I carefully did. In my research, threats to validity relied also on the reliability of the tools used and cautiously considered analysis of psychophysiological processes, which are indirect, complex, and inherently noisy (Gratton, in Cacioppo, Tassinary & Berntson, 2007, p.835). To support internal validity or credibility (a concept used in qualitative studies), I minimised extraneous variables (e.g. external distractions of noise or behaviour of other participants) influencing the biometric results (Leavy, 2017, p.115). I also explored alternative explanations (Payne & Williams, 2005, p.310; Easton, 2009, p.122).

The internal validity or credibility of the research design led to a thorough consideration of the possibility of generalisation/transferability. But the concept of generalisation is caught, also among qualitative researchers, by the positivist understanding of generalisation from sample to population (Eriksson, 2006, p.38; Maxwell, 2020b, p.111). According to Maxwell's critical realist conceptualisation, internal generalisation indicates generalising within the setting or group studied to persons, events, and activities that are similar but not directly represented in the data collected; while external generalisation refers to generalisation to other settings, cases, persons or times (Maxwell, 2020, p.112). The most common tactic to increase internal generalisation is sampling, but according to Miles and Huberman (1984) sampling does not only refer to a selection of people but also settings, events, and processes (in Maxwell, 2020, p.115). That is why two VR art projects selected for my research represent different, but (reasonably) universal, audience engagement paths – when the audience sits or moves and when it has different levels of agency while taking part in directed and semi-directed experiences. Also, the selection of people for detailed analysis aimed to enable comparison of temporal engagement of people with generalisable characteristics:

> [t]he basic criterion governing the selection of comparison groups for discovering theory is their theoretical relevance for furthering the

> development of emerging categories. (Glaser & Strauss, 2006, p.49).

Such strategic “purposive sampling” (Palys, 2008, p.697) in my research concerned people, events, and engagement processes. It aimed to increase validity/credibility (to confirm that I explore, to some extent, universal manifestations of audience experience of engagement with arts). It also supported generalisation, so transferability to similar and other contexts (being representative for engagement processes).

Generalisability also requires consideration of what is critical for the transferability of the results to other contexts (Maxwell, 2020a, p.10). Only in qualitative research internal generalisation can fully include the situation context. It is believed that to determine the extent to which transferability is probable, both (transferring and receiving) contexts need to be similar, well known, and comprehensively described (Lincoln & Guba, 2000). However, Robert Donmoyer, on examples of experiential learning and Piaget’s schema theory describing the process of acquiring knowledge through assimilation, accommodation, integration, and differentiation, has argued that generalisation can also be done from a single case, and similarities in cases are not necessary (Donmoyer, 2000, p.66). Arts experience can be a perfect illustration of generalisations to non-similar circumstances as the audience often transfer inferences from artistic situation to personal, totally different contexts. Donmoyer has suggested considering generalisability in qualitative case studies in psychological (rather than mathematical probability) terms. In his view, such generalisability should have more utility for applied fields (Donmoyer, 2000). My research integrating interdisciplinary insights for academic and applied purposes required design supporting comparisons and transferability and exploration *if* and *in what conditions* generalisations were plausible.

The process of internal generalisability includes the analysis of their typicality and diversity. But final generalisations and transferability do not oblige to make conclusions about the wider population nor impose the use of terms such as *typically* or *always*. When one generalises, one may state that something can happen, can happen often, or under specific conditions (Mook, 1983, p.382; Morley, 1992, p.153), or indicate that generalisations are time and context free or are time and context specific (Yin, 2016, p.19). The generalisation can also build on a theory (Mook, 1983, p.384; Yin, 2003, xiv; Easton, 2009, p.126). Höijer has argued that weaker claims for (empirical) generalisation of findings may be done on theoretical grounds and by comparing the results with results of other studies “[t]he logic is that cumulative studies are supporting evidence

and that consensus demonstrates generality" (Höijer, 2008, p.288). (Theoretical) generalisation can also be done on extreme or deviant cases, as the general mechanisms studied may be most visible in such instances (Höijer, 2008, p.286). That entitles discussion about studies that support the findings and those in which results differ. My analysis included reference to other findings as I examined how the two cases and their sub-cases (different people's experiences) related to previously done studies. This supports the validity/credibility and generalisation/transferability of my findings.

Those are important issues as a lack of clarity, transparency, and replicability of procedures impede the progress of audience studies (Barker, 2006). Transparency about methods and conceptual accessibility in qualitative research is postulated by, for example, Yin (2016, p.13). A lack of transparency over research processes might cause misinterpretation of the results. Transparency about processes, conceptual clarity for readers coming from different disciplines and areas of studies and practice, and detailed descriptions support in my study the generalisability of results and transferability of methods to other (similar or not) contexts. This brings greater confidence in the methodology and a deeper understanding of research processes and results. As the study aimed to support methodological innovation in arts engagement research, I took special care of its validity and rising levels of generalisability/transferability.

3.3 The main research overview

I developed a new methodical approach for studying audience experiences of engagement with arts, building on the strengths of both qualitative and quantitative methods. The design of the research supports transferability in empirical and applied studies. The emphasis was on personal engagement processes framed by artistic context and, in line with the study aims, the resulting impact of such an approach on the facilitation of audience engagement by the arts sector. The study explores the audience's real-life, dynamic, and time-bound arts experiences and analyses the interaction between individual contexts, dynamics of bodily engagement, and the audience's post hoc cognitive reflection about the event. In this way, the research offers an original contribution to knowledge.

I explored the audience experience of engagement in two strategically chosen, diverse, but complementary cases – virtual reality art projects. Each case – a VR art project – was divided into a subset of sub-cases to identify similarities and differences across smaller meaningful units (Mills, Eurepos & Wiebe, 2010,

p.134). I explored sub-cases – experiences of different audience members – within each arts project first independently, and subsequently, I compared their results within and between case studies. Next, I sought convergent evidence regarding the data and conclusions of each case. The next step was a cross-case analysis when both cases' conclusions dialogued. Such a collective case study was suitable for capturing the complexity of arts engagement while providing a deep understanding of its contexts (Mills, Eurepos & Wiebe, 2010, p.589).

Each of the case studies combined exploration of cognitive, emotional and bodily aspects of engagement of different, but with identified some key for engagement similarities and differences, audience members having the same arts experience. I explored audience reflective (slow, deliberative, cognitive and emotional) and immediate (quick, automatic, intuitive and affective) aspects of engagement with specific arts projects and acknowledged that a combination of automatic and controlled is rather the case (Bargh, 1994; Kahneman, 2011, pp.24–25; Melnikoff & Bargh, 2018). The research design included three stages: pre-, during, and post-experience. Pre-experience questionnaires provided information about audience members' personal context. To explore immediate processes, I looked at audience members' physiological reactions gathered by biometric devices during the experience of arts. Post-experience audience reflections and opinions were collected in questionnaires and semi-structured interviews. Qualitative and quantitative data gathered in the pre-, during, and post-experience stages were integrated in complementary units of analysis. That allowed the structured investigation of matters corresponding with the issues identified in the literature review.

I assumed that study of the experiences of the same artistic content by different audience members could provide evidence for diversity but also empirically mark similar features in specific experiences of engagement. Also, qualitatively analysed quantitative data from audience members' physiological reactions to the same work of arts offered a unique opportunity to identify the actual processes in action in specific artistic cases and the contextual influences on these (Maxwell, 2020a, p.12). Such an approach supported an explanation of the processes and clarified the conditions under which the causal relationship between arts content and audience response occurred. I investigated the generative mechanisms involved and, wherever possible, tried to get beyond the recognition that something produced some change to an understanding of what it was about the object that enabled it to do this. In this way, the study, building on real-life arts experiences and up-to-date multidisciplinary

knowledge, contributes to a comprehensive understanding of the complex issue of audience experience of engagement.

Table 3.1 The scheme of the research

Time frame > action	**Pre-experience, just before the arts project**	**During the arts experience**	**Post-experience, after finishing the experience**
Data collection	questionnaire focusing on audience profiles and personal context to associate them with propensity for technology or the arts	bio-sensing device collecting physiological data: heart rates, skin conductance, movement	1) just after – questionnaire focusing on audience experience; 2) a few days later – semi-structured interviews with some audience members
Kind of data collected	Quantitative	Quantitative	Quantitative and qualitative
Data analysis	Quantitative data analysed as a) quantitative and b) partly transformed into qualitative descriptions	Quantitative data a) visualised as graphs b) transformed into qualitative description	1) Quantitative data analysed as a) quantitative and b) partly transformed into qualitative descriptions 2) Qualitative data analysed qualitatively

3.3.1 Pilot studies

Before my primary research, I conducted self-observant pilot studies to confirm the viability of the methods and methodology – probing the relationship between biometric data and recollections of the experience and testing biometric sensors. I did my first pilot experiments during my monthly informal training at the Experimental Psychology department of the University College London (part of the Division of Psychology and Language Sciences) in June 2018. I organised the stay with the support of WRoCAH to learn about physiological experiments with arts the UCL professors recently conducted. During that residence, I had access to Empatica sensors and received instructions on how to use them. Hence, I performed mini experiments during a few of my artistic experiences. Those were tests rather than complete case studies or autoethnographic observations. Those mini experiments put me in the shoes of my future participants and provided interesting first-hand insights into the engagement from my artistic experiences (discussed in the next

chapter). During the tests, I understood the technical capacities of the devices. I also identified several challenges – the size of the literature to process; the deficiency of methods (beyond the statistics) to apply in the humanities' exploration of bodily reactions; the challenges of interpretation and comparisons with the existing variety of often inconsistent results in studies of the physiology of the arts experience. I understood I could use the sensors but could not replicate experimental psychology methods in physiological data analysis. Therefore, I had to develop my – humanities-friendly – methodology. Yet, the phase suggested the adequate feasibility of the study and inspired thinking toward developing my own approach. I devised my research methodology after tests with Empatica. Subsequently, UCL equipment was not available. I tested two new sensors – Ring and Garmin – just before the principal study's data collection in July 2019. I will discuss all pilot experiences in chapter 4.

3.3.2 The case studies – directed and semi-directed experiences

As arts give structure to personal engagement processes, I considered the levels of audiences' agency during the experience as a vital aspect of the selection of case studies. I therefore differentiated artworks and engagements into directed and semi-directed. The engagement processes are dynamic and, to a different degree, directed by the artists in both structured-traditional and more open contemporary artworks. Artworks that are fully directed (having a more traditional structure) and semi-directed arts (with an open form) arrange audience engagement differently. Directed arts experiences (and directed engagement) occur in an artwork with a closed form in which the audience has minimal control throughout the developments and has no impact on the autonomy of the artwork. In many arts projects, for example, dance, film, music, and some theatre performances, artists fully direct the artistic content. Through that content, they direct the inner, personal, psychological, or emotional engagement of the audience. The semi-directed form of experience covers arts engagement that is (more or less) pre-mapped by the artists. It is in some way facilitated and structured, but also partly free, leaving the audience members space and/or time, encouraging (or requiring) active involvement of different kinds, not only psychological but also physical and (or) social. In that case, for example, in interactive digital artworks or museum visits, audience members maintain a sense of control over their experience, and their actions become a personal contribution to their artistic experience. In my research, those two directed and semi-directed types of arts experiences covered experiences also in other arts forms. In my view, the arrangement of artists' and audiences'

interactive capacity (from reaction to influence) represented different modes on the continuum of audiences' possible participation in an artistic project. In this way, two case studies representing two arts experience scenarios – closed (directed) and open (semi-directed) – became a comprehensive representation of the audience's artistic experiences per se.

3.4 Selection of art projects for primary research

My arts case studies' selection criteria included (1) technology-augmented live arts projects with specific and distinct audience engagement styles as technology might draw new audiences to arts; (2) experiences including interaction to review the influence of the level of audience agency in the experience; (3) limited use of music as music guides physiological reactions (Rickard, 2004; Trochidis & Lui, 2015; Daly et al., 2015); (4) reduced or systematised movement of participants during the experience as it might overshadow other physiological reactions; and (5) project creators' agreement to carry out research using bio-sensing equipment and questionnaires. Diverse arts genres were to be chosen if possible. The exploration of existing and in-the-making artistic projects disclosed difficulties in securing collaboration with potential cases as creators could not engage with research being focused on their tasks. In the meantime, I noticed that virtual reality is used in psychophysiological experiments in lab-like conditions. Thus, I decided to focus on virtual reality projects – arts experienced through a virtual reality headset.

Virtual reality supported the exploratory-explanatory character of my study as it caused increased levels of audience immersion. The PhD follows the understanding of immersion in virtual reality in which

> the degree of immersion can be objectively assessed as the characteristics of a technology, and has dimensions such as the extent to which a display system can deliver an inclusive, extensive, surrounding, and vivid illusion of virtual environment to a participant. (Slater & Wilbur, 1997).

The use of virtual reality headsets limits external (environmental) influences during an experience. Noise (data unrelated to arts engagement) in physiological information was, thus, limited in my study. Even though music strongly influences our physiological reactions, I decided to accept art projects with narrative and music. Those are integral parts of many artworks contributing, like all artistic means, to effects of "sorrowful sorrow", "joyful joy", and "marching march" (Eisenstein, 1949, p.151). Also, such arts experiences prevail in a real-life context. Virtual reality art, thus, created lab-like conditions, even if I studied real-life arts experiences.

Authors of the virtual reality dance performance *Whist* – Aoi Nakamura and Esteban Fourmi – and the venue, Mills Art Centre in Banbury, agreed to collaborate. This decision and dynamic, episodic, semi-directed (partly open) form of *Whist* (up to nine episodes during each experience) led to the selection of the second case. In collaboration with Limina Immersive in Bristol, I arranged and curated a showcase of three VR art movies as an illustration of directed engagement. In the selection of the artworks for the *Bristol* presentation, I took into consideration the affective load of the content. The diversity of emotions enhanced prospects for detecting and interpreting general (tonic) levels and big and fast (phasic) changes in physiology, representing the audience's affective state. The emotional content supported recognition and understanding of temporal dynamics of physiological responses to selected artworks. *Bristol* and *Whist* – two chosen VR art experiences having different but complementary characteristics and features – provided a broader representation of engagement in various circumstances: directed and semi-directed.

3.4.1 Case studies description

It was paramount for my research that virtual reality would not cause audience members to modify their attitudes or behaviour. In both selected cases the audience did not receive a virtual body and, actually, it did not receive a body at all. Previous research on virtual reality experiences revealed that virtual representations of the self (i.e. agents and avatars) influence attitude and behaviour change (Fox, Bailenson & Ricciardi, 2012, p.69). In my art projects, there was no confusion of body ownership and agency, as audiences entered both experiences as (what the virtual reality community would name) first-person agents. The internal sensations of each audience member were their internal sensations. It was significant, as giving people virtual bodies could have brought confounding factors in the experience of engagement, which would limit the generalisability of the results.

Bristol: directed engagement

The *Bristol* VR film programme was organised in collaboration with Limina Immersive: The Virtual Reality Theatre located in Waterside, Bristol, UK. On Friday 26 July 2019, four presentations (at 6pm, 7pm, 8pm and 9pm) were held in a cosy space dedicated to Virtual Reality. The programme included three virtual reality movies, classical in form, with linear storylines, presented back-to-back (with a blackout between the films). The descriptions below, provided by the Limina, are the same audiences saw in advertisements before the event.

The programme included in the order of presentation:

(1) *The 500*

Director: Rollo Wood, Sam Rowley, Anthony de Unger & Ted Savile; UK; duration: 11 mins 56 secs

> With less than 500 individuals, the Ethiopian wolf is one of the world's most endangered species and is on the brink of extinction. The 500 offers audiences the rare opportunity to come face to face with these amazing creatures. Learn the story of local wolf monitor Alo Hussein, who is dedicated to saving them. For him, these wolves are family. The experience was created by Bristol's natural history VR innovators, Biome Productions.

(2) *Songbird* [6]

Director: Lucy Greenwell; Art and Animation Directors: Michelle & Uri Kranot; UK, duration: approx. 9 mins.

> Experience a lush cloud forest on the Hawaiian island of Kauai in 1984, retracing the steps of world renowned ornithologist Dr Jim Jacobi in search of the last known ʻōʻō, an iconic black bird with yellow leg feathers and a beautiful song. Songbird presents a rare opportunity to encounter this extinct species through "sonic fossil" soundscapes and breath-taking painted landscapes.

(3) *Step to the Line*[7]

Director: Ricardo Laganaro; USA, duration: 12 minutes

> VR documentary shot entirely on location in a California maximum security prison, *Step to the Line* is a documentary that aims to provoke a transformation in the spectator's eyes about prisoners, the US prison system, and the spectator themselves. *Step to the Line* is a story of the consequences of systematic racial inequality and an exploration of the ways lives are changed when someone serves time in prison.

The first and third movies were VR documentaries, while the second film was a VR animation. The content, led by spoken narrative and music, was cognitively clear, evocative, and affective, but different in each film. Virtual reality headsets provided the audience 360 degrees of vision. Audience movement was limited, as it was a seated experience. Swivel chairs provided an opportunity for smooth motion to experience different parts of the virtual reality. The length of the total VR art experience was about thirty-five minutes.

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[6] This can be viewed at https://www.viveport.com.
[7] The trailer can be viewed at https://vimeo.com.

Whist: semi-directed engagement

Whist – a VR dance performance developed in 2017 by choreographers Esteban Fourmi and Aoi Nakamura (AΦE) – was presented during the Dance Banbury festival organised by the Mills Art Centre in Banbury, North Oxfordshire, England on 20–21 July 2019. The festival celebrated "cutting edge dance from leading professional companies to push the boundaries by combining non-traditional dance elements; from augmented reality to parkour whilst blurring the lines between watching and becoming part of the show" (Prestidge, 2019). *Whist* was presented ten times during two days in a pop-up venue, one of the unused shops in Castle Quay Shopping Centre. I ran data collection during each of the shows.

Dramaturg Amanda Fromell, who collaborated with the *Whist* principal creators, best represented the content of the artwork (this description was not provided to the audience):

> You enter the room where the performance is going to take place and see a range of different sculptures; a large black cube speckled with white lines, a quadrant made up of thin white lines, melting into a black pool on the floor. You are given a VR headset and the experience begins. Through the headset, you see a symbol, across your vision, an augmented form in front of reality. You are instructed to find an object in the room that matches that symbol, walk up to it and align the real object with the augmented one. When you do, reality ceases and the VR experience begins. [...] Whist draws on Sigmund Freud's study of the unconscious. The piece is a series of filmed performances experienced through a VR-headset and earphones, where characters inspired by well-known Freudian case studies, such as The Wolfman, Little Hans and Anna O, are presented through a range of different, often dreamlike, scenes. This dreamlike quality physicalizes the unconscious, as we are invited to step into the inner, private worlds of the characters, where their fears and desires come alive. (Fromell, 2018, pp.139–140).

The contemporary in its' arts form project had a non-linear story and open structure of several (up to nine) episodes, the exact number depending on the audience's unconscious choices. *Whist*'s unique dramaturgy was led by the gaze of the audience member, as the technology accounted for and responded to it in real-time. The content, led by spoken narrative and music, was cognitively demanding, evocative and affective, providing opportunities for a diversity of possible emotional responses in different episodes. The length of the arts experience was between thirty-five and fifty-five minutes, depending on the audience's response to the story. Virtual reality headsets provided the audience with 360 degrees of vision. The experience required some movement – slow walking, adjusting posture to objects, and sporadically taking off the

headset between scenes and limited moves during episodes that lasted a few minutes.

3.5 Recruitment of participants

The experimental nature of the project lay beyond sample size and manipulation of the circumstances by the researcher. The research design incorporated artistic content presented in real-life situations, both not manipulated by the researcher. Two case studies involved real audiences – people who decided to participate in the arts presentations motivated by reasons (discussed later in chapter 5 and 6) that were not financial or related to academic remuneration (taking place in many experimental psychology studies). It needs to be noted, therefore, that the study explored audiences, so people that attend arts events, rather than non-audiences or people resistant to arts attendance. A consequence of the decision to fully embrace the real-life audience experience of engagement with arts was settling for self-selected participation in the artwork presentation. It also means that I did not influence the selection of audience members from which I collected biometric data. A first come, first served tactic was implied in this regard, as, up till the last moment, it was unclear how many people would participate in every presentation. For the selection of participants for in-depth analysis, I used purposive sampling.

Self-selection is considered a selection bias in statistics when, for hypothesis testing, researchers randomly select the sample from the population to get "accurate statistical evidence on the distributions of variables within the population" (Eisenhardt, 1989, p.537). This issue relates to the previous discussion on creating conditions for generalisability. In qualitative research, statistical representativeness is replaced by the aim

> first, to identify groups, settings, or individuals that best exhibit the characteristics or phenomena of interest, and second, to select those that are most accessible and conductive to gaining the understandings you seek. (Maxwell, 2012a, p.94).

Strategic "purposive sampling" is considered by Palys as synonymous with qualitative research (2008, p.697). Specifically, purposive sampling was used in my study to select for in-depth analysis the extreme, polar cases. In extreme cases, the process of interest is "transparently observable" (Pettigrew, 1988, in Eisenhardt, 1989, p.537), so they increase "opportunities to develop concepts in terms of their properties and dimensions, uncover variations, and identify relationships between concepts" (Corbin & Strauss, 2015, p.146). The identification of extreme cases in my data provided the needed diversification of and a broader look at experiences of engagement (Eisenhardt, 1989, p.537;

Palys, 2008, p.697). On the other hand, looking at similar cases provided an opportunity for uncovering causative elements.

The total number of participants was limited by the capacities of each project and the venues, as well as the quantity of VR equipment. As Limina Immersive in Bristol treated the project as an external event, I recruited for the *Bristol* shows by disseminating invitations for a free “VR art showcase and a study of audience engagement with art”. Information was distributed through an Eventbrite event, social media, emails sent by local university contacts, direct emails to arts venues, and private connections. People passing by the Watershed public space were invited to participate when there were still headsets available. Most of the *Whist* audiences were comprised of the Banbury Dance festival audience pre-booking a free ticket through the festival website. Also, in this case, I issued a direct invitation to people passing by in the shopping mall. Twenty people partook in the *Bristol* project, while thirty-six participants attended *Whist* presentations. All audience members were asked to complete questionnaires, yet, some questionnaires were incomplete, so nineteen and thirty sets of both questionnaires, respectively, were available.

An issue I wanted to address was the size of the sample. The idea was to increase the accuracy of comparisons with other experiments done in physiological studies in the arts. Therefore, being aware that parts of empirical material might be damaged, the goal was to collect physiological data from at least fifteen participants per case study and device type. Unfortunately, due to the late delivery of Ring devices with no instructions, the data from the first six presentations of *Whist* were not recorded (the device's memory card was not activated on the first day of recordings). Also, it was impossible to organise more presentations in Bristol. Therefore, data gathered during the study concerns a smaller (than expected) number of participants. Nevertheless, this does not diminish the value of the study. As explained earlier, the research was exploratory and not confirmatory, and I have never aimed for statistical generalisation. Moreover, meaningful data analysis can also be undertaken on smaller datasets (Lindstrom, 2016; Reill, 2016).

Table 3.2 Data inventory

Art	Total number of participants	Both questionnaires	Ring data	Garmin data
Bristol	20	19	8	5
Whist	36	30	12	14

3.6 Three stages of data collection

The construction of the research included three timeframes for data collection pre-, during, and after the experience. Before and after the arts experience, audience members provided (qualitative and partly quantified) information responding to (pre-and post-experience) questionnaires[8]. Questionnaires were filled (on paper) by the whole population of each case study. Some of the participants also took part in semi-structured interviews a few days after the event. Questionnaires and interviews were built on insights from the literature review and integrated elements of (1) WolfBrown's applied research into the impact of live arts (Brown & Novak, 2007; Brown, 2008; Brown & Novak-Leonard, 2013), and (2) the User Engagement Scale Short Form developed in the domain of online HCI (O'Brien, Cairns & Hall, 2018). The authors developed those studies and their measurement tools to ensure replicability, so their comprehensive descriptions enable adaptation to other studies. Operationalised for my pre- and post-experience surveys, components of engagement, for example, constructs such as anticipation, attention, aesthetic appeal, became proxies for variables that could not be directly observed (DeVellis, 2016, p.36). During the event, measurements of physiological responses (providing quantitative data) were carried out. They provided insights into the dynamics of processes that unfolded during the arts events. In general, the design of the study and PhD framework concentrated on immediate and situational, and not longitudinal, aspects. However, the pre-event personal context (explained through questionnaires) revealed the audience's past behaviours. Also, some interviewed audience members referred to their and their family members, previous (not always directly arts-related) experiences. The research design integrated qualitative and quantitative data into one framework organised by engagement timeframe rather than a method. That supported the depth of analysis and study's relevance for a diverse audience (Bazeley, 2015, p.296).

3.6.1 Defining personal contexts – pre-experience questionnaires

My pre-experience questionnaire was developed after an analysis of the methods and findings of WolfBrown's (Brown & Novak, 2007) research about the impact of performing arts events. The pre-experience questionnaires – both WolfBrown's and mine – collected information about the audience pre-event context, as that is fundamental to an assessment of both the impact and the

[8] See appendices C and D.

engagement processes. Yet, I approached the pre-experience personal context differently, even if it is (partially) aligned with Brown and Nowak's "readiness to receive" (2007, p.22). The definition of readiness to receive as

> individual's level of preparedness to engage [...] including mental and emotional state immediately prior to the experience, as well as the amount of context that they [audiences] have on what's about to happen. (Brown & Novak, 2007, p.22).

have underlined valid factors, but the readiness concept is itself debatable. The word readiness implies the existence of a state when someone may have a very high level of readiness and a state when someone is not ready to receive. That places the concept of readiness in the realm of ethical concerns of audience development. The authors, however, have recognised that attendance is already a sign of readiness to receive and follow-up studies by Brown and Ratzkin underlined concentration on audiences rather than non-attenders (e.g. Brown & Ratzkin, 2012). Their concept of readiness to receive has explored, thus, the personal context on the continuum from being somewhat to fully ready for an arts experience. Three aspects contributing to readiness to receive – context, relevance, and anticipation – might be potent factors of pre-experience conditions (Brown & Novak, 2007). However, WolfBrown's analysis has demonstrated the challenge of defining overlapping sub-constructs, which impacts the interpretation of the study results.

After the literature review, I considered personal pre-experience context as a confluence of feeling, thinking, and doing. I divided those issues into two aspects. First, I collected information about current (pre-experience) anticipation or affect, so in-the-moment feeling. The psychological state has been considered a variable impacting the artistic experience (e.g. Kaplan, Bardwell & Slakter, 1993). Thus, the pre-experience questionnaire included five questions about mental state/anticipation, which I considered declared anticipation. In addition, in the analysis (explained later in this chapter), I modified the declared anticipation by calculating (inferred) bodily arousal. The second aspect of the personal pre-experience context studied was the propensity for arts or technology, which encompassed past actions related to thinking (e.g. knowledge), doing (e.g. attendance), and the mix of both (e.g. previous experience). I specified propensity in line with my case study characteristics as a predominant focus – the propensity for the arts and technology. Such division of audience members' pre-experience personal context supported the comparisons (of the same features) in two other stages of my audience engagement study during and after the arts experience.

I merged two of Brown and Novak's readiness to receive constructs – context and relevance – into one concept of propensity. The propensity questions in my pre-experience questionnaire, as the study included virtual reality art, collected information about potential focus on artistic and technological matters. That included information about the level of knowledge, interests, and motivations for attendance in that specific arts event and arts in general. Those aspects indicated individual interests (Krapp, Hidi & Renninger, 1992), so interest in a longer timeframe, as "a more-enduring personal characteristic [is] influencing choices and behaviour" (Ainley, 2017, p.6). Many researchers have underlined that interest is not purely a characteristic of an individual but "identifies a quality of relation between a person and some content of their environment" (Ainley, 2017, pp.4–5). Interest as a state uniquely combines an individual's past and immediate experiences with a specific object or content. The individual's personal history may impact the relations and balance among these components (Ainley, 2017, pp.4–5). My propensity questions did not gather material to judge the quality of humans or their capacities for meaning-making. They allowed an understanding of the more likely direction of each audience member's focus (on arts or tech) during the arts experience. The question directly asking about the reasons for this specific attendance added specificity to the investigation of internal and external motivation in engagement.

It must be underlined, however, that any definition of a personal pre-experience context (so also WolfBrown's and mine) bounds something latent, not directly observable, and variable rather than constant. However, more questions increase the reliability of the scales (DeVellis, 2003, in O'Brien, Cairns & Hall, 2018, p.30). Building each of my pre-experience context's constructs on answers to several (more than WolfBrown's) elaborated issues increased the reliability of my pre-experience questionnaire.

Composition of pre-experience questionnaire

As I already mentioned, audience members' pre-experience personal context was looked at from the position of feeling (now) and thinking and doing (related to past). Pre-experience questionnaire (appendix C) collecting information about personal context included twenty-nine questions, a mix of Likert-scale and multiple-choice questions that gathered information about audience members:

(1) pre-experience mental state and declared anticipation (feeling), asserted by the levels of anticipation, curiosity, excitement and confidence of enjoyment (questions 1–4) and declared focus (question 25);

(2) propensity (thinking and doing) – a/ thinking: attitude toward arts and technology, artistic and/or technological interests, competences and skills and motivation for attendance; b/ doing: previous actions – frequency of arts attendance and tech/VR usage, previous experiences with both arts and technology. Propensity was examined in two separate directions – audience focus on arts (questions 11–14, 20–24) and technology (questions 6–10, 15, 19, 24), each built on eight questions.

(3) demographic data: gender, age group, education, cultural background were collected to build a more detailed audience profile and enable a more accurate comparison with the results of other studies or segmentation models.

3.6.2 The latent engagement – collecting bodily signals during artistic experience

Exploring bodily engagement through biosignals added a vital layer to the study. Wearable sensors are promising instruments for conducting ecological (in real-life circumstances) research in psychophysiology. The physiological processes' measurement delivers temporal precision and continuous (in real-time) measures of mostly involuntary responses, so they provide data not reliant on participants' memory or verbal abilities (Kivikangas et al., 2010; Thomas, Crutch & Camic, 2018, p.66). Such measures allowed a focus to be placed on the moment-by-moment interaction and not only on a whole long-lasting experience (Bryan-Kinns, 2014, p.125). Psychophysiology builds on "hypothesis-driven" studies, which provide more rigorous tests of specific propositions through statistical analysis. But it also values exploratory studies, as they enable researchers to uncover unexpected matters (Cacioppo & Tassinary, 1990; Cacioppo, Tassinary & Berntson, 2007, p.856). Some methods, especially those studying brain signals, require a great deal of specialised expertise and are too expensive to be applied in humanities research (and arts practice). However, past results (e.g. of projects mentioned in chapter 2) have indicated that physiological data correlate with changes in the experience, even when studied in relatively simple scenarios. Combined with qualitative approaches, psychophysiological methods increase estimation accuracy in the experience studies (Kivikangas et al., 2010).

A deeper analysis of audience engagement as a process that is also latent suggested observation (using wearable sensors) and assessment of continuous bodily responses. The study followed current neuroscience's position that (as explained in chapter 2) the brain and the body of the perceiver are the real architects of the experience. The arts event influences temporal

reaction in the body and the brain, influencing heartbeat, sweat levels, blood pressure, breathing, temperature and cortisol levels, etc. These are independent of the perceiver's consciousness (e.g. Andreassi, 2000; Boucsein & Backs, 2008; Barrett, 2016). In my study, heart rates (HR), skin conductance (EDA/GSR), temperature (in the pilot studies only) and details of audience motion were collected, as they were assessed as feasible for analysis by the humanities researcher and proven to provide valuable insights into the engagement.

The physiological signals are, however, determined by the interaction of a variety of factors. Investigating them means looking at "events occurring outside the human body, which are related to events that occur inside the body" (Gratton, in Cacioppo, Tassinary & Berntson, 2007, p.835). Bodily signals under scrutiny – heart activity, skin conductance, and movement – are modulated by different branches of the nervous system and have distinct characteristics. Heart activity and skin conductance are both under the control of the autonomic nervous system (ANS) – a branch of the peripheral nervous system. Muscular activities are modulated by a different division of the peripheral nervous system – the somatic system (Andreassi, 2000). ANS is composed of the parasympathetic nervous system (PNS) – dominant when the individual is at rest (rest and repair) – and sympathetic nervous system (SNS) – principal in situations requiring mobilisation of energy (mobilisation and work). The heart is modulated by those two divisions of the autonomic nervous system, so interpretation of its activation is not univocal (Andreassi, 2000). Changes in the electrical properties of the skin represent the activity of one branch of ANS – the sympathetic nervous system (SNS) (Greco et al., 2016). Yet, in general, the nervous system is highly integrated, so it is difficult to interpret its actions. But my study did not explore the work of the nervous system but the arts engagement of specific audience members with particular artworks. I assumed that the physiological data offer insights when coupled with the narrative and form of artwork and the personal characteristics of the audience member. Heart rate and skin conductance response were previously considered indicators of arousal (Hopkins & Fletcher, 1994; Lang, 1994; Richardson et al., 2020), and skin conductance response – an indicator of emotional arousal (Latulipe et al., 2011). Therefore, the data from the heart, and skin and supplementary information from the audience provided an opportunity for a qualitative interpretation of, also invisible, engagement.

Even though I took the principles of physiological studies seriously, this research had no ambition to be treated as a full-scale study of human physiology or emotions. Nor did it strive for verified precision. Biosignals

accuracy was not essential (or achievable) in this exploratory real-life events' study by the humanities researcher. Nevertheless, biosignals (quantitative) data provided the premise for a discussion and comparisons of different engagement trajectories. They revealed trails of unfolding in-the-moment engagement and situational interest.

Biometric devices

The research aims and its exploratory scope primarily guided the selection of the tools for biosignals collection in this study. The idea was to collect data about bodily engagement through wireless, wearable, light, easy to place, and unobtrusive devices, which allow collecting real-time physiological information in real-world research scenarios. Such devices do not disturb the participant's natural behaviour, provide comfort for the user, and an agile arrangement for the researcher. However, the feasibility and accessibility of devices turned out to be a defining aspect of my research design and outcomes. The availability of instruments defined the data I could collect and the means for their analyses.

Due to their availability, I used three instruments in different stages of the research. They were two professional, research-grade wearables – Empatica E4 and Bitbrain Ring – that collect accurate and precise physiological data, and a less precise but affordable representative of Consumer Wearables – the Garmin vivosport smartwatch. All three devices were able to be fitted unobtrusively and discretely on audience members' wrists (Empatica and Garmin) or fingers (Ring). In the testing phase, I used all devices, but I conducted most of the tests with Empatica, which turned out to be unavailable during the main stage of the research (borrowing it from any UK source was impossible while buying the equipment was too expensive). Ring and Garmin vivosport were tested in a much shorter (a few hours) timeframe. The principal case studies (*Bristol* and *Whist*) relied on data from Ring and Garmin vivosport.

The unavailability of Empatica E4[9] had a detrimental impact on my research. This device is light and easy to administer instrument looking/feeling like a smartwatch. It includes an EDA sensor (GSR sensor) that measures constantly fluctuating changes in electrical properties of the skin, a PPG sensor that measures Blood Volume Pulse (BVP), and a three-axis accelerometer that captures motion-based activity. The E4 also reads peripheral skin temperature, so collects data related to more diverse physiological processes. It includes an internal real-time clock and event mark button to tag events and link them to

[9] See more information at https://www.empatica.com.

physiological signals. The function of timestamps allows for more precise alignment of the data and device positioning on the wrist reduces the amount of data error. Moreover, Empatica enables the use of dedicated data analysis software, making access to row data and data analysis easier. Nevertheless, I decided to continue my research without Empatica and secured Ring as a replacement.

The Ring is for a lab use designed biosignal device. Its integrated sensors monitor skin conductance (electrodermal activity – EDA/galvanic skin response – GSR) and cardiovascular (blood volume pressure – BVP) activity from which heart rate and heart rate variability can be derived. EDA – “Changes in the skin’s electrical conductivity due to changes in the amount of sweat present in the eccrine sweat glands of the palm” (e.g. Khalaf et al., 2018, p.7) – is collected by an optical sensor. Heart rate measurements are also derived using an optical method for measuring changes in blood volume under the skin (photoplethysmography, PPG) (Bent et al., 2020). The sensors are positioned on the fingers’ first and second phalanges, which are considered optimal measurement points. The device also captures data produced by finger movements thanks to the three-axis accelerometer (ACC).

A wrist fitness tracker, Garmin vivosport[10] includes a heart rate monitor and accelerometer. Garmin gathers limited and less reliable data, but I selected this smartwatch for two reasons. First, it is possible to obtain raw heart rate data through Garmin’s management platform to process it in external software. Other low-cost smartwatches did not provide that function at that time of my data collection. Second, the smartwatch’s affordable price could support the possible usability of the watch (or similar devices) in further (including the applied) research.

It must be noted that significant differences between devices in data precision have been identified (Bent et al., 2020). Wearable sensors vary in signal quality and generation of measurement errors (so-called artefacts). The measurement errors appear especially in certain conditions, e.g. during movement – walking and hand moving, when participants are talking, under stress, or have larger wrists (Ragot et al., 2017; Menghini et al., 2019). Moreover, in Garmin, wearing a watch too tightly, participating in activities that cause flexing the wrist, and tattoos were reported as factors affecting performance (Bent et al., 2020). Statistically significant differences between devices have also been observed during changes in activity and between activity types (Bent et al., 2020).

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[10] See more information at https://buy.garmin.com.

However, there are no systematic comparisons of the reliability of the three tools I used in my study. After a comparison of different wearable sensors (including Empatica and Garmin watch), Bent and colleagues have concluded that various wearables are all reasonably accurate at resting and prolonged elevated heart rate. I resolved the untrustworthiness of devices' clocks or their setups affecting data synchronisation (Johnson, 2016) by analysing data against an experience's content not in precise moments but in broader time scales. The organisation and analysis of my artistic adventures in the testing phase prepared the ground for informed planning, collection and exploration of physiological data from my primary case studies.

Physiological data collection

Physiological data – heart activity and skin conductance, as well as movement – were continuously measured throughout the arts experiences, simultaneously for up to five participants as two Ring devices and three Garmin watches were available. The data streams for each participant were fed into my computer wirelessly – directly (data collected by Ring) and indirectly (through the Garmin management system). Data recorded via Rings were saved on a memory card. To track the exact time of components of experience, timestamps (in seconds) were recorded on the Unix Time Stamp platform (Dan's Tools, 2022) open on my phone. For the *Bristol* experience, I was able to note the start of each artwork's segment and the end of the experience. The nature of *Whist* was different. In this case, each participant initiated and ran the artistic experience individually, so there was no possibility to timestamp changes in the content. Only the start of the first participant was recorded for general reference. After the experience, participants' identification numbers were paired with the relevant biosignals.

The limitations and challenges of physiological data collection in more complex situations were addressed in several ways in this PhD. It must be noted that discarding movements during physiological data collection is recommended (Ragot et al., 2017; Menghini et al., 2019). That means that biometric studies of arts involving participants' motion are impossible. Indeed, movement effects physiology, and physiology effects the experience. Movement, however, is not always an error but can be an integral part of an experience. Therefore, studying the effects of movement on experience and physiology is also necessary. Instead of creating circumstances without movement, the artistic projects included expected, in specific moments, motion. Another problem of different wrists' sizes was solved by providing equipment with adaptable

wristlets or bands. Asserting difficult and noisy issues of causality in a complex system of the body where cells and neurons continuously receive input from many sources (Engel, Friston & Kragic, 2015) was possible thanks to virtual reality, which limited external distractions. Each case study was conducted in similar circumstances and included emotionally arousing content. Those decisions aimed to limit differences in physiological signals' recognition capabilities between sensors (Ragot et al., 2017) and supported comparisons between participants.

During *Whist*, I collected physiological data from twenty-six people, so 75% of the participants. Ring device collected data – HR, EDA, movement – from twelve people, while the Garmin smartwatch collected heart rate from fourteen people. In *Bristol*, I collected physiological information from thirteen participants. Ring (HR, EDA, movement) collected data from eight and Garmin (HR) from five people. Yet, records had different levels of artefacts impacting data quality.

3.6.3 Post-experience reflections

In the post-experience phase, I approached audience members' experiences also from angles related to feeling, thinking, and doing. The questionnaires gathered information about the characteristics, features, and qualities of individual VR arts experiences, for example, whether audience members considered experience as more intellectual or emotional and whether they paid more attention to (a) arts or technology and (b) art form or content. There were also questions to cross-examine pre-experience issues. For example, "In what art activity will you most probably engage with in the near future?" was treated as a control question for general artistic priorities (expressed in the pre-experience questionnaire). Other questions, such as "Would you consider yourself more as a person: having specific, fixed interests; being open to new experiences, or both" and if, in general, the audience member considered themselves a relaxed person, added information to the individual characteristic and pre-experience context. The answer to the latter question also provided information for the biometric data analysis, adding contextual explanation about the aptitude of changes in physiology. Other questions directly linked to the potential of facilitation of involvement: the wish to participate in related arts talks, the change of attitude towards VR art, the reasons for arts events attendance, and non-attendance. The post-experience questionnaire included also open-ended questions to provide an audience space for additional comments and feedback.

The post-experience questionnaire included the User Engagement Scale Short Form (O'Brien, Cairns & Hall, 2018), a statistically validated tool (proven to measure what it is supposed to measure). Building on Csíkszentmihályi's flow theory and Dewey's *Philosophy of Experience*, O'Brien and Toms have defined engagement as a "quality of user experience with technology that is characterised by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest, and affect" (O'Brien & Toms, 2008, p.960). Those factors have been incorporated in the User Engagement Scale (UES) to evaluate user experience with computer-mediated systems (O'Brien, 2016a, p.19). A multitude of online digital engagement studies using the scale have demonstrated some limitations of the tool:

> person-dependent characteristics, such as preferences, seemed to factor heavily into perceived engagement, sometimes independent of the system or construct of interest in the research study. (O'Brien, 2016b, p.46).

Those results and challenges of filling in a long questionnaire encouraged authors to create a shorter version of the tool. The UES short form has a four-factor structure with focused attention, aesthetic appeal, perceived usability, and reward factor sub-scales. The reward factor included merged items from the first UES three sub-scales: felt involvement, novelty, and endurability (O'Brien, 2016b, pp.46–47). The short scale comprises twelve questions, each of four engagement aspects building on answers to three questions. The authors have not determined levels of low or high engagement. The multi-dimensional form of the scale permits to decide according to specific study circumstances which aspects of the measured quality of engagement have greater weight. For my study, I decided to keep the equal weight to all scale's sub-constructs, as the literature review did not justify any prioritisation. Therefore, I integrated the scale with other post-experience questionnaire items without any changes not to threaten its construct validity.

Composition of post-experience questionnaires

The post-experience questionnaire (appendix D) consisted of thirty questions. A mix of Likert-scale, multiple-choice (quantitative), and open-ended (qualitative) questions aimed to collect first-hand information and reflection about the audience experience. They included:

- twelve questions (all items) from the User Engagement Scale short form (O'Brien, Cairns & Hall, 2018);

- questions linking back to anticipation and artistic and technological propensity;
- questions about the arts (content and form) features influencing the specific experience; and
- about attendance and engagement with arts in general.

In the post-experience questionnaire, the multiple-choice questions included pre-determined responses, but some allowed the respondents to add their specific answers. The aim was to limit the threat to the validity when the results are determined by the researchers' judgement of relevance when composing the questionnaire (Alasuutari, 1999, p.41).

Semi-structured interviews

Semi-structured interviews were conducted two to three days after the experience with eight audience members. After inspecting the questionnaires, I selected participants from groups with similar and distinct characteristics, and based on their appraisal of the experience. Out of the selected group, I conducted interviews with audience members that agreed to an interview and were able to partake in it. In the case of *Whist* seven interviews were done in person. For Bristol, only one interview was conducted by Skype, as I left Bristol the day after the data collection. To enrich the *Bristol* data, an additional online questionnaire was distributed to participants and five attendees provided new comments.

The aim of interviews was to deepen understanding of the engagement during the artistic experience and put more light on individual personal pre-, during, and post-experience contexts. The interviews (appendix E) included questions about pre-experience behaviour – how people learned about the project and if they sought additional information about it. The questions about the arts experience covered aspects of technical setup, feelings of immersion and engagement, and memories of the content. The post-experience topics related to behaviour and communication about the meaning or merits of this VR art with others (who attended or not the event). Questions were modified to the context of a specific person, and emerging interesting issues were probed. The interviews aimed to facilitate participant narrative, not to validate the investigator's preconception of their engagement.

Analysing data for processes and trends

The interdisciplinary study of engagement as a dynamic process required the creation of bespoke data representation and analysis procedures. In the analysis phase, I continued exploration through knowledge and experience-based experimentation with existing and new analytic frameworks and tools. The critical realism founding position implied going beyond experience description and suggested discussing causes, reasons, and effects connecting personal and the artistic context. Mixed-methods research still struggles with the visions of how to combine – bridge or integrate – qualitative and quantitative methods (Yin, 2015, p.659). Multilevel mixed design (Creswell, 2015, p.47), where “mixing occurs across multiple levels of analysis, as QUAN and QUAL data from these different levels are analysed and integrated to answer aspects of the same question or related questions” (Teddlie & Tashakkori, 2009, p.136), best fitted the purpose of the study. I aimed to develop a testable framework for analysis and comparisons of engagement processes that unfold in time in dynamic conditions. Furthermore, the literature review indicated the importance of incorporating human heterogeneity in the deliberation. To use the same analytical framework in the highly complex study, textual and numerical information collected was brought to a uniformed – textual – basis. Empirical material’s transformation to form the joint narrative allowed for a valuable dialogue between different sets of data. By assessing the relationships between operationalised constructs (e.g. anticipation, propensity, aesthetic appeal), I indirectly inferred the relationships between constructs (DeVellis, 2016, p.36) that constituted and impacted the process of engagement. As the separation of process from the outcome seemed artificial, the study combined process evaluation of the temporal experience of engagement with an outcome evaluation, useful for facilitation of involvement.

Analysing data for the process requires identification and integration into the findings patterns and variations in data (Corbin & Strauss, 2015, p.184). In such a way, it is possible to demonstrate how different conditions influence actions and interactions. To support the identification of similarities and variations and to track causes, reasons, and effects, I grouped data in three different ways during the interpretation phase. The analysis included individual engagement, group-specific – comparison of engagements of clusters of participants, and general engagement – involving exploration of data coming from all participants. The empirical material from each phase was analysed independently and in relation to each other through classical reasoning by induction from specific to general, mainly used in qualitative studies.

All the empirical material collected was explored through analytical humanities lenses as the complexity and the breadth of focus were more important in my study than the precision of the study findings (Hammersley, 1992). First, quantitative data from questionnaires were analysed using (elementary) statistics, biometric data were visualised in graphs, but as a second step, both were qualitised. Examples of such qualitising data are rare, but this method has previously served to generate qualitative group profiles based on quantitative survey scores (e.g. Teddlie & Tashakkori, 2009, p.135). That is what I also did in the analysis of the surveys. I calculated means to different questions (grouped in analytic concepts explained later in this chapter) and compared responses using automatic processing in Excel. For group analysis, I used scatter plots (diagrams used to display relationships between two numeric variables, presented in chapter 6). The language of mathematics is acausal, and models of accounting frameworks (for example, the Likert-type surveys I used) can calculate the components of change but do not indicate the mechanisms and causes of that change (Sayer, 2010, p.122). I therefore decided to transform – qualitise – processed quantitative data (biosignals and surveys results) to extract meaning from them (e.g. Caracelli & Greene, 1993; Nzabonimpa, 2018). Quantitative data was therefore analysed twofold: first, as a comparison of arithmetic means (from Likert-scale answers), representing conceptualised constructs (described earlier in this chapter) to select individuals for more detailed exploration and study group trends; and subsequently, the scores were converted into a narrative consolidated with qualitative material (Caracelli & Greene, 1993, p.197). Also, the graphs created on the physiological (numerical) information were consequently interpreted in a word-based manner (see later in this chapter and subsequently in chapter 5) to integrate them with the narrative. The results from the parallel analyses of the qualitative, quantitative, and synthesis of (transformed) quantitative and qualitative data constituted one analytic framework addressing the research questions.

3.6.4 Analysis of personal context

Personal context, as previously explained, was approached not from the perspective of capacities for meaning-making but pre-event feelings of current anticipation and propensity related to past actions. As far as feelings are concerned, WolfBrown's research (e.g. Brown & Novak, 2007) has explored only declared anticipation. My literature review indicated that assessment of a mental state is incomplete without considering inner processes. Those impact the body's energy level but are not always conscious. In the attempt to include

at least some of them, I inferred bodily arousal by looking at the novelty aspect of the experience. That is because, according to neuroscience, we are more alert when we enter new territories and experience new things (Eagleman, 2020, p.435). Therefore, I studied the pre-experience mental state (feeling) in two ways: initially, as expressed by audience members' levels of anticipation – declared by the audience – mood, curiosity, excitement and confidence of enjoyment and declared focus; and next, as inferred pre-experience arousal – assessed by the researcher – the levels of intrinsic anticipation in each person's broader personal contexts. Propensity (thinking and doing) was analysed on questions related to (a) attitude toward arts and technology, artistic and/or technological interests, competences and skills and motivation for attendance (thinking); and (b) previous actions – frequency of arts attendance and tech/VR usage, the previous experiences with both arts and technology (doing). Demographic information collected, including gender, age group, education and cultural background, served as a frame for audience members' engagement profiles. As I already mentioned, an examination of the surveys revealed some missing responses, so questionnaires from thirty participants of *Whist* and nineteen participants in *Bristol* were analysed.

Coding for audience profiling

The pre-experience questionnaire included twenty-nine multiple-choice questions: seventeen questions on the Likert scale and four questions related to participants' socio-demographic profiles. The Likert five points scale allowed expressing how much the person agrees or disagrees with a particular statement. Depending on the question, collected data was coded normally, or reversely. In normal coding, one point was applied for the "strongly disagree" answer, three points for "neither agree nor disagree", and five points given for "strongly agree"; for reverse coding, the inverse order was applied.

Figure 3.3 Coding of quantitative information

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Normal coding	1	2	3	4	5
Reverse coding	5	4	3	2	1

For data analysis, Likert-scale questions representing similar matters were combined into four composite variables. Their scores estimated four overarching issues: arts propensity/focus, technological propensity/focus,

declared anticipation, and pre-experience arousal. The scores were calculated as means for each sub-scale, i.e. overall sum of points for each construct was divided by the number of questionnaire items.

Each of two variables – artistic and technological propensity – was constructed on (summed and converted into mean values) answers to eight questions:

- Propensity for the arts (questions 11–14, 21–24) related to attitude, motivation, awareness, and knowledge about arts, and attendance in arts events.
- Propensity for technology (questions 6–10, 15, 19, 24) encompassed attitude, motivation, awareness, and knowledge of technology and VR, as well as previous experience with virtual reality.

In both cases, normal coding was applied, as answers related explicitly to information provided by the participants. All variables within each group were assumed to have equal importance.

Two other constructs of pre-experience context related to feelings – declared anticipation and pre-experience arousal – were interrelated. The first estimated level of anticipation building on audience members' conscious assessment of their states, while the other considered a broader context of the experience. Pre-event psychological state – the level of arousal – was treated as an attempt to assess the intrinsic levels of anticipation, arousal, or comfort so moving from declared to the broader (nonconscious) context. I assumed that a high level of arousal signified a low level of pre-experience comfort, and the opposite – a low level of arousal meant a person might feel very comfortable in the whole situation.

Two constructs relating to feelings were estimated differently. Declared anticipation was calculated as the arithmetic mean of audience answers to five questions (1–4 and 25) regarding asserted levels of curiosity, excitement, readiness for absorption and confidence of enjoyment, and a question about the declared level of current mental state – between distraction and focus. Pre-experience arousal at the start of the experience built on the answers to twenty-two questions. The construct of pre-experience arousal took into account answers to questions related to declared anticipation (1–5) and declared focus (25), and was supplemented by answers to questions relating to various aspects of novelty (6–17, 19, 21-23). Numeric answers to questions 1–5 and 25 were summed normally, while novelty questions (6–17 and 19, 21–23) were coded reversely. All answers contributing to those concepts were assumed to have equal importance.

The so-called novelty questions (6–17, 19, 21–23) related to two constructs – propensity (for arts or technology) and pre-experience arousal – but were counted in both cases differently. For example, for the low frequency of attendance, a first visit to the event organised by the institution or less than once a year visits to arts institutions in general, the person got one point in propensity for the arts calculation (very low level of propensity for the arts) and five points in pre-experience arousal (very high level of novelty). Similarly, a later question (21) identified the specific trait of propensity for the arts – if an audience member was an enthusiast of emergent, contemporary arts, or established cultural forms, neither or both was calculated twofold. For propensity for the arts the answers “both”, “contemporary” or “established art”, got five points, while “neither” got zero points. In the arousal construct, those answers were weighted differently. For both kinds of art, one point was administered (due to high level of pre-experience comfort regardless of the experience form); for an indication of contemporary or established art – three points (neutral state of comfort, as a form of VR art was not fully revealed before the experience); and for “neither” – five points (new experience meant higher alertness).

As mentioned before, pre-experience arousal was treated as a modifier of the assessment of declared anticipation made by each audience member. I hypothesised that pre-experience arousal was needed for establishing a prior benchmark of expectations, a baseline in pre-experience context for further analysis of physiology. Establishing a classical biological baseline was not possible in a real-life situation. Creating artificial conditions – for example, instructing audiences to sit still for some minutes, to not drink coffee/alcohol, to not climb the stairs before the experience – would devoid the experience of its real-life context. Therefore, to estimate pre-experience arousal and establish a provisory baseline, I used a mix of qualitative and quantitative approaches.

Analysis of codes and qualitising

The summed-up data for each construct (propensity for the arts and tech, declared anticipation, and arousal) were analysed in specific numerical ranges to interpret the mean score of each construct, as presented in the table below.

Table 3.4 Interpretation of mean values

Mean score	Answer	In propensity represents	In arousal represents
1–1.80	strongly disagree	unimportant, very low	very low arousal (very high level of comfort)
1.81–2.60	disagree	low importance, low propensity	low arousal (high level of comfort)
2.61–3.40	neither agree nor disagree	moderately important, neutral	moderate, neutral level of arousal, comfort
3.41–4.20	agree	important, high propensity	highly aroused (low level of comfort)
4.21–5	strongly agree	very important, very high propensity	very highly aroused (very low level of comfort)

That analysis led to preparing short qualitative profile descriptions for each participant with their guiding focus demonstrated in the profile title. The title presented in small letters as “tech” or “arts” indicated a moderate score for propensity in the specific area; “TECH” and “ARTS” (in capital letters) indicated a high range of propensity, while “TECH!” and “ARTS!” (capital letters with exclamation mark) indicated very high propensity. “?” – a question mark in the title presented a lack of focus as both areas received very low scores below average. Pre-experience questionnaires allowed labelling each participant’s state before the experience acknowledging explicit information provided by the audience and implicit factors inferred from their answers (appendix F).

For example:

- one of the participants (Hanna, *Bristol*) was portrayed as having: “ARTS!/TECH!” focus. She was an educated female, with expressed pre-experience very high anticipation (4.4 points), but context demonstrated low arousal (2.45, good level of comfort), propensity for the arts very high (4.25), propensity for tech also very high (4.5);
- while another (Dan, *Bristol*) had an unclear “?” focus. This participant was an educated male with expressed pre-experience very high anticipation (4.4 points), context demonstrated high arousal (3.77), low propensity for arts (2.5), and low propensity for tech (2.25).

Qualitising led to audience qualitative profiling. Qualitatively described numerical responses connected to the conceptualisation and operationalisation

of the survey questionnaire items (Nzabonimpa, 2018, p.7). It was recognised that respondents interpreted both verbal anchors and the numerical values attached to them, deriving their meaning from the particular context of the questionnaire (Sandelowski, Voils & Knafl, 2009, p.212). Profile descriptions formed the base for comparisons of each participant's states before and after the experience and supported analysis of physiological data collected during the experience: “[l]inking numerical responses to qualitative nuances that trigger them is used to arrive at a meaningful interpretation of the quantitative results” (Nzabonimpa, 2018, p.13).

3.6.5 Analysis of latent engagements

Biosignals and bodily movement information collected during the arts experiences were cleaned and transformed into graphs, which allowed observation of internal processes, audiences’ relocations, and motion. As mentioned in the previous chapter, audience members’ attention, thus also engagement, is partly steered by stimulus-driven bottom-up processes, as the pattern of psychophysiological responses varies with stimulus properties. Since this project studied engagement during highly immersive VR art, it was valid to assume that processing mechanisms stimulated by the artwork could be visible in participants’ physiology.

Permanent and complex internal processing mechanisms are non-linear, but physiological data representation can be studied in a linear form, as physiological events evolve temporally (Gratton, 2007, p.841). I hypothesised that the graphical representation of biometric data provided insights into cognitive processes (thinking) and emotional resonance (feeling) and allowed to document movement during selected arts experiences. As my research involved two case studies – directed (more static) and semi-directed (involving slow movement) artistic experiences – I assumed that graphs from biometric data might indicate differences or similarities in both types of engagement paths. Moreover, as qualitative information collected led to building detailed audience members’ profiles, together with the biometric graphs, it allowed for comparisons of engagement trajectories of people with similar and different characteristics.

To counter the difficulty of comparisons caused by individual psychophysiological variability, standardisation/normalisation of biosignals is usually advised. Standardised measures in which the data are transformed to have equal means and standard deviations are usually applied in comparisons (Gratton, 2007, p.855; Fleureau, Guillotel & Quan, 2012). Statistical

computations neutralise the variance in cardiac patterns caused by non-stimuli-related physiological functions and external distractors, for instance, the conditions of data collection (temperature or humidity). However, signal averaging also defuse specific characteristics of individual processes and eliminates potentially relevant information about the person-to-person variability of the signal (Andreassi, 2000; Gratton, 2007, p.835; Kim, 2007, p.5; Suckfüll, 2010, p.53). It also limits the exploration of physiological reactions concerning contextual information (Kim, 2007, p.5). The immersive technology in my case studies reduced external distractions, and conditions of data acquisitions were stable. The study aimed to increase understanding of the engagement phenomenon, so specific, rather than standardised, data were more revealing and appropriate. I decided not to normalise data and create a new, more humanistic-narrative way of information analysis.

However, before the interpretation, data cleaning and processing were completed. Because Bitbrain, the developer of the Ring device, did not provide an analysis platform and Garmin software was too generic for running the detailed exploration, the preparation of the physiological data for analysis included the development of the software to clean and visualise the empirical material. Those actions were done by a data scientist.

Preparation of biometric data

The physiological data was processed to clean the signal noise and artefacts to increase the accuracy of the analysis. The artefact term indicates the large, isolated data records not related to the stimuli but other factors. For example, missed heartbeats in measures of heart rate are the artefacts, as they originate from outside the system of interest. Artefacts, missing data or outliers, could obliterate the signal and skew the analysis; thus, automatic and manual inspection of data to detect, eliminate, or compensate for the effects of artefacts is always necessary (Gratton, 2007, p.849). The automatic and manual data cleaning procedures were, therefore, applied.

Heart rate data processing

For heart rate analysis, the automatic data cleaning was done through a validated algorithm named HeartPy (van Gent et al., 2019). HeartPy software is an open-source toolkit accessible to engineers and researchers (also researchers without coding experience). It allows the creation of applications that use (real-time) heart rate data collected in the lab and the wild (van Gent et al., 2019). The software, previously used mostly in a vehicle driver’s workload

simulations (both lab-based and real-world), includes many pre-processing options and cleans up poor-quality signals. All schemes are well explained and documented to facilitate integration with independent projects (van Gent, 2021).

On the collected data, all pre-processing options available in HeartPy were performed. The peaks were enhanced to regulate the amplitude and increase the R-peak amplitude relative to the rest of the signal; adaptive input scaling useful when measuring at locations where the PPG signal is weaker was done to stabilise amplitude over time; a Butterworth filter was used to remove high-frequency noise; and a modified Hampel Filter was applied on the raw signal for outlier detection, with a window of half the sampling rate (van Gent et al., 2019). Moreover, missing heartbeats were substituted with values computed by linear interpolation methodology between the last and next observable data points. They were marked in a different colour not to miss those estimated values during the graphs' analysis.

Heart rate – interpretation

In this study, the heart rate (HR), a simple measure of the heart period, expressed in beats per minute, was used. The resting adult heart rate value is about 70 bpm (beats per minute) for men and 76 bpm for women (Andreassi, 2000, p.415). People with more athletic behaviours (physically active) generally have a lower heartbeat frequency. The heart is controlled by both branches of the autonomic nervous system, so the interpretation of its activation is not straightforward.

Measuring heartbeats can tell us about arousal and emotion, attention, and cognitive effort. HR can indicate short- and long-term shifts of attention. Short-term shifts are related to automatic internal resource allocation (visible in the phasic analysis) and long-term changes to voluntary actions (visible in tonic analysis). In the rest state (increased cardiac parasympathetic activity), the heart slows down. This has been associated with paying attention to an external stimulus, information intake, and approach to a significant stimulus behaviour (Lang, 1994, p.102; Porges, 1995, in Ravaja, 2004, p.201; Andreassi, 2000, p.420). In the mobilisation and concentration on mental work (increased cardiac sympathetic activity), the heart speeds up (Ravaja et al., 2005, p.2). This has been associated "with emotional arousal, general preparation for action, and mobilisation of various types of resources" (Obrist, 1981, in Ravaja, 2004, p.201) as well as a focus on internal thoughts (Lang, 1994, p.102). Fowles has postulated also adding to the conditions of "mobilisation and work" the states of pleasure and fun (and food) (Fowles,

1983, p.62). Vigorous muscular activity speeds up heart activity (Andreassi, 2000, p.418). The increase in heart rate generally lasts as long as the task continues (Lang, 1994, p.102; Ravaja, 2004, p.201). Sudden changes in the environment, which are significant or important for the individual, cause a stronger orienting response (Boucsein et al., 2012, p.1028), which manifests itself in phasic HR deceleration (Abercrombie et al., 2008). In general, short-term changes in attention (orienting response) occur in reaction to stimuli that are novel, learned, intense, complex, and (or) surprising.

Electrodermal activity processing

Processing of electrodermal activity (EDA, previously also known as Galvanic Skin Response) was more problematic. The reliability of EDA, particularly in the presence of motion artefacts, is still questionable (Posada-Quintero & Chon, 2020, p.14). The majority of my audiences' EDA information included errors. Some records were missing due to (possibly) changing position of the hand causing a disconnection between participants' skin and the sensor. It is held that only static recordings can be processed by fully automatic algorithms (Menghini et al., 2019). The decision was, therefore, made to rely on visually examined raw EDA records (Gratton, 2007, p.836) to identify outliers and possible artefacts. This was still considered acceptable due to the exploration not of precise moments but of general trends in the artworks' storyline.

Electrodermal activity (EDA) – interpretation

Changes in skin conductance occur with a variety of sensory and psychological stimuli, including those emotionally arousing (Andreassi, 2000, p.314). EDA has been found sensitive to emotional content but also novelty, intensity, and significance of stimulus. Therefore, also for EDA interpretation, the knowledge of context is necessary (Dawson et al., 1990, in Andreassi, 2000). The skin conductance response can be observed approximately one to three seconds after stimulus presentation, depending on the participant's body reaction times (Andreassi, 2000). The minimum EDA response amplitude varies across studies from 0.01 μS (with computerised scoring) to 0.05 μS (microsiemens) (when acknowledging the increased level of equipment noise in experiments with active participants) (Boucsein et al., 2012, p.1026). EDA increases with higher levels of arousal or activity of the person and decreases at low levels. A relatively flat and slowly varying skin conductance level (SCL) is observed over a longer time in the tonic level analysis (Andreassi, 2000, pp.314–315; Khalaf et al., 2018). Orienting responses, brief and swift changes in EDA (called skin

conductance responses, SCR) manifest in a rapid EDA increase (Lynn, 1966, in Andreassi, 2000, p.332; Ravaja, 2004). Shorter skin conductance responses, studied in phasic changes analysis, can be measured in quantity and magnitude (Andreassi, 2000, p.320). In media studies, the frequency of SCR response from each audience member has been an important measure of "[c]ommitment of the central nervous system to devote attention to a message" (Fletcher & Shimell, 1989, in Hopkins & Fletcher, 1994, p.123). For example, to be considered effective, at least three peaks are needed from most viewers for a thirty-second radio or TV commercial, five peaks for a sixty-second message, etc. (Hopkins & Fletcher, 1994, p.123). For the longer arts experiences such an approach is not reliable, as those are more complex in their substance. In my study, I concentrated on shape and variability of the EDA responses and considered as an increased level of EDA a change of a minimum of 0.05 μS in the cases including participants' movement and 0.03 μS for a seated experience. Due to phasic changes (SCR) often overlapping in complex arts experiences, I decided against counting orienting responses.

Movement

Both, Empatica and Ring, were equipped with accelerometer sensors that enabled recording of the movement on three axes corresponding to the three dimensions of the motion of the hand on which the device was placed. One axis documented the participant's hand moving up and down; the second – left and right; and the third axis – back and forward movement. According to Vähä-Ypyä et al. (2015) and Aittasalo et al. (2015), both seating and standing can be considered as *sedentary behaviour* (classified by them as class 0), while slow walking on a levelled surface – a light activity (class 1) (Vähä-Ypyä et al., 2015, p.66). The collected tri-axial raw acceleration signal was visually inspected in raw mode.

In general, it is recommended to discard participants' movements during physiological data collection (Ragot et al., 2017), as movement is considered as an artefact in EDA analysis (Boucsein, 2012, p.141). Interoceptive inner-body movements (movements inside the body) are also influenced by the spatial movement of every audience member (Barrett, 2017, p.66). The level of this influence on physiology depends on the intensity of the motion. Moreover, the movement might have a role in the pre-stimulus factor or be a part of the response to the stimuli. The latter aspects would add to the analysis of the actions involving the peripheral nervous system, the work of the central nervous system. When movement is involved, heart rate responses might

“include both centrally-initiated and peripherally-mediated changes” (Graham & Jackson, 1970, p.88). However, in an arts experience, a changed body position or movement may not be an error or confounding variable. It may be an integral part of an experience, for example, during a visit to a museum. It can also be an indicator of a strong reaction during a (seated) performance.

In this research, fine-grained interpretation of every motion was unnecessary as movement played a limited role in both experiences. *Bristol* was a sedentary experience, while *Whist* included standing and short, slow walks. Changing bodily position in *Bristol* was hardly detectable as it was primarily related to movement of the head – changing the focus of attention. The function of the movement in *Whist* was twofold, instrumental – adjusting bodily position to a physical object triggering a subsequent episode, and attentional – for following (through head movements) the actors and the story. Relocation required mildly dynamic actions, while changes of attention and taking advantage of the 360-degree vision caused a smooth adjustment of the head or the upper part of the body. Those movements might not be visible in the accelerometers’ data as the sensors were positioned on hands and not on participants’ heads or chests. In both case studies, the movement was minimal, but the motion in the *Whist* experience was expected to be more visible.

Yet, graphs presenting the accelerometer data showed little difference in movement in the two VR art projects. *Bristol* Ines's seated experience (Fig. 3.5 below) started at 468 seconds. The beginning of the graph shows the change in the position of the hand during pre-experience walking, headset and headphones mounting. The shifts on the *Bristol* graph indicate most possibly the modification of the placement of the hand. Faye (Fig. 3.6) stood during her *Whist* experience and slowly walked between the episodes. Yet, looking at both graphs, one cannot distinguish sedentary from standing and slowly moving during the experience. It is impossible to decode *if* and *when* the participant during *Whist* walked or (just) changed (and kept a new) position of the hand. Some participants’ graphs displayed more changes – but those in most cases indicated the turn of the device (changing orientation) and not the impactful movement.

Figure 3.5 Accelerometer data visualisation from Ines's *Bristol* experience

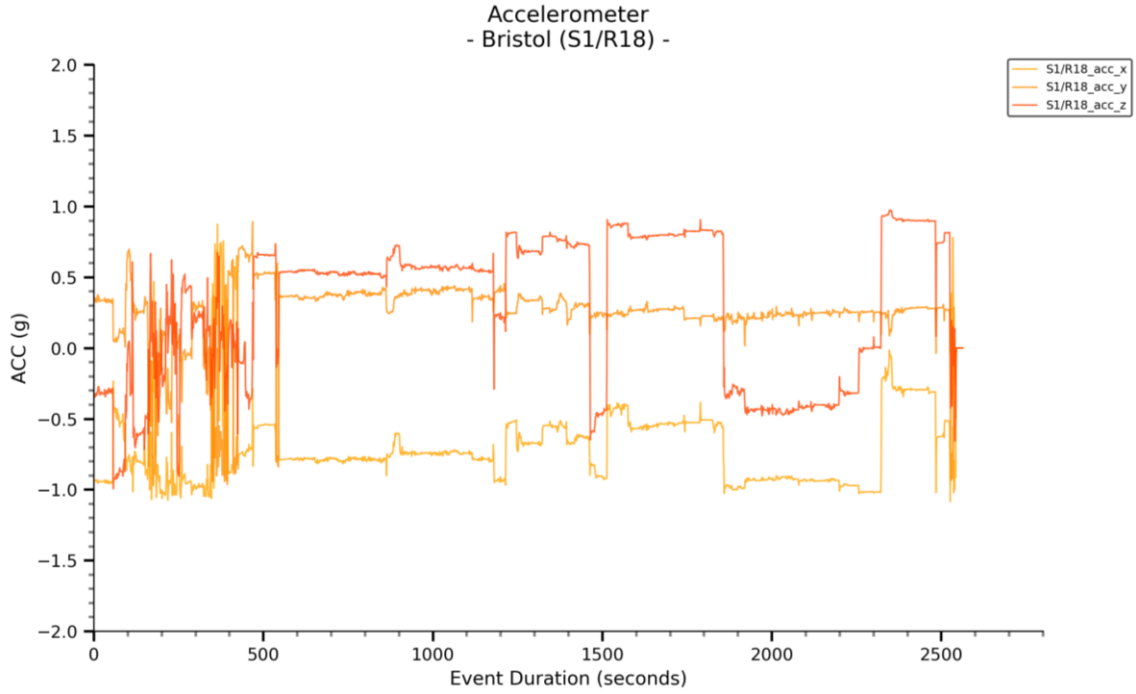
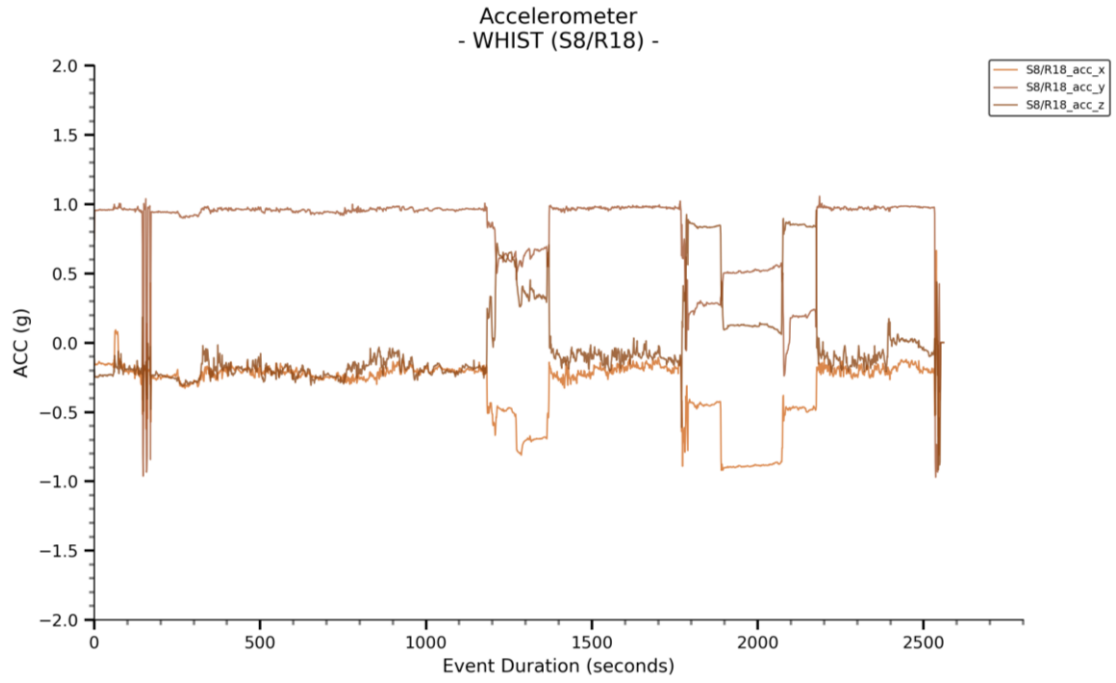


Figure 3.6 Accelerometer data visualisation from Faye's *Whist* experience



The drawback of accelerometer data is that changes on the graphs may indicate when participants' hands (or bodies) change speed and (or) direction. Besides, the sensors also detect the force of gravity (Finio, 2020). Thus, even if there is no movement, accelerometer data include gravity, which on Earth is 1 g/s (*g* or *G* standing for the *acceleration of gravity*) (Voshell, 2004).

Motion in *Bristol* and *Whist* was insignificant, so it did not overshadow other physiological reactions. That also has been observed in a study by Rouselle,

Blascovich & Kelsey in 1995 (Andreassi, 2000) and “eMotion - mapping museum experience” research (Tröndle, 2014). I will reflect on accelerometer recordings only in a pilot experience, *The War of the Worlds*, which required the most dynamic movement. The detailed interpretation of all the data concerning (in the main study) light motion was thus inessential.

The moving baselines

Most physiological measures are communicated as changes to a baseline level of the initial state. The human heart normally contracts at a rate of about 70–72 (men) and 76 (women) beats per minute (bpm) at rest (Andreassi, 2000, p.404). In experimental studies, it is required but not necessarily possible to induce a *rest* condition – the state without the participant’s cognitive and emotional engagement caused by internal or external stimuli. That is because pre-experience states and activities influence the physiological data related to the experience (Wilder, 1950, in Wainer, 1991, p.147; Wilder, 1967; Gratton, 2007, p.854). Controlled laboratory studies are usually short, starting with inactivity for computation of baseline rest condition followed by measurements of arranged deliberately collection of short stimuli (with the silent interstimulus intervals, the pause, to get data back to baseline, no-experience state). The decision to study not-normalised physiological data of longer (thirty to fifty minutes long) audience engagement with arts in the wild is a new approach that generated a question of what to compare and, as the results of the study are affected by the method of adjustment (Wainer, 1991), how to establish a baseline. Even if I did not precisely judge the strength of the arousal (as that would require more complex statistical calculations), it was essential to understand individual differences and each audience member's bodily baseline level. That is because peaks or changes can only be observed when compared with the previous state (Cacioppo, Tassinary & Berntson, 2007, p.852).

It was reasonable to assume that, without artistic experience, the participant’s physiology, e.g. the heart rate, would have continued at about the same rate as it had before. Such assumption in statistics is labelled as a correct untestable assumption (Wainer, 1991, p.149). The Law of Initial Values declares that the intensity, direction, form, and magnitude of response to a stimulus is related to the pre-stimulus level (Wilder, 1950, in Wainer, 1991, p.147; Wilder, 1967). As audience members’ physiological states before the experience influenced the bodily engagement at the beginning of the experience, the estimation of the initial state’s baseline was appropriate also in this study. In real life, arts experiences rarely start in a pure rest condition. Therefore, the baseline in this

study was not designed (or assumed) as a tabula rasa in the rest condition, but as the authentic pre-experience physiological information obtained from each participant's measurements. As recommended, sessions between two and four minutes long (Braithwaite et al., 2015, p. 9) were used to calculate and interpret a baseline.

It was also understood that in longer experiences, the Law of Initial Values operates continuously. Constantly changing physiological states influence engagement on the go, while it happens. Therefore in this study, it was necessary to deal with the "moving baseline" (Wilder, 1967). Also, the excitation-transfer paradigm (noticed in the media studies and supported by the heart rates' studies) confirmed that residual stimulation from previous input should contribute to the intensity of activation during the next stimuli. Positive or negative pre-stimulus arousal should influence – respectively positively or negatively – subsequent stimulus' arousal (Wise, 2004; Barrett, 2017). Hence, the statistics would consider subtracting the base rate from the observed rate as appropriate in this situation (Graham & Jackson, 1970; Wainer, 1991, pp.149–150). The Law of Initial Values is not a purely mechanical method, though. It declares that, depending on the pre-experience state, the change in physiology might be smaller or bigger. When stimuli have the same function as the pre-experience condition, the observed difference is minor. The conversion is bigger if the function changes. For instance, the change will be less visible when the pre-experience state is calm, and the experience state is relaxed (or excited-excited). It will be bigger if the function changes, so excitement transforms into relaxation or calmness into excitement. Assessment of increase or decrease in just arithmetic percentage difference to the baseline is not a correct measurement (Oken, 1968), as the level of the stimulus' impact can only be interpreted by comparing it with the content of the previous unit. If the Law of Initial Values operates continuously, the baseline is applicable as an initial reference but less relevant in extended timeframe. I compared the bodily changes during the experience both with the initial state and preceding data.

Comparisons of biosignals

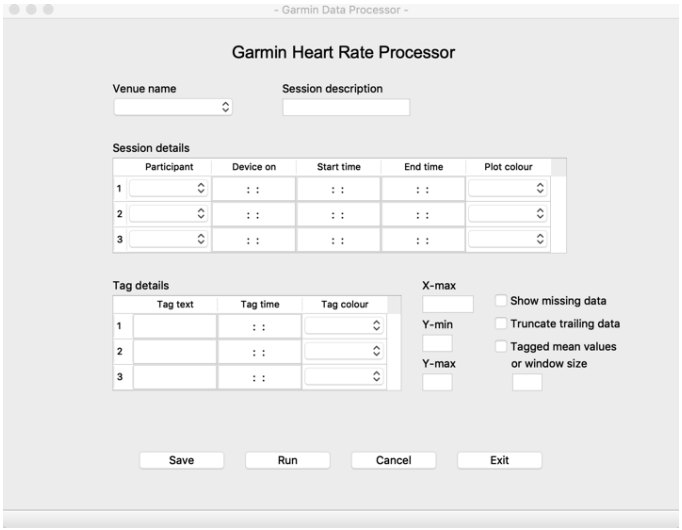
The previous studies of physiology have suggested that the level of engagement could not be inferred by a direct comparison between data of various people. Baseline levels may be different for different people due to, for instance, physiological characteristics and states of individuals (e.g. their health state), location, and time of measurement (Gratton, 2007, p.854). Some people may also exhibit higher psychophysiological variability than others (Gratton,

2007, p.855). Therefore, I first analysed changes in each participant's data/graphs (also done by Mandryk, Inkpen & Calvert, 2006). To enable comparisons, I looked at the shape rather than the numeric magnitude and intensity of physiological responses in each episode of individual arts experience. I aligned those shapes with the artwork's affective rhythm.

In both cases, the data was segmented. In the *Bristol* case, all participants' physiological signals were subjected to the same slicing process using registered (on my mobile phone) timestamps for the start and end of each artwork's segment. In the case of *Whist*, each participant initiated and ran the arts experience individually, so there was no possibility to mark changes in the content. The idea was to track the main elements of the *Whist* narrative in physiological data registered (movement between *Whist* episodes being principal segmentation's indication) and on the base of information – the script – provided by the artists. That process assisted comparison of different people's experiences.

Inferences from individual experiences were subsequently compared across participants. The shape of the trajectories from the person's whole experience and/or episodes and their interpretations, were compared with other participants' graphs and interpretations in the same timeframes. In *Whist* the whole experience was looked at, while in *Bristol* it was possible to investigate entire and episodical data. In this way, individual and group variations in physiological responses were exposed across a series of episodes (Khalaf et al., 2020). The textual analysis of graphs was shape based and not directly discrete (numeric) value based, so no single data points but time-series data (Mandryk, Inkpen & Calvert, 2006) were of primary interest. A bespoke Graphical User Interface (GUI) was used for processing the data (from CSV format files) from the Ring and Garmin devices to be presented and compared in linear graph formats (Figure 3.7). The GUI options included the application of timestamps, computation of arithmetic mean values (average result) in different timeframes, displaying missing data segments, zooming into the parts of the experiential data, and moving through it in stages from start to finish. The GUI thus allowed for a more detailed comparison of data sets coming from different audience members. As mentioned before, created graphs were subsequently coded in textual form for further interpretation together with qualitative data. In the analysis, I paid attention to the sequencing and dynamics of the processes over time. I also looked for signs of diversity and similarity in different audience members' engagement trajectories.

Figure 3.7 Graphical User Interface (GUI) used for data visualisation

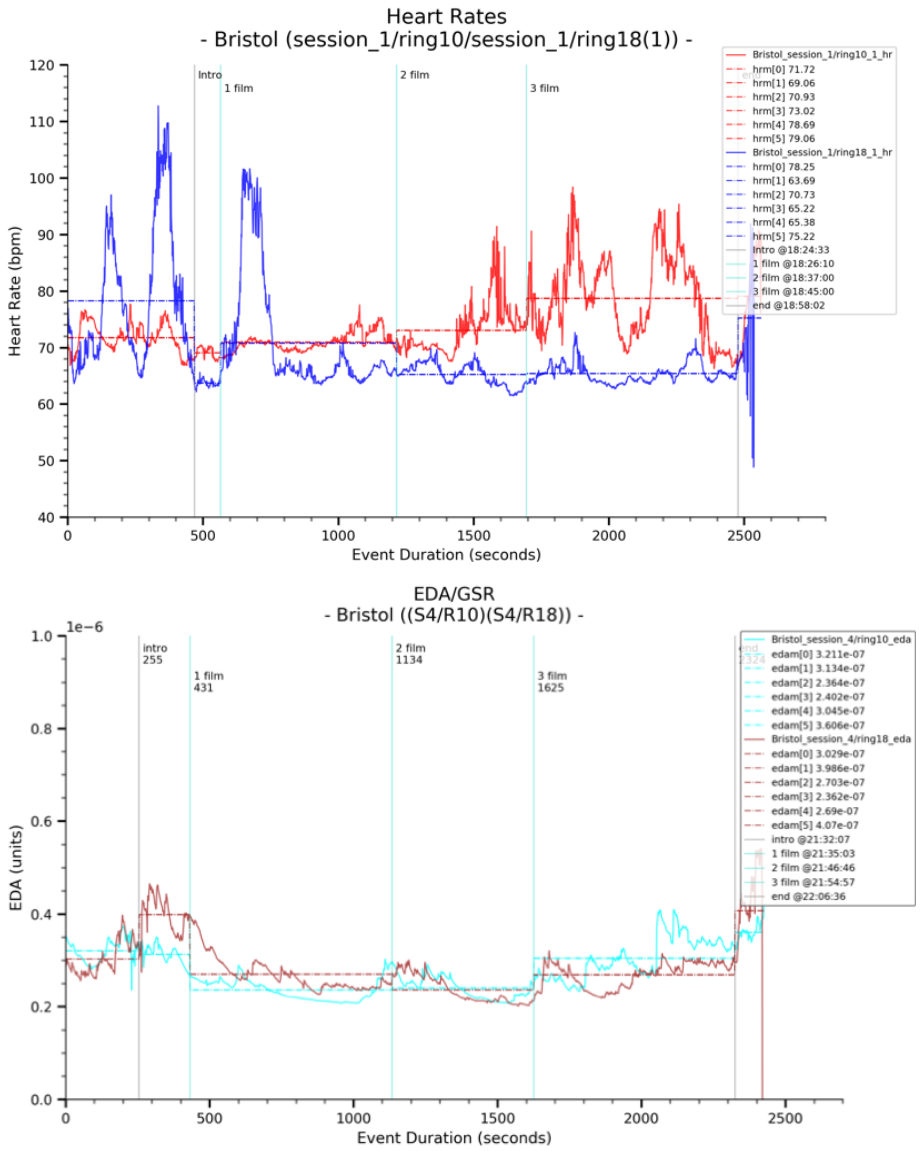


Arts guiding experience of engagement

General – narrative and formal – analysis of the selected artworks provided a base for comparisons of different audience members' responses to specific scenes of the VR art. Triggers of mental and physiological responses may be associated with the structure (for example, unexpected actions) and the content of the artworks (Hidi, 1990, p.559). Having virtual reality art as a case study was advantageous for two reasons. Virtual reality causes greater participant immersion and is characterised by a plainer cinematographic form than, for example, film. Virtual reality involves considerably more stable camera work and transitions, a smaller number of changes of viewing angles, and editing cuts that in the film express emotions. The 360-degree view, giving participants the possibility to look around, requires shots with a longer duration that can often make a scene seem more relaxed and slower paced (Ascher & Pincus, 2012). After initial adaptation and habituation to perceptive differences and confusion caused by virtual reality's specificity, such form could contribute to audience members' focus on a story rather than a form. For data analysis, I divided each artwork into shorter segments and briefly coded them to indicate the shifts in the story and sensory input. A time-framed description of those segments and their affective load structured the temporal analysis of engagement. Additionally, *Whist* artists provided a table with timings and the order of the episodes. Therefore, even if in *Whist* each audience member walked through their individualised path, it was possible to identify the content of their experience. In both experiences, the audience could look around (a 360-degree view), so even though the sound of the movies provided some uniformity, the total synchronisation of the reactions was not possible even in the *Bristol* case as audience members might have looked in different directions.

Two selected artworks provided an opportunity to observe audiences' bodily reactions to emotionally distinct arousing contents (Figure 3.8). *Whist* included a scene that in some audiences might have caused disgust (eating part of the human body). On the other hand, the third *Bristol* story about prisoners might have evoked empathetic reactions. In my analysis, I paid particular attention to those moments.

Figure 3.8 Example of biometric data (HR in session 1, EDA in session 4) visualisation from *Bristol* experience divided into segments of experience (before the start, introduction, and three films are marked)



I looked at each case as an *episode-by-episode* matrix inspired by the work of Fleureau, Guillotel and Quan (2012) and Biometric Storyboards (Mirza-Babaei, 2013). The levels of audience responses created a sequence displaying the variability of the sub-cases' trajectories. That allowed for comparisons through what Aaron Cicourel has called indefinite triangulation, which requires

collecting versions of the same event from the perspectives of several people (in Hammersley, 2008, p.25). The aim of such triangulation was not to discover the truth about the situation but to explore how different physical, temporal, and biographical circumstances of participants impacted the experience (Hammersley, 2008, p.25). That kind of analysis required looking at quantitative data through qualitative lenses. The selected participants' physiological reactions during the artistic experience interpreted textually added to the overall narrative.

3.6.6 Post-experience reflections analysis

My subsequent exploration included analysis of post-experience reflections gathered in questionnaires and semi-structured interviews. If people construct their engagement during the arts event, it has to be accepted that they also construct their tale about that experience. The post-experience analysis did not look in the empirical material for truth nor confirmation of the artists' premises. It explored various, and all valid, perspectives on the same event.

Coding for the narrative (post-experience questionnaires)

The post-experience questionnaire included thirty items. It contained eighteen multiple-choice questions on the Likert scale, other multiple-choice inquiries, and open questions to provide more detailed information about each audience member's experience.

The questionnaire included questions assessing the quality of engagement from the User Engagement Scale Short Form (O'Brien, Cairns & Hall, 2018) used in its original form. The only change made was replacing the term "technology" with "VR art". This five-point Likert scale with twelve items examined four dimensions of engagement quality: focused attention, perceived usability, aesthetic appeal, and reward factor. Each of these engagement quality indicators built on answers to three questions and (coded) scores were calculated as means for each sub-scale. Sub-constructs of focused attention, aesthetic appeal and reward factor were coded normally, while perceived usability items were coded reversely. The overall quality of engagement score from this scale was calculated as the sum of four sub-scales. Such an accounting framework, which provided total and sub-total ratings of each person's engagement, did not explain the phenomenon, but it presented "how variables which might be regarded as causes and conditions co-vary" within the total engagement score (Sayer, 1992, p.181). The indicator's sum, and its sub-sums, were interpreted according to the same pattern:

Figure 3.9 Interpretation of Likert scale answers

Mean score	Answer	Level of quality of engagement
1–1.80	strongly disagree	very low
1.81–2.60	disagree	low
2.61–3.40	neither agree nor disagree	Moderate/neutral
3.41–4.20	agree	high
4.21–5	strongly agree	very high

The post-experience questionnaires' analysis led to preparing short descriptions of each participant's engagement demonstrating an assessment of artistic and technological components of the experience (again) in the profile title. I treated the responses to the UES short form's questions about perceived tech usability and aesthetic appeal as indicators of post-experience assessment of tech and artistic components of the experience. They were coded in the same way as pre-experience personal context as, for example, "arts", "ARTS" or "ARTS!" assessment. The same coding supported the comparison of the pre-experience state and focus and post-experience assessment of engagement by the audience members. That allowed to supplement the description of already presented people by their engagement components' self-assessment:

- (Hanna, *Bristol*) pre-experience "ARTS!/TECH!" focus – post-experience "ARTS!/TECH!" assessment: very high general engagement (4.5), very high attention (4.67), very high perceived usability (5.0, compatible with expressed very high "TECH!" focus), very high aesthetic appeal (4.33, compatible with expressed very high "ARTS!" focus), high reward factor (4.0). The comparison indicated that there was no change of attitude.
- (Dan, *Bristol*) "?", so pre-event unclear focus – post experience "ARTS!/TECH!" assessment: very high general engagement (4.42), high attention (4.0), very high perceived usability (4.33, much above expressed low propensity for tech), very high aesthetic appeal (4.33, much above expressed low arts focus), very high reward factor (5.0). The comparison demonstrates build-up of attitude (at least temporary)

from “?” (low levels of propensity for the arts and tech) of three levels from low to very high “TECH!” and “ARTS!”.

Interviews analysis

After I inspected the completeness of the pre-experience questionnaire, I invited a few audience members for one-to-one semi-structured interviews. The qualitative data from eight interviews with audience members were transcribed and analysed in line with critical realism standpoints with the support of NVivo. I searched for unexpected issues and explored themes identified in the literature review, for example, facts about pre- and post-experience actions, memories, and emotions.

3.6.7 Segments of interpretation – from individual to overall

In the final stage, I merged and interpreted results from all phases of the research. None of the phases of data collection alone could provide reliable material allowing for an understanding of dynamic processes of engagement. Temporal, intellectual, and emotional evolutions in the artwork directed by the artists allowed for the prediction of part of the engagement paths. The physiological data provided some information about the dynamics but did not label those reactions as even positive or negative feelings are hard to differentiate in that data. The participants’ personal context, their lived bodily experience, and their views on that experience were complementary components of the investigation. I interpreted the processed, visualised and narrativised data on three clusters of audiences: individuals, groups of people having similar experiences, and the whole population of the audiences studied. Those groups determined three segments of interpretation. Each case study's results were explored separately and subsequently compared.

Building profiles of individuals (merging questionnaires’ data)

As a final step of pre- and post-experience questionnaires' analyses, I created individual representations of each participant's experience of engagement. I processed and analysed qualitative and quantitative responses to both questionnaires. I compared numeric values representing attitudes towards arts and technology before and after the event. Then, I created individual narrations about each participant's experience of engagement.

The comparisons of each participant's pre-experience propensity for arts and technology (assessed through an especially developed questionnaire) with

responses to the post-experience quality of engagement scale (O'Brien) provided the opportunity to examine a short-term change of attitudes toward both aspects of experience. Descriptive questions in both questionnaires suggested explanations of the change and detailed reasons for the estimated individual assessment of the quality of engagement. As an example, the description of a person coded as Dan (*Bristol*) summed as follows:

> Pre-experience context:
>
> "?": An educated male (British, 35–44 years of age), with expressed pre-experience very high anticipation, context demonstrated high arousal, low propensity for the arts (below average), low propensity for tech (below average).
>
> Reason for attendance: social, discover something new, arts ("we were passing by and found out about this research. It sounded fascinating and I always want to support research").
>
> Post-experience assessment:
>
> "ARTS!/TECH!": very high general engagement (4.42), high attention, very high perceived usability (significantly above expressed low tech focus), very high aesthetic appeal (significantly above the expressed low arts focus), very high reward factor.
>
> Very highly engaged, correlating with very high expressed anticipation but higher than high pre-experience arousal. There might be a difference between initial arousal caused by novelty (a mix of excitement, curiosity, and nervousness of the unknown) and subsequent arousal related to the artwork experience. The arousal strength did not change, but the arousal appraisal (called valence) grew positive.
>
> Answer to question: "This VR art fully fulfilled my expectations" (with possible reason fished out of question 23):
>
> 5 (very high) even if the headset was not comfortable with glasses. This response aligned with very high engagement and very high anticipation.

As assessment criteria vary widely across people (Cutting, 2021, p.318), I primarily compared a within-person change of (individual) appraisals of the propensity for arts and technology before and after the event. Based on the audience's reports, I created narratives that supported the comprehension of an individual experience. Within-person comparison increased the reliability of the study, as even if participants differently understood my questions, they should have used the same understanding of concepts in responses to both

questionnaires. Individual engagement analysis was also instrumental in conceptualising generalisable interpretations of the experiences of purposefully assembled groups of participants.

Comparisons of engagement of clusters of participants

The reported and experiential data enabled the exploration of the relationship between audience personal context, mental states, dynamics of bodily reactions, and post hoc cognitive reflection in two studied forms of experienced engagement – directed (*Bristol*) and semi-directed (*Whist*). This segment of interpretation involved group comparisons in clusters of participants having a similar experience. In *Bristol*, eight experiences documented on Ring were compared. Moreover, two groups participating in *Whist*, all together seven audience members – three participants that went through a similar path and four that had similar profiles – were studied. The qualitative information and interpretation of bodily reactions of nominated participants were compared with the same information obtained from other selected audience members. In my research, objective and subjective measures had equally important positions (Boehner et al., 2007, p.286). The directions of causality in my study were hypothesised based on the literature review, incorporating critical realism stance and the work of cognitive neuroscientists (Gazzaniga, Ivry & Mangun, 2019, p.641). The research moved between reported and experiential data retroductively inquiring “what must be true to in order to make this event possible” (Andell, 2019, p.70). The analysis set specific engagement processes within (during arts event – arts context) and surrounding (before and after the event contexts) the audience members’ mental states.

Case studies trends

The third segment included general analysis, so deeper reflection on the totality of data collected through different methods. The general interpretation of items/questions in all pre-experience, and then all post-experience, questionnaires and subsequent reflection on the insights coming from the comparison of both sets of data were done. That included the observation of similarities and differences between *pre* conditions and *post* assessment. The Excel programme (a visualisation and analysis tool) was functional in those general comparisons. The “sort and filter” data function in Excel and quasi-statistics allowed for comparing answers to different questions and examining the frequency of responses among all respondents from each VR art. I grouped and coded similar responses to open questions and presented them as clouds

of phrases. Scatter plot reports represented group tendencies. A comparison of anticipation and satisfaction levels of participants, the most popular in arts experiences' real-world evaluations, was also done. But for my study, I did it in correspondence with similar and different pre-experience personal focus. I also determined a change within participants' data regarding attitudes towards arts and technology. I calculated a difference between the pre-experience focus and post-experience valuation of arts and tech factors of each audience member by determining the number of ranks between both codes. For instance, the substitute of medium "art" (before) for high "ART" (after), or "ART" for very high "ART!" was coded as +1, while a change from "art" to "ART!" (two levels up) as +2. The propensity for the arts and tech, pre-experience anticipation, and arousal were also evaluated against the quality of engagement scores.

The engagement analysis was related to inner drivers of experienced engagement – arts or tech pre-experience focus. The plan was to divide the scores within each data set according to fitting in the Likert interpretation to create (low, medium, high, or very high) groups of engagement based on the total score for "quality of engagement". However, vast majority of scores fell in the high and very high range. I, therefore, compared individual experiences of extreme and contrasting sub-cases – people with very low or very high propensity for the arts. The comparisons allowed observing the general mechanisms of pre-experience focus impacting engagement and (potentially) causing differences in the engagement. Such method seemed sensible enough but might be inconclusive as "[n]either common nor distinguishing properties need be causally relevant (Sayer, 1992, p.115).

The results of those comparisons were then related to the graphs and interpretation of available biosignals. Even though Simon considered "[e]xplanation of cognitive processes at the information processing (symbolic) level […] largely independent of explanation at the physiological (neurological) level" (Simon, 1992, p.160), I assumed that physiology could provide additional information about engagement. That is because audiences' vision is supported by affective responses from the moment when visual stimulation begins (Barrett & Bar, 2009; Nadal & Skov, 2017). That last stage of analysis allowed me to assess in what way the outcomes of the scrutiny of qualitative and quantitative data are complementary or divergent.

Described modules of analysis were conducted initially within each case and subsequently as a cross-case study. Exploratory-explanatory process of such an arrangement fully exploited and endorsed the literature review and supported a deep exploration of arising issues. Zooming out the perspective of

the whole group's responses added insights relevant to the facilitation of engagement. The analysis brought up new issues, which I explore in the sixth chapter.

3.7 Ethical approval

The ethical review was done by the Arts, Humanities and Cultures Faculty Research Ethics Committee at the University of Leeds (LTSPCI-045).

At the beginning of the experience, participants were informed about the purpose and methodology of the project. After signing a consent form, each participant received an identification number. In this way, the anonymity of participants was preserved, and it was possible to merge different data sources in the analysis phase. Interviewed participants, however, agreed to be represented by their first names. The participant information sheet and a copy of the informed consent form that was signed by all participants can be found in appendices A and B.

Chapter 4
Pilot studies

The chapter includes a description of pilot studies of my own and a small group of participants' artistic experiences while I tested biometric sensors. In this phase, I used mixed methodology. I collected quantitative data (collected using Empatica, Ring, and Garmin) and qualitative reflections – my own and other participants'. In this chapter, I compare graphs with physiological data with the recollections of our experiences. I pay attention to the impact of the movement on physiological reactions. The analysis considers the structures and emotional features of the selected artworks. However, precision in my study was not essential (nor possible), so the information about the artistic content does not require a high level of detail. The initial experiments demonstrate the feasibility of methods for data collection during authentic arts experiences with and without audience movement. The chapter describes the relationship between bodily reactions and post-events reflections on the pilot experiences and ends by presenting the main insights from the testing phase.

4.1 My own experiences of engagement (tests with Empatica)

Before I start, it is necessary to underline that the physiological data visualised in the graphs could not be directly compared – even though experiences consider the same person, the range of data varies. This relates to the differences in my body states during each event. Previous physiological research has indicated that "different emotions from the same day tend to be more similar than features for the same emotions on different days" (Picard, Vyzas & Healey, 2001). Direct comparisons were also impossible due to the different duration of the experiences.

4.1.1 Immersive theatre

The first comparison of my arts experiences relates to two immersive theatre productions by companies that designed live-performance dramaturgy putting audiences, like actors, in the middle of the story. Both performances were based on historical content and required audience movement. From an audience member's perspective, there was a significant difference between the two shows. In the first one, *These Rooms*, the audience witnessed the story from within (as a silent witness), and the other, *For King and Country*, required audience improvisation, acting skills, and historical knowledge. In the first performance, I felt immersed emotionally; in the second, I primarily engaged cognitively. The first performance lasted one and a half hours and the second

two hours.

These Rooms

These Rooms, by CoisCéim Dance Theatre and ANU Production, was performed in several spaces in The Ditch at Shoreditch Town Hall, as part of LIFT Festival 2018. *These Rooms* was a promenade production and a living history performance: “an intense, immersive blend of theatre, contemporary dance and visual art whose starting point was the testimonies of 38 female witnesses to Dublin’s North King Street massacre in April 1916 – when 15 civilian men were killed in house-to-house raids by British soldiers” (CoisCéim & ANU, 2018).

Figure 4.1 *These Rooms*, original data obtained from the Empatica analysis software

The Empatica graph (Figure 4.1) includes separate rows for EDA (in blue), blood volume pulse (BVP, in red), accelerometer data indicating movement (in purple), hear rate (in orange) and the temperature level (last, green line). The row with BVP measure was not analysed as these data calculate the heart rate. The Y axis indicates the magnitude of the reaction; the X axis indicates the time

passed. The experience started at the third red vertical line from the left, which represents the timestamp I made by pressing Empatica's "mark" button. Other red lines signal the beginning of a new scene I marked during the performance.

I entered the Shoreditch Town Hall just before the performance started after quite an intense walk as I could not find the venue. The mixture of tiredness and anxiety (if I managed to arrive on time) explains higher values at the beginning of the recording. The first significant HR changes marked the walk down the stairs as we walked down to the basement, where the performance started a few minutes later. The graph indicates that after Empatica was switched on, I needed a few minutes to catch my breath and adjust to a new situation. A few interesting observations of my physiological engagement could be made when looking at the graphs. The movement shown in the accelerometer graph influenced my heart rate (HR). About thirty minutes of the performance data show irregularity of the heart rate, which may indicate varying bodily responses. A lot of changes align with accelerometer (movement) spikes. It is unclear if the increase (or what magnitude of the increase) in other parameters correlated with, or was caused by, the movement. However, not all signs of motion match other significant physiological changes.

Electrodermal Activity (EDA) of the Skin indicated high activation in relation to the content. Starting from the end of the second scene and especially during the fourth and the final (fifth) episode, my EDA fluctuated between 1 and 2 μs (microsiemens). That corresponds with my high heart rate. My heart rate during relaxation is usually in the range of 72–74 bpm. During sympathetic arousal (e.g. stress, emotional arousal, general preparation for action, and mobilisation of internal resources), the HR normally increases. My heart rate in the second half of the performance definitely beat faster (in the range between 85 and 118 bpm), and I remember that my emotional response to the plot got more and more intense towards the end of the experience. I remembered that my emotional responses and stress level in the second half of the performance were high, but I also felt good. Progressively dramatic content kept me emphatically and emotionally connected to the story. Interestingly, the openings of each scene manifest by slight falls in the HR graph. My heart rate slowed down, potentially signalling my attention to the changing external environment and quiet beginnings of the scenes. A few orienting responses (in the form of a few sharp falls in the line) are visible in the data, for example, at the end of the second and beginning of the fourth scene. My EDA was higher at those moments, which indicates that those moments were both surprising and emotionally loaded. My rising temperature might be associated with the

physical tiredness caused by an hour and a half of standing and moving around. Haag et al. documented that body temperature rises in happiness or anger and drops during sadness or fear (2004, p.39). My temperature slowly and steadily increased throughout the performance toward its dramatic and emotional ending. The presented story was sad, but I was genuinely happy with the quality of the show. That perfectly illustrates the complexity of emotions and the challenge of data interpretation. If sadness had prevailed, my temperature would have dropped. My temperature rose, indicating (possibly) my general satisfaction. Physiological reactions of my body to *These Rooms* were generally in tune with my reflections from the event.

For King and Country

The second performance *For King and Country* by Parabolic Theatre was, as the company planned, “highly interactive and responsive to audiences that choose to participate” (Parabolic Theatre, 2018, no pagination). The audience was offered “the freedom to actively explore – interacting with the space, our performers and other audience members” (Parabolic Theatre, 2018, no pagination). The action took place in December 1940 after a Nazi invasion force has landed on the south coast of England. In the face of a constitutional crisis some members of the Parliament and their families – designated survivors – needed to make decisions shaping the course of history and save (or not) the British people from Hitler and his Third Reich (Parabolic Theatre, 2018, no pagination). The majority of the performance took place in an open space in the basement divided by stage design into a few functions (e.g. parliament room, radio studio).

Figure 4.2 *For King and Country*, original data obtained from the Empatica analysis software

Before the start of the *For King and Country* (Figure 4.2), I sat in the venue's bar decorated in the style of the 1940s. There was some interaction with the bartenders/the performers while we were waiting for the whole audience to gather. I felt a bit anxious, as I did not know what would happen, knew no one there, and am not a fan of direct interaction during art events. The second red line from the left indicates the start of the performance.

During my second immersive theatre experience, the accelerometer data (purple line) indicated constant movement of my hand during the performance. However, the amplitude shows that the movement demanded less physical effort (we used stairs only at the beginning and end of the show) than in the first performance. The blue flat line of EDA in the first half and steep falls in the second half of experience might suggest a processing error (possibly related to the too-loose mounting of the device on my wrist). But it might also indicate a lack of my emotional connection to the story. The size of the leaps in the data in the second half could be also attributed to the reaction (individual or cumulated orienting responses) to the plot. The range of EDA (up to 0.067 µs) indicated arousal, but on a lower level than during *These Rooms*. I would name my emotions here as a mix of curiosity and stress/irritation. The (orange) heart

rate data (with a few exceptions) stayed close to my average state of about 74 bpm. Sharp spikes going down in the graph represent reactions to unexpected events such as, for example, the sound of an explosion. My heart data reflected what I did during the performance – I was paying attention to external events. Due to cultural differences, I did not become fully immersed in content that was immensely British (I am Polish and do not understand the UK parliamentary system). Early in the experience, I resigned from being an immersed audience member/performer and just proceeded as an observer. Even though I stood and walked for two hours throughout this event, my body temperature did not rise but dropped (last green line). I did not measure the rooms' temperatures during either experience, so I cannot conclude that my temperature directly signified my warm feelings during the first and colder attitude during the second performance. But, at least metaphorically, my temperature represented my felt emotional engagement during both immersive theatre experiences. Also, during the *For King and Country*, my bodily reactions represented my feelings towards the performance well. Moreover, they showed my attention and my moderate emotional engagement.

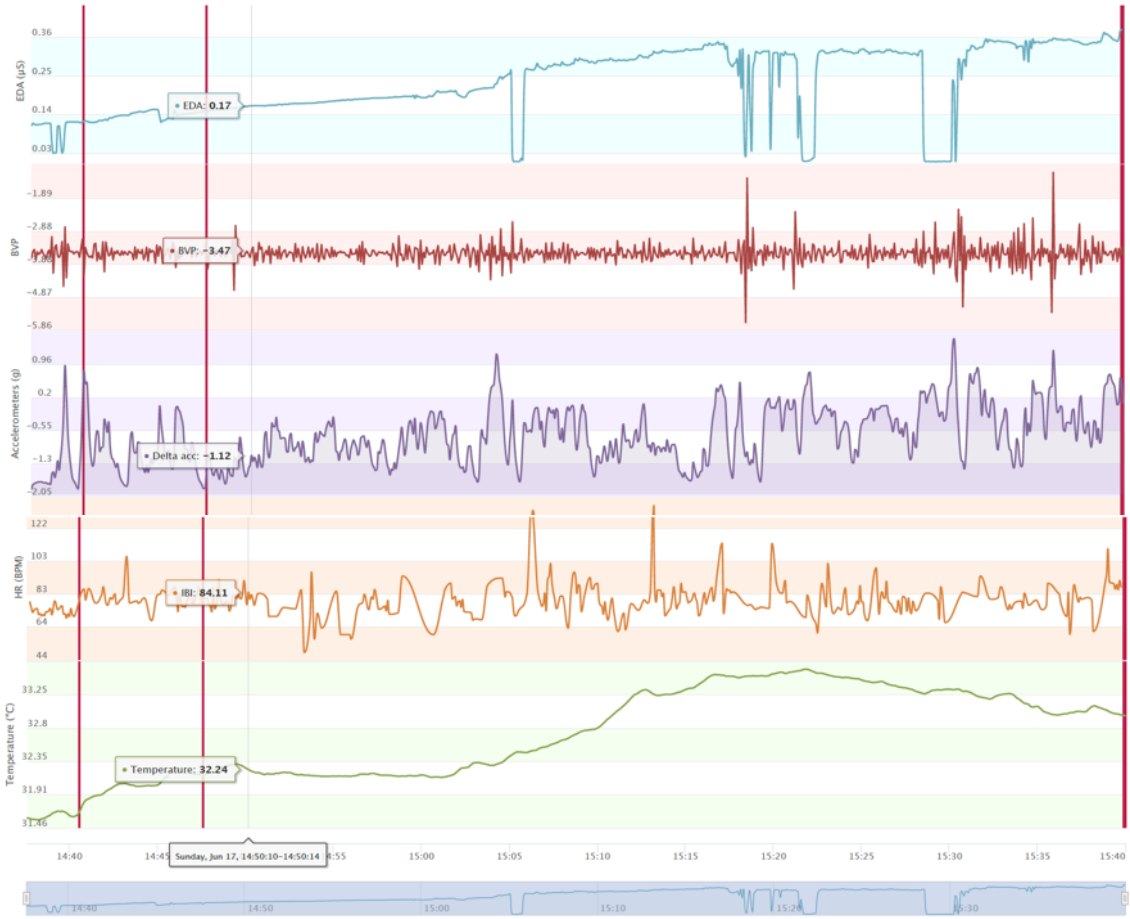
In general, my heart was more active and sped up during the first performance. Also, the level of electrodermal conductivity of the skin indicated high engagement during the first performance. EDA response is considered significant if the change in the signal is above 0.01–0.05 μs (Boucsein et al., 2012, p.1026; Braithwaite et al., 2015). During the whole first performance, EDA was stabilised on high 1 μs, with short moments of relaxation (fall of the line) and occasional rise to about 2 μs. HR, EDA, and my temperature graphs correspond with my memories of high emotional engagement during the first performance culminating in its dramatic finale and rather cold – more intellectual – engagement with the second one. Both graphs suggest that if the content of the artwork and details of the participant's movement is known, the heart rate data itself could indicate the scope and type of engagement.

4.1.2 Museum visit

To further investigate the artistic experience including the impact of movement, I attended an exhibition in the Victoria and Albert Museum (Figure 4.3). Accelerometer data (in purple) indicate what we would expect from such an experience – I was almost constantly moving during my one-hour stay there. I did not recall any significant moments from the visit, so in this case, I would consider my rising temperature (green line) the effect of the movement. The EDA (blue) slowly raised, so this could also be an indicator of my emotional

activation. There was no agreement about the impact of the movement on increases in EDA (Critchley, 2002 p.132), but in my other pilot immersive theatre experiences, such impact was not visible. The movement caused an increase in heart rate. Therefore, I associate heart rate levels with increasing physical tiredness rather than growing arousal.

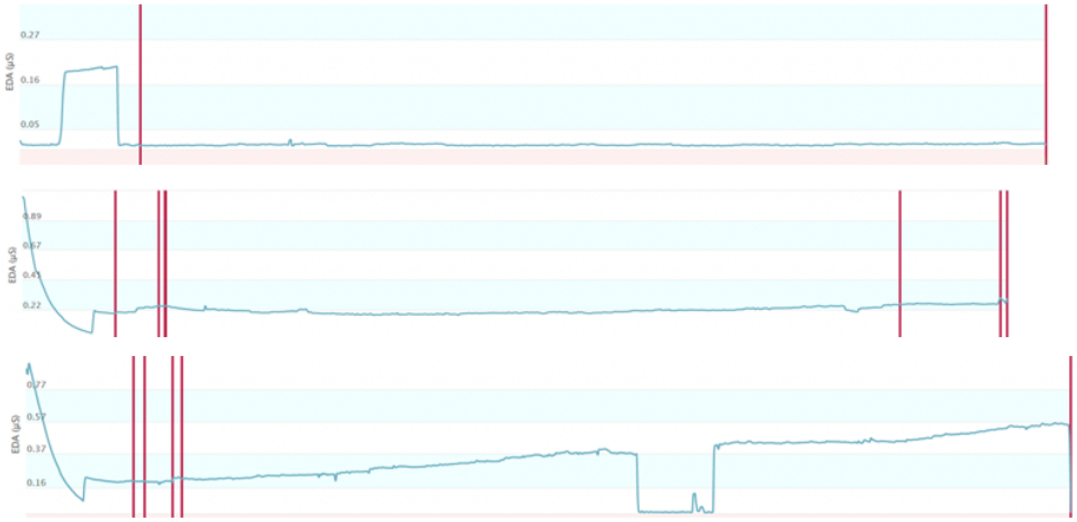
Figure 4.3 The Victoria and Albert Museum visit



4.1.3 Watching films in the cinema

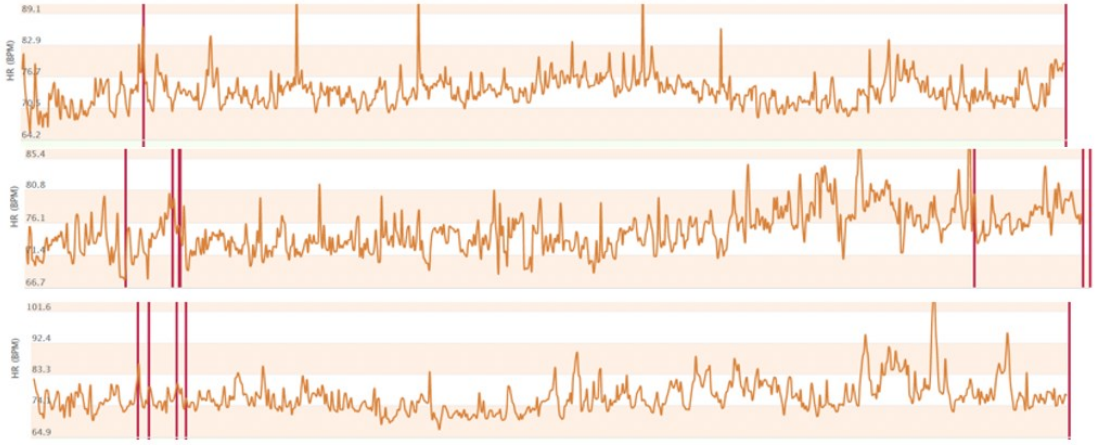
The three films that I experienced using Empatica differed in their emotional load: the first *The Guernsey Literary and Potato Peel Pie Society* was a romance with a sad ending; the second, *Oceans 8*, was an action film with some laughs; and the third, *In the Fade*, was a drama that kept me on the edge of my seat most of the time. It is useful to present these data differently, comparing each experience's specific physiological parameters (in the order mentioned above). Accelerometer data was irrelevant as I sat still during all films. I watched all three movies in small cinemas in London with just a handful of audience members present. Therefore, external distractions were minimal.

Figure 4.4 EDA during my film experiences: *The Guernsey Literary and Potato Peel Pie Society*, *Oceans 8*, *In the Fade*



During the romantic story, my EDA settled at a low level, indicating my low activation. During the action movie, EDA stabilised at a higher level but also remained flat. Only the drama movie caused my EDA level to steadily rise (from ca. 0.18 to 0.57 µS), indicating my arousal developing during the film. The significant drop on that graph could suggest temporary less dramatic developments, which could be interpreted as the “calm before the storm” or a sign of a lost skin-sensor connection. Nevertheless, the growing trend of EDA continued after that break.

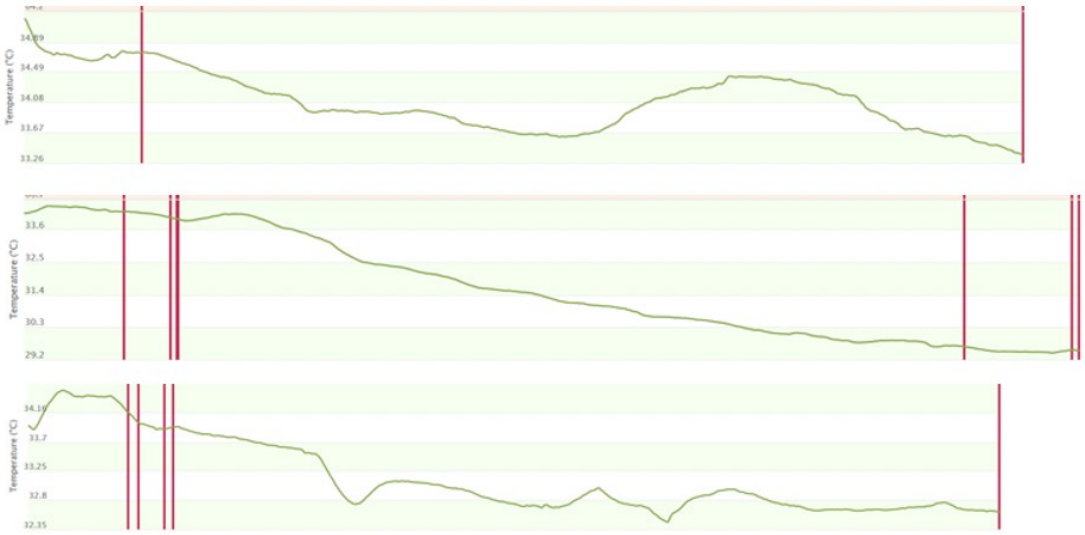
Figure 4.5 HR during my film experiences



On the heart rate graphs from the films watching, the position of the rightmost red vertical line on the left side indicates the start of the film projection. Looking at the HR range (on the Y-axis), the three graphs (still in the same order) indicate my fastest heartbeats during the third movie – the drama. That data show a bigger HR range, especially in the second part of the movie, with the

highest arousal visible in the culmination. Also, the last sections of the action movie indicate the rising pace of the action speeding up my heart's reactions. The first film's graphs present HR close to normal rest state, which relates to paying attention to external stimuli. The story did not involve increased internal processing or highly relevant (for me) emotions. The sharp changes in the graphs intuitively could be considered to register orienting responses to something unexpected in the film. However, as I noted earlier, orienting in HR is generally marked by a sharp fall rather than a surge. Also, the graphs present long experiences, so something that looks sharp on the present scale may take several seconds to develop.

Figure 4.6 Temperature during my film experiences



As the above graphs show, all three cinema experiences resulted in a drop in my body temperature. As I mentioned before, the temperature rises during happiness or anger; it drops during sadness or fear (Haag et al., 2004 p.39). I do not know if the temperature in all (air-conditioned) cinemas was constant during the projections. The decrease in my temperature during the first and third films could also be explained by sad developments in the stories. The rise in the second part of the first movie might be related to more hopeful events in that part of the film. Why my temperature dropped in a quite entertaining second film is unclear.

I consider all films, all for different reasons, worth the effort experiences with varied emotional responses, even if it was not visible in my EDA graphs. That suggests that more relaxed emotional engagement might not be visibly marked in the electric response of (my) skin or too subtle to be captured by the sensors. The second film included moments of laughs associated with positive

emotion and increased heart and skin response (Marci, Moran & Orr, 2004; Whalen, 2010), but small changes in my EDA did not allow for clearly marking those reactions. The Empatica pilots with my arts experiences showed that engagement with relaxed and dramatic content had different effects on my skin conductance level. Flat EDA cannot mark the acts of disengagement, as I did engage with all films. I just did it in an emotionally different and sometimes less intense way.

I only had access to Empatica and its data visualisation system during my visit to UCL in June 2018. I decided against re-analysis of data from Empatica on another platform. Zooming in to specific moments of experience would add little value to the study. Later, during my primary research data analysis, I used different software to visualise data from Ring and Garmin. The bespoke Graphic User Interface tool allowed for more precise comparisons of other pilots and later data in my case study.

4.2 Mini-group comparisons (tests with Ring and Garmin)

In the next part of my pilot phase, I expanded the experimentation. The general idea of the research was to draw an analogy between different people's experiences with the same artistic content. In the subsequent tests, I participated in the same activities with one or three more people. I wanted to engage in the same experience as other people, so I could understand it from my perspective and compare it with the interpretations of other participants. Those mini experiments involved both seated and involving movement experiences.

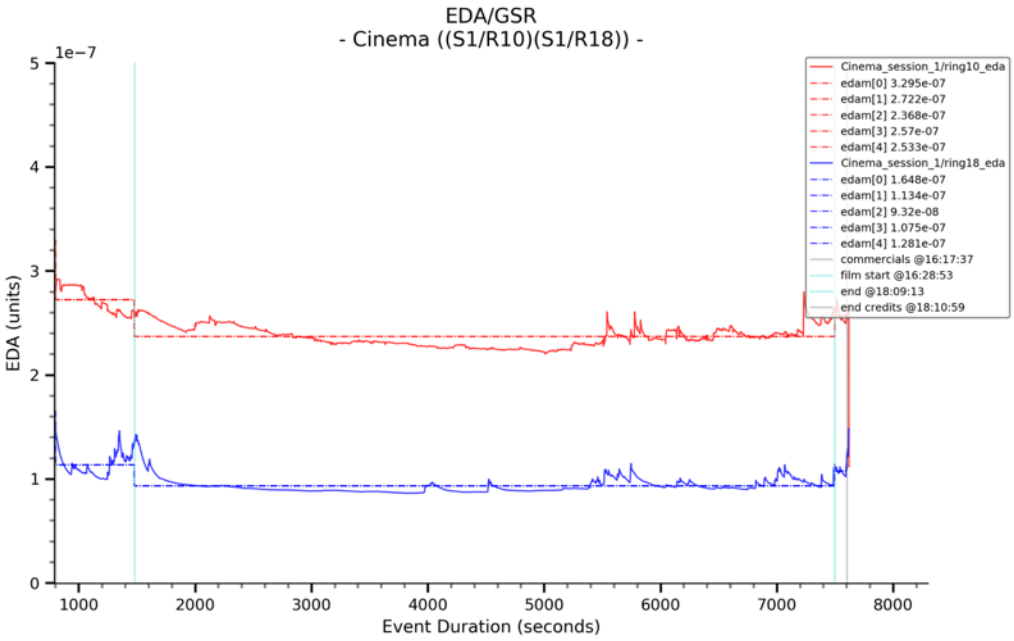
I managed to rent the Ring devices from the manufacturer for only a few days for my main case study. Therefore, I recorded only two of my and my partner's experiences using Ring during our cinema and immersive theatre visits. Unfortunately, my heart rate was not correctly recorded during both Ring trials. It is unclear if the error was caused by a fault in the positioning of the sensor, problems in the device, or my fingers' pulse being too weak for Ring recording. I first present EDA data from a film viewing and will return shortly to another experience recorded with the Ring.

4.2.1 Cinema visit *The Current War* (test with Ring)

The EDA graph below (Figure 4.7) presents my and my partner's cinema experience. The content of *The Current War*, in general, did not include dramatic developments. Therefore, both graphs are rather flat, even if mine

(the red one) indicates higher values. The aligned data might confirm the couple's synchrony (e.g. Imel et al., 2014) or show a similar reaction to the dramaturgic structure of the film, signalled especially at the entry to the culminating phase. However, there were also divergent reactions to the film developments. That was not surprising as the film was watched by people with different levels of sensibility.

Figure 4.7 EDA of the couple watching *The Current War* film (mine is red)



4.2.2 *The War of the Worlds* – immersive theatre with VR (tests with Garmin)

The Garmin smartwatch was tested by four people during *The War of the Worlds* – an experience with a mix of live theatre, virtual reality, and multisensory special effects. Two pairs of audience members attended two performances on 28 July 2019 – my partner and I experienced a 2.40pm performance, and another couple – two sisters – a 4pm show. *The War of the Worlds*, guided by live actors, included moments of seating and walking. We experienced a few transitions between real and virtual, as in some episodes we used VR headsets. The experience was full of unexpected developments and dynamic action. The show lasted for one hundred minutes, with a twenty-minute break in the middle. During the first presentation, I and my partner wore both Garmin (on the wrist) and Ring (on the left hand's palms). The Rings needed to be close to the laptop (recording data through Bluetooth), so my partner carried it in the backpack. After experiencing the show myself, I decided against using Ring for data collection of the second couple – carrying a laptop

and dynamic action that required physical engagement from the participants (for example, when sliding or putting on headsets) significantly influenced the quality of the recording.

In terms of the plot and technical details, the two shows were identical. However, there might have been some changes in action distribution as the speed of walking during the performance or putting on headsets, etc. might differ in both shows due to audience behaviour. Rising HR might be associated with walking (if both people's graphs demonstrate the same tendency of going up), while sudden falls of the HR line indicate an orienting response. These were not always synchronised, as a few surprising elements of the plot were directed differently for each of the participants. Some of the differences in physiological reactions might be explained by personal differences in reaction times or behaviour (e.g. the pace and moment of standing up differ). The performance script included ten-minute-long scenes, so to assist the comparison, I divided the records into five-minute segments (with their mean values presented by a horizontal dotted line). Even if (for reasons mentioned above) each participant's data could not be directly compared against each other, many similarities in trends were observable.

First couple's *The War of the World* experience

The graphs in Figure 4.8 to Figure 4.12 present my and my partner's reactions, with my data presented in red and my partner in blue.

Figure 4.8 *The War of the Worlds*, data of first pair of participants – full experience

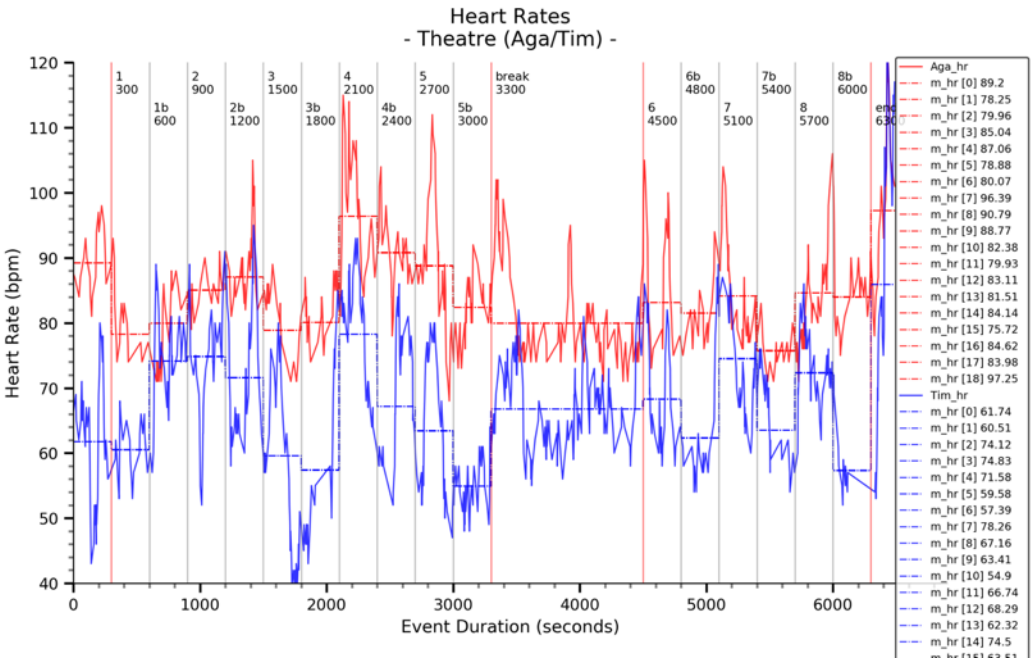


Figure 4.9 *The War of the Worlds*, the first part of the show (close-up)

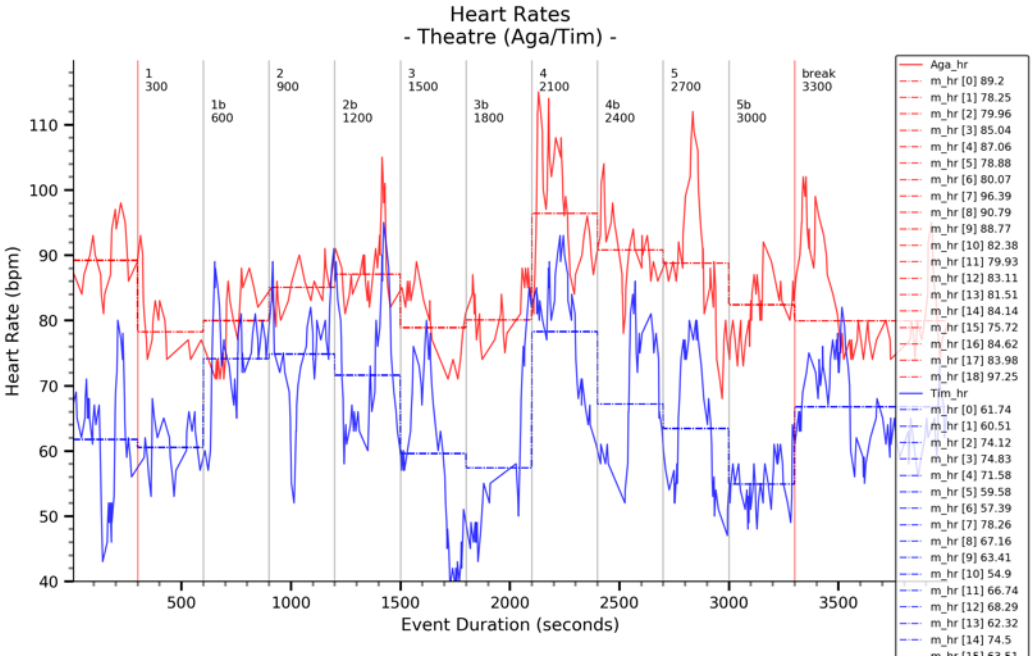
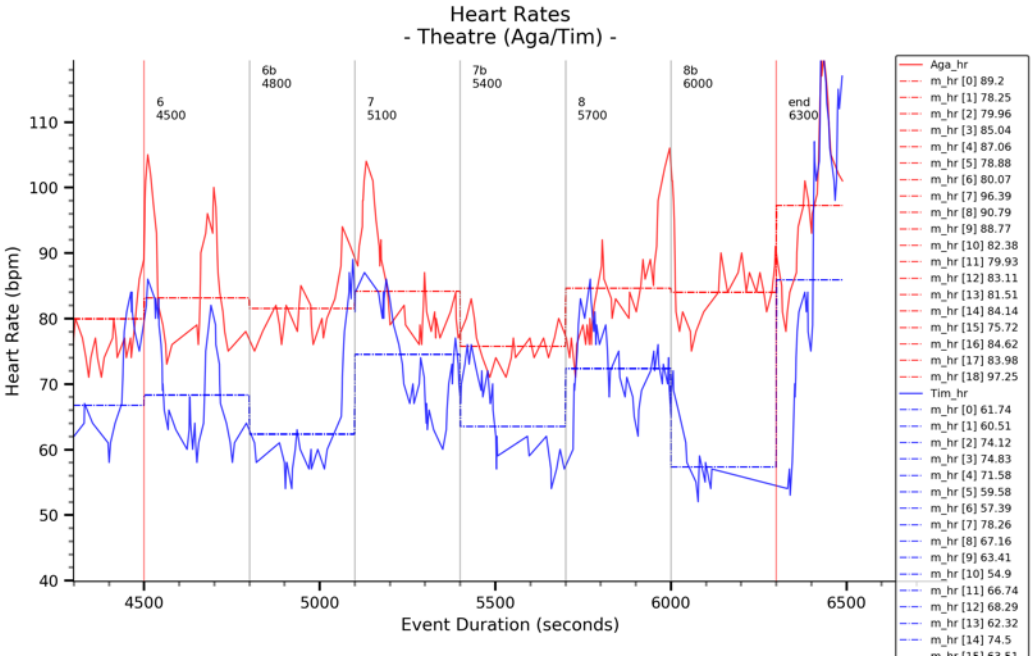


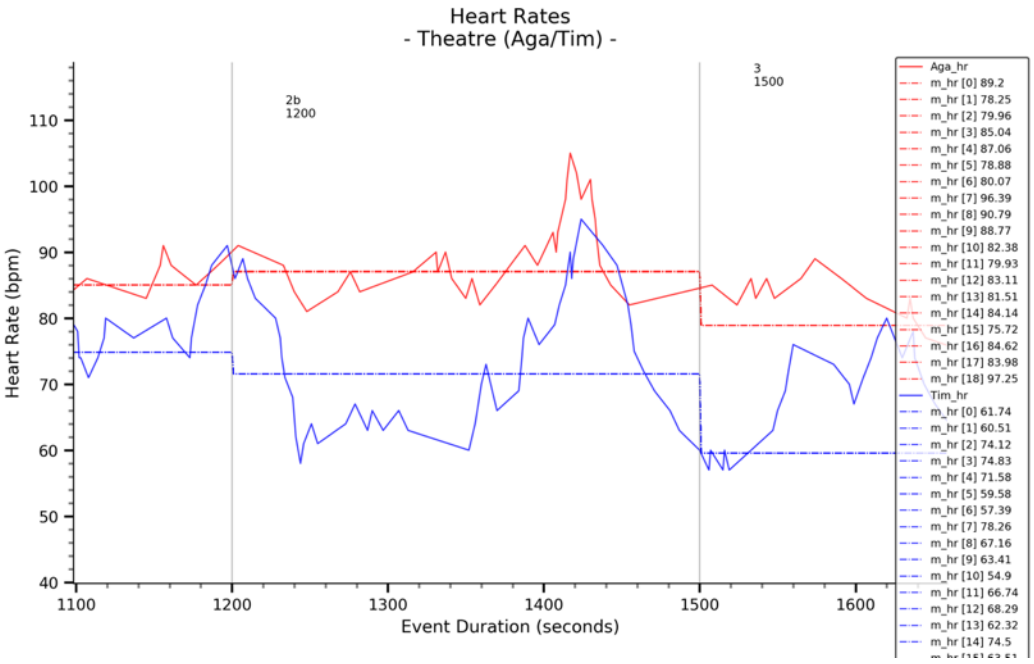
Figure 4.10 *The War of the Worlds*, the second part (close-up)



The performance started with us entering a small theatre space (the first minutes include movement) where we listened to the welcome speech while seated (about five min). The welcome section 1 and later session 5b have a similar mean as we spent most of them seated. As my (female) average HR in those sessions is about 76 bpm and my partner (male) is about 60 bpm, I considered those mean scores as our respective resting but cognitively moderately engaged baselines. If the resting HR is ca. 72–74 bpm for a woman

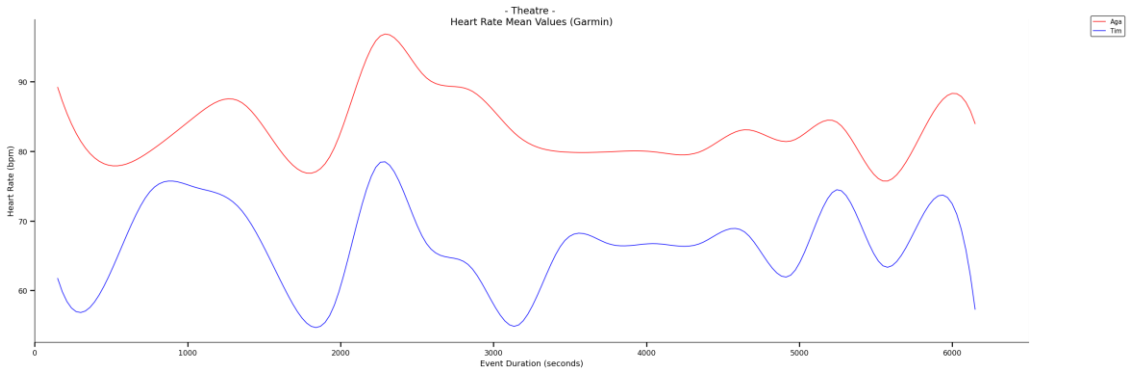
and the man has lower HR, both graphs express sensibility to the performance action visible in, at times extremely changing, amplitudes of data. The lines of the graphs display some resemblance and similar directions of two people's heart reactions to changes in the plot. Something that on above graphs looks like orienting response in a close-up turns out to be a longer, and less dramatic, change of heart rate (like below in the close-up of section 2b).

Figure 4.11 *The War of the Worlds*, section 2b close-up



My and my partner's graphs have a similar shape in both the first and second part of the performance – the means of five-minute sections (Figure 4.12 below) exhibit the same tendencies of going up or down. Also, there are many indicators of similar bodily responses to the content. It is because, during the show, we focused on the experience rather than interaction with each other.

Figure 4.12 *The War of the Worlds*, the first pair's experience through smoothed HR means of five-minute periods



Second couple's *The War of the World* experience

The graphs (Figures 4.13 to 4.16) of another couple – the sisters – include some similar and a few divergent features.

Figure 4.13 *The War of the Worlds*, data of second pair of participants – full experience

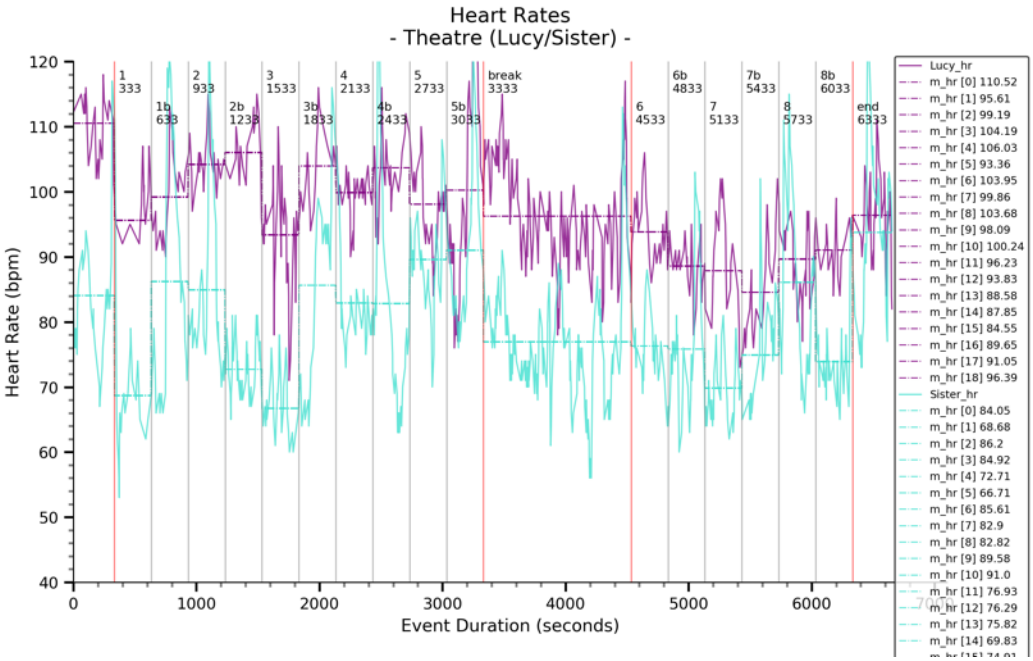


Figure 4.14 *The War of the Worlds*, the first part of the show (close-up)

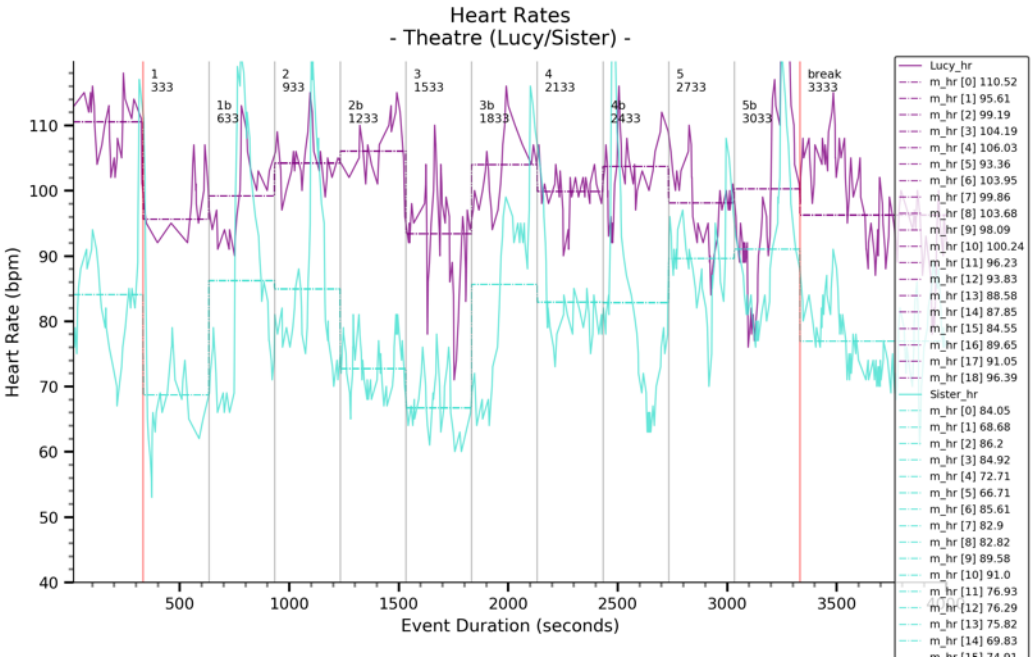
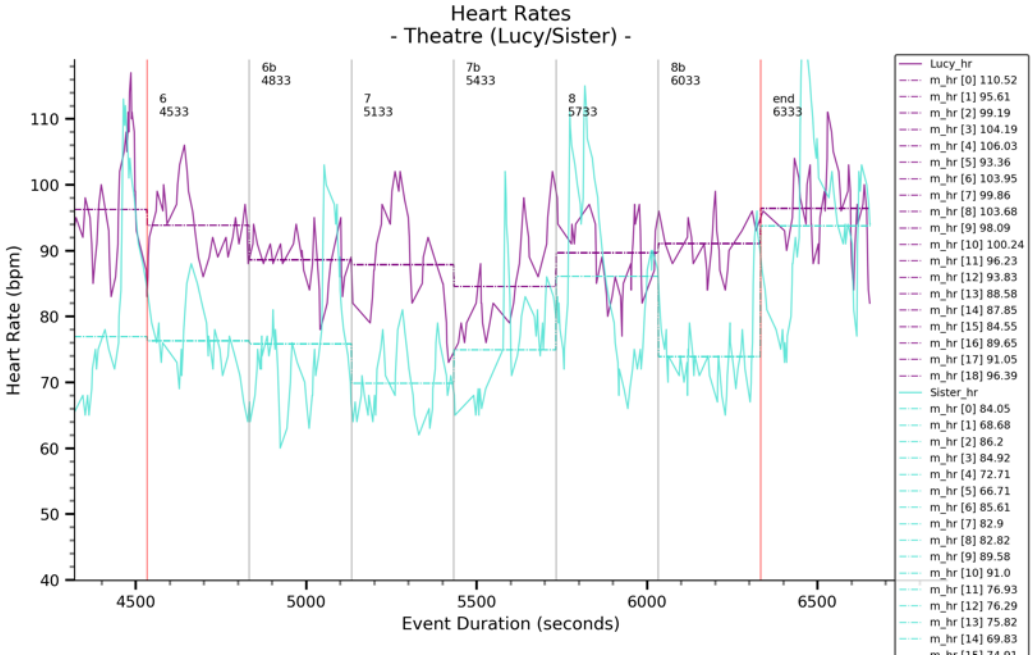


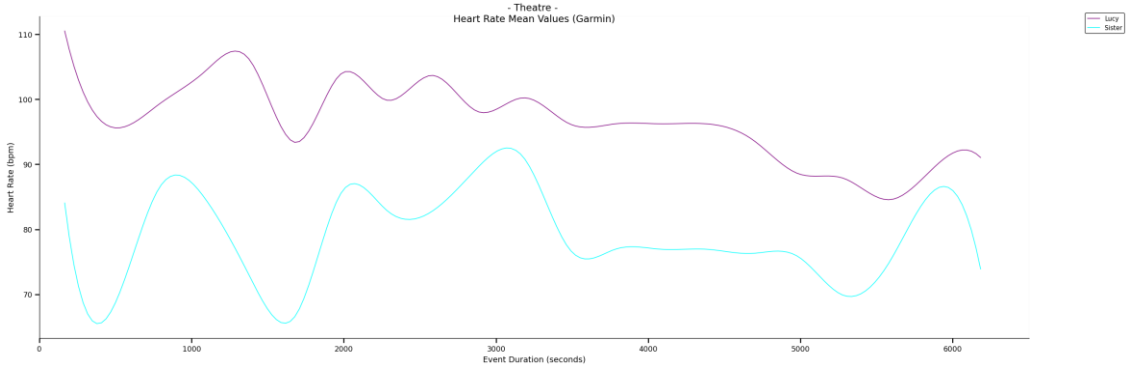
Figure 4.15 *The War of the Worlds*, the second part of the show (close-up)



The data indicate that one of the persons (marked in turquoise) was more sensitive to the dynamic action, but both women were significantly aroused during the performance. The resting or rather comparative HR in the case of the purple graph is far from average female heart rate. That indicated high arousal at the beginning of the experience. As those high values continued throughout the show, this was considered a physiological or sustained recording feature rather than an error. In the second couple case, the comparative HR is taken only from welcome section 1, as it was uncertain if the section 5b timing aligned with 5b of our first experience.

The sisters' graphs do not have a similar shape in both the first and second parts of the performance. Tendencies of the means (Figure 4.16) are only partly matching. The responses in the short post-experience questionnaire (filled out by the four of us) explained that – during the show, the sisters at times interacted with each other. That means that their reactions were both responses to the performance and themselves.

Figure 4.16 *The War of the Worlds*, the second pair (smoothed HR means of five-minute periods)



Four people comparisons

The four of us (my partner, the two sisters, and I) experienced, even if not concurrently, the same artistic event, but our bodily responses exhibited both similarities and differences. There were significant similarities in the first pair's reactions. There were also several similarities in my, my partner's and one of the sisters' reactions. Finally, there were a few similarities in all four people's reactions.

Figure 4.17 *The War of the Worlds*, three people comparison (smoothed HR mean values)

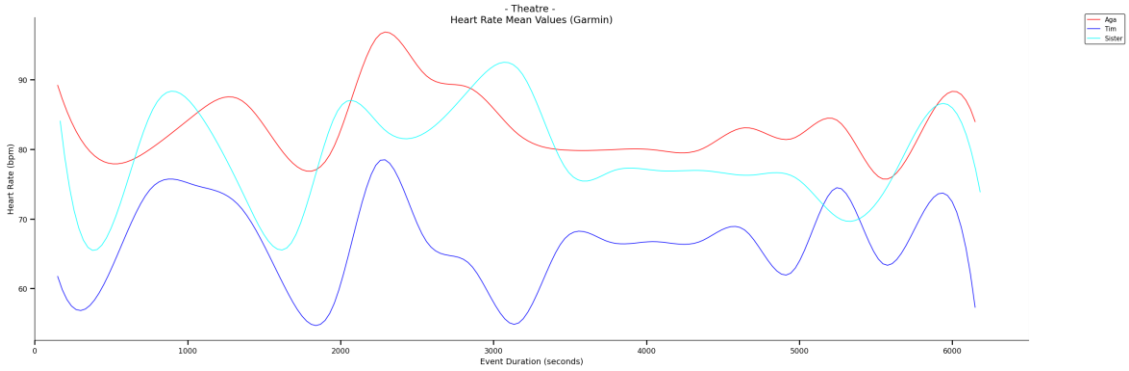
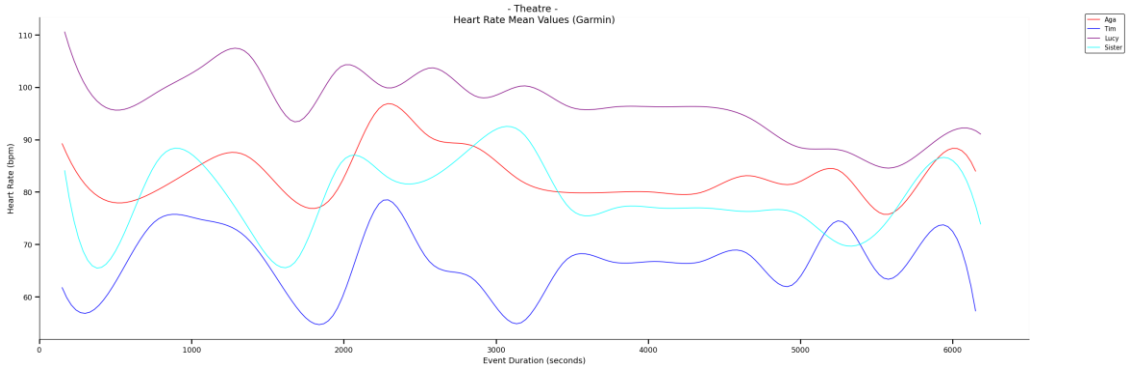


Figure 4.18 *The War of the Worlds*, four peoples' experiences (smoothed HR mean values); first pair: red and blue, second pair: purple and turquoise



The comparison of four experiences indicated individual differences in bodily sensitiveness. Especially the turquoise person demonstrated high-level changes visible in the detailed graphs (Figures 4.13 to 4.15). Other differences might be explained by different focuses in the experience of both pairs. Interpersonal interaction changes responsiveness to arts, which was also observed by Tröndle and colleagues, which showed that the social behaviour of museum visitors had a decisive influence on arts reception (Tröndle et al., 2012; Kirchberg & Tröndle, 2015).

All four people were very frequent arts attendees. Three (red, blue, and purple) had extensive previous experience with VR. The fourth (turquoise) had earlier only one simple VR experience. The graph of this person indicated the strongest reactions during the performance. This person also rated the change in her attitude towards VR art after experiencing *The War of the Worlds* as five points (maximum). The rest of us gave it four points.

After the experience, the four of us wrote about the emotional engagement during the event. “Turquoise”, for whom it was her second VR experience in general, but her first professional VR art, wrote:

> There were parts of the experience which instilled a lot of fear in me and a few moments where I screamed out loud and felt quite shaken, e.g. in the confession booth when a Martian hand reached out and touched me. Although knowing it not to be real, it took longer than expected to calm down after it due to the senses of touch and sight being so confused [due to use of VR]. There were other moments of joy as I enjoyed interacting with my sister whilst acting as another body. I found it amusing to affect other experiences through my own actions.

“Purple”, her sister, very highly acquainted with VR art, responded:

> The experience was quite fun – there were moments that were funny and amusing and moments that gave me a bodily rush (such as going through the slide, being touched by the alien in the confession booth). My main emotional responses were amusement and moments of exhilaration.

The only man in the group (blue graph), also very experienced in VR, wrote:

> Most emotional moment would probably be the injured soldier scene. Engagement overall was good, particularly with the excellent live actors. I found it difficult to be fully immersed in the VR sections, more graphical fidelity and higher, smoother frame rates would be needed for this.

My note about the emotional engagement was as follows:

> It took me a while to enter the experience emotionally both at the beginning and after the break. But generally, I felt very emotionally

> engaged. I jumped several times, e.g. when fire unexpectedly was used. I was scared several times, and I felt idyllic during the final song. I was confused with the last scene as I did not understand the ending.

Those four notes indicated that, despite differences, there probably were more similarities in our hearts' reactions than in our mental recollections. It is also clearly visible that the least experienced person had, in general, the most dynamic and influential adventure.

4.2.3 *The War of the Worlds* (tests with Ring)

During *The War of the Worlds*, I also tried to test the Ring. However, the quality of that data is uncertain. The Ring is designed for laboratory experiments, while the actions of the performance were constantly moving the audience. The device I wore did not record the data, so I only had one person's – my partner's – recordings from that experience.

Still, there were a few observations from the comparison of our Garmin records and available Ring data. First, the Ring registered the motion, which was valuable for attempts to distinguish and separate the HR changes related to (in this experience at times – brisk) movement from those not caused by it. The registered motion was related to various things, e.g. adjustment of a headset, (different duration) walking, (a few seconds of) sliding, or (instant) "jump" responses that involved short dynamic bodily reactions. There were some discrepancies between the heart data of the same person recorded by Garmin and by Ring, though. That could be explained not by different heart rates but by differences in physiological signals' recognition capabilities between sensors (Ragot et al., 2017) and the unsuitable for Ring circumstances of data collection. Interestingly, in section 5b in the first half of the performance, we were seated on a bench that played the role of a boat when "we cruised along the Thames" in the VR headset. The boat journey in virtual reality caused heart rates to trend up, while Ring ACC figures are steady. The rising heart rate level at that moment indicated a reaction to immersive VR content. Figures 4.19 to 4.22 compare movement and heart rates registered by Ring. Data was sliced into five-minute segments on every graph to support comparisons.

Figure 4.19 *The War of the Worlds*, movement during the first half of the performance (Ring data)

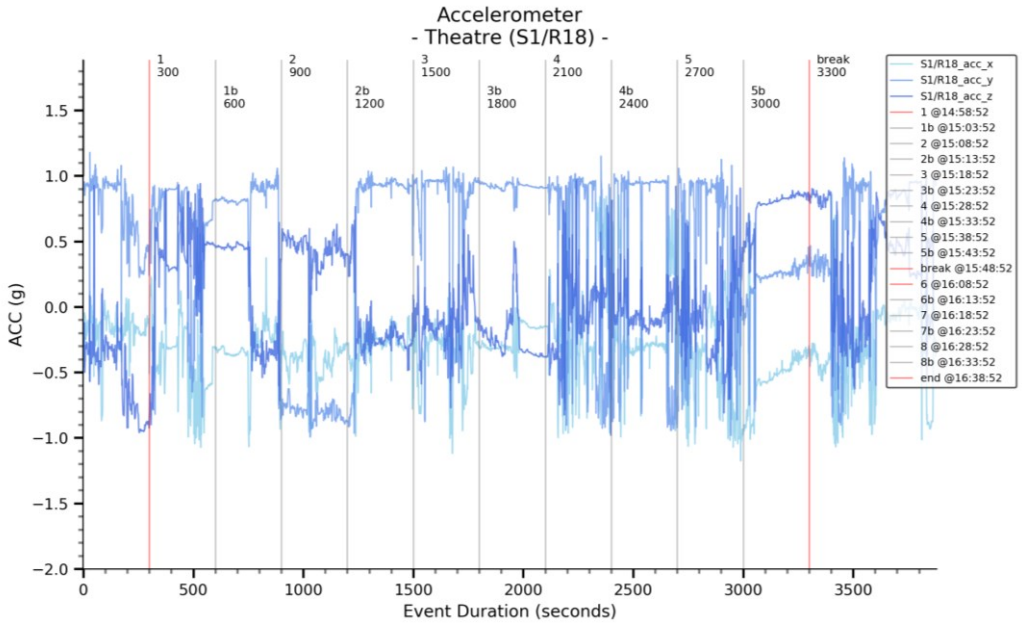
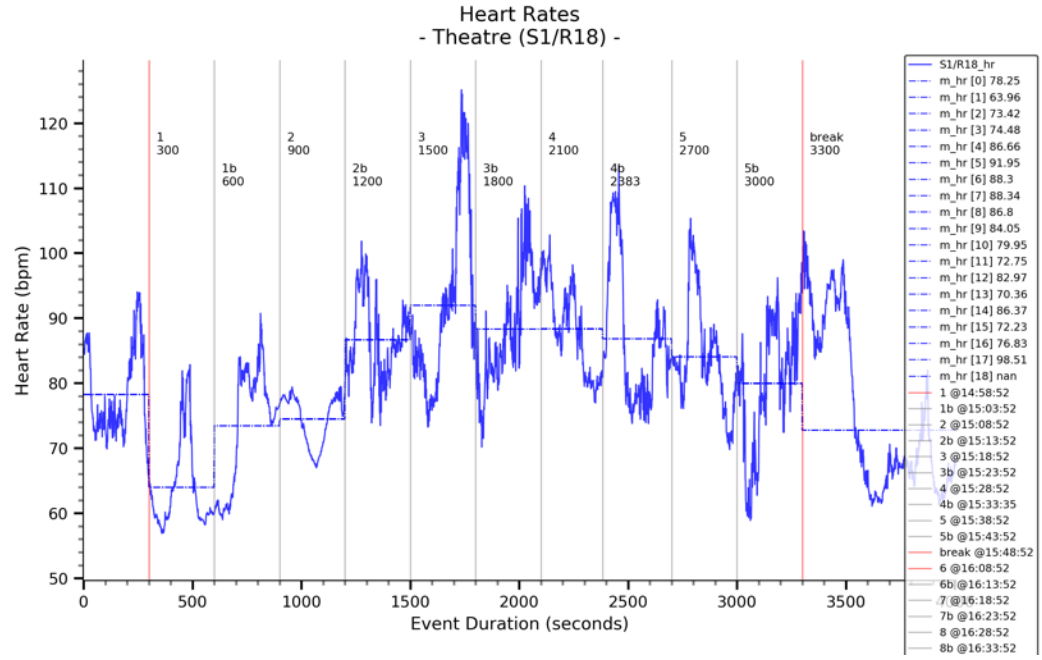


Figure 4.20 *The War of the Worlds*, HR during the first half of the performance (Ring)



The movement records and heart rate values recorded by Ring often coincided, but their strength varied. For example, the highest peak in HR (at ca. 1,750 seconds of the experience) did not indicate the biggest strength of the movement (recorded at ca. 2,400 seconds). That might mean that HR peak at 1,750 was not only caused by movement. The movement around the 2,500 seconds mark high HR registered by Ring and my strong response registered by Garmin. But changes of position of the Ring before that moment (between

2,000 and 2,400 seconds) do not associate with decreasing heart rates. Figures 4.21 to 4.22 compare movement and heart rates in the second half of the performance.

Figure 4.21 *The War of the Worlds*, movement during the second half of the performance (Ring)

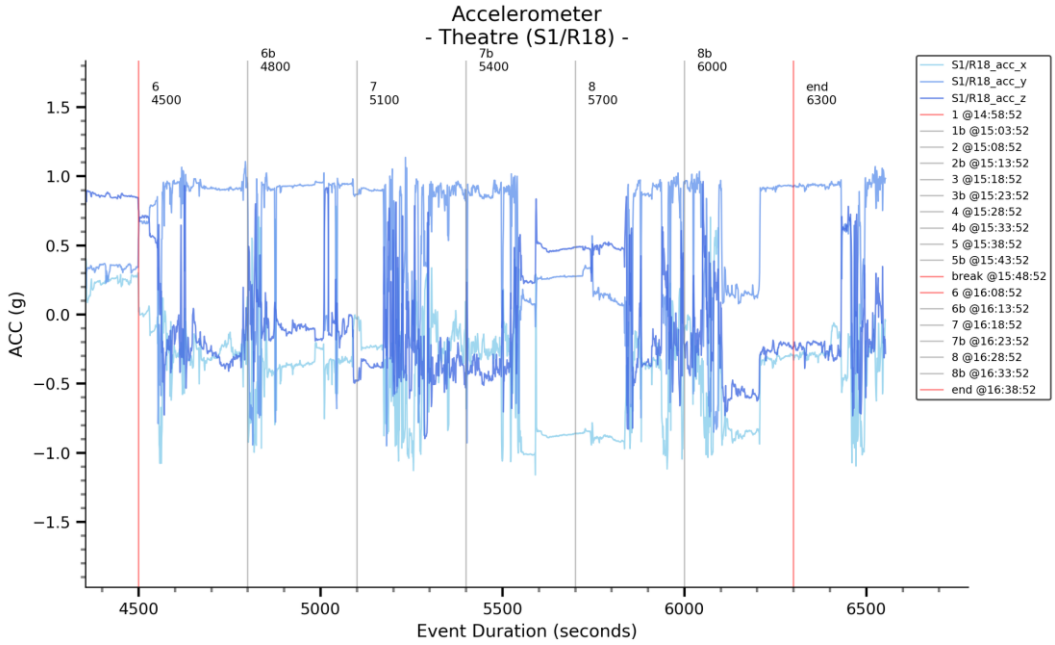
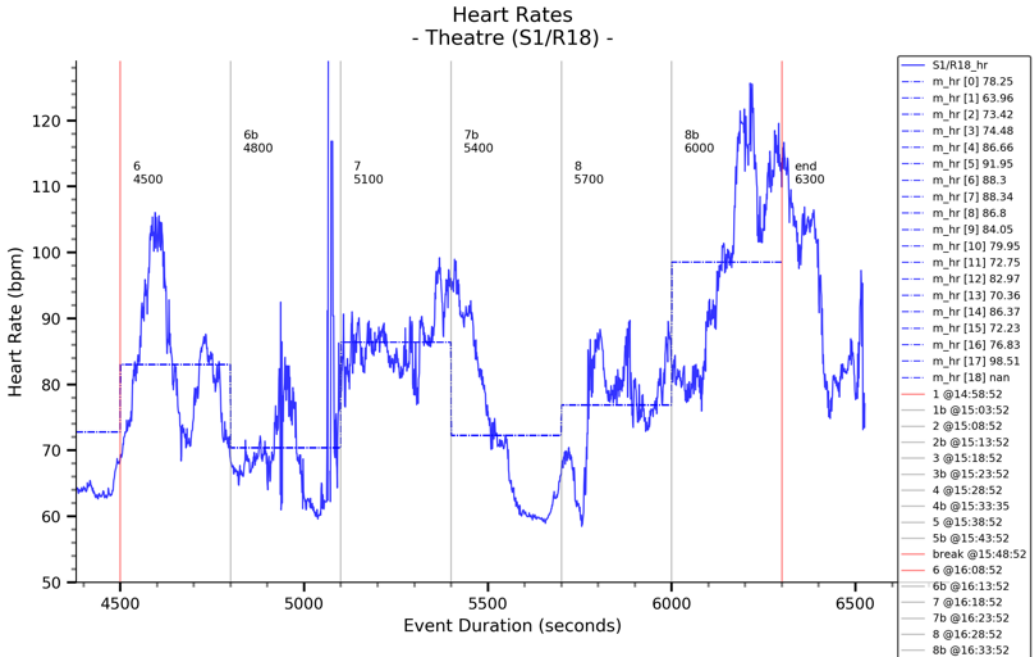


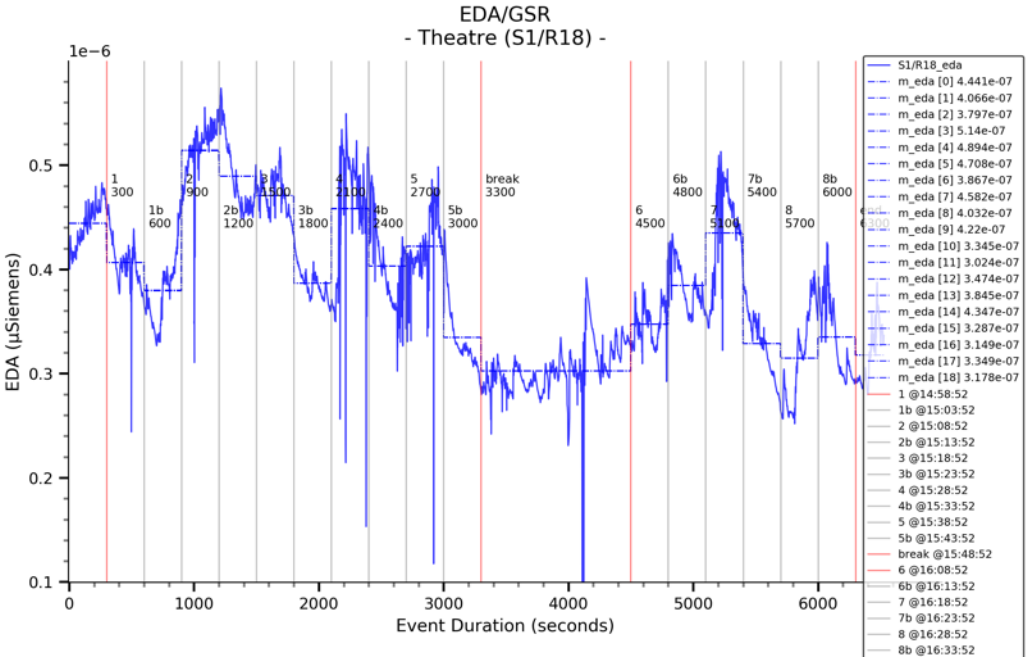
Figure 4.22 *The War of the Worlds*, HR registered by Ring



In the second part of the show, the steeply climbing line at ca. 5,100 seconds represents the artefact (recording error). The end of the show (8b), with the calm accelerometer data, indicated a clear HR raise – an intense reaction of my partner to the art.

During *The War of the Worlds,* the Ring also recorded the skin conductance of my partner (Figure 4.23). Regardless of a few errors (visible on the graph as long, sharp, straight lines down), the EDA graph presented variations in his changing and significant (in the range of 0.3 to 0.56 µS) arousal during the show.

Figure 4.23 *The War of the Worlds*, EDA during the whole performance (Ring)



EDA recordings indicated regular waves of arousal during both parts of the event and confirm a quiet period during the break. Skin conductance displayed a pattern different from heart rate. The authors of *the War of the Worlds* divided the show into ten acts, each lasting about ten minutes. The EDA form presented an acceleration happening (usually) in the first half of the ten-minute act (sessions marked as 1, 2, 3, etc.). The second half of the short segment (marked with added “b”) presented calming down effect. The pattern distorted during the second part of the show. That might be associated with the imprecise mark of the start after the break (calculated, not timestamped). But it might also mean building up dramaturgy and a less dramatic beginning of the second part of the show. The above graph demonstrates that measurement of the electrodermal activity of the skin adds a vital element to art engagement studies.

4.3 Key insights from the pilot stage

The pilot phase revealed the challenges but confirmed the feasibility of my approach and its capacity to provide insights into the engagement processes. The testing phase indicated that Empatica, even if not perfect, was the best

available tool for studies of experiences with movement involved. It collected the most versatile physiological data and gave access to an easy-to-navigate records visualisation platform allowing concurrent analysis of all kinds of collected bodily reactions. The Ring sensor is more appropriate for collecting data during seated experiences. Garmin functionalities might be satisfactory for studying experiences with artworks with dynamic structures, like *The War of the Worlds*, and less useful for more relaxed experiences like film viewing. The use of specific sensors (for example, because of their availability) determines the outcomes.

My physiological responses visualised in HR and EDA graphs corresponded with my memories of different artistic events. Heart rates collected during three immersive theatre performances suggested that if the details of movement are known, the heart rate data itself could indicate the scope and fluctuations of arousal. The range of my heart response to each of the films logically represented levels of arousal and my body's adaptation to the content. My heart had a more relaxed pace (within the rest state range) during the romantic movie, higher speed in the final section of the action film, and even higher arousal starting from the middle of the drama. It was impossible to infer the scope and changing intensities of engagement from heart rate data collected during less structured experiences such as a museum visit. EDA logically visualised the levels of my engagement with films – relaxed state during the romantic story, stabilised on a higher level but flat EDA during the action movie, raising and high activation during the third drama film, and relaxed state (of both viewers) of *The Current War*. Pilot studies showed that one person might have flat and, at other times, more varying skin conductance response and that flat EDA might indicate more relaxed but still an engagement. My heightened self-awareness and self-evaluation might not be typical for a general audience. Yet, my pilot experiences suggested that when we have context, bodily data, and reflections on the event, even an analysis of individual experience could increase understanding of general aspects of engagement.

When two or four people in the pilot phase experienced (even if not simultaneously) the same artistic event, their bodily responses exhibited many similarities and a few differences. The aligned heart rates of a small group of participants included similar reactions to the dramaturgic structure of the film and immersive theatre performance (*The War of the Worlds*). There were significant similarities in the bodily responses of a couple, but also several similarities in the four people's reactions. However, there were also differences in the physiological responses to the content developments. That is not surprising as audiences may have different levels of sensibility, and social

interactions introduce changes in engagement. The measurement of the electrodermal activity of the skin during *The War of the Worlds* displayed a pattern of bodily engagement that might reveal the creators' intentions. The pilot phase also signalled that people with significant VR art experience assessed the change of their attitude towards VR art on 4, while 5 was the highest score. Contrastingly, a person with little experience evaluated it on 5, declaring an upgrade in attitude towards VR art. That is understandable – people with a high level of relevance in the area needed a ground-breaking experience to upgrade their already positive attitude. The post-event reflection of the participants indicated that, despite differences, there were more similarities in participants' heart reactions trends than their conscious recollections of the experience.

Already the pilot experiences demonstrated that the experience of engagement is individualised but not messy. The physiological reactions of my body during all arts experiences matched my recollections and reflections about the events. Further investigations with other participants also showed some encouraging convergence. Graphs demonstrated similarities in the reactions of different audience members, especially partners, and the influence of social interaction during the event. The analysis illustrated the challenges of assessing the strength of the movement's impact on other physiological reactions. However, this problem might be less valid in studies when the occurrence of the response is more meaningful than its dimension. Studying physiology during artistic experiences involving motion was not easy but possible. The most valuable seemed to be the simultaneous use of several physiological measures.

The preparatory phase exposed difficulty in understanding of bodily data as the artistic experience rarely involves clean, discreet feelings. Physiology does not indicate precise emotions anyway, while the presence of mixed emotions (or mixed feelings) further complicates the analysis. The pilot studies signalled issues to look at during the main case study, for instance, the presence of mixed emotions and differences in experience assessment by more and less experienced participants. The pilot phase suggested that if we have bodily data and an understanding of the artwork, we could infer peoples' internal engagement (but not its meaning for the participants) even if they do not provide full cognitive feedback.

Chapter 5
Bristol and *Whist*
– internal processes of engagement in context

In this chapter, describing my central exploration, I study the audience's experiences with two virtual reality art projects. They represent directed (art in a closed form) and semi-directed (when artwork adapts to audience reactions) arts engagement. I explore the relationship between dynamics of physiological engagement (visible in heart rate and EDA), participants' personal context (gathered in pre-experience questionnaires), and audience reflections on VR art (communicated after the experience in questionnaires and during the interviews). Both audience reflections and the virtual reality artistic content provide contextual influences on bodily engagement processes and expose (some) generative mechanisms in action.

The chapter concentrates on individual experiences (sub-cases) and comparisons of a small group of participants' experiences. The *Bristol* and *Whist* artworks descriptions are limited to those in the methodology chapter (pages 91–94), as my analysis concentrates on searching for causes and reasons for specific reactions in the individuals' respective contexts. I address each case – both VR art projects – first individually, through in-depth analysis of individual and small groups of participants, and then compare the results of the sub-analyses. Although I study individual engagements, the participants for in-depth analysis were selected to provide grounds for comparisons and generalisation of the findings to similar and different contexts. However, I will reflect on the congregated trends in the next chapter. The analysis now concentrates on sub-cases within each case – the VR art – and their comparisons.

This chapter provides a solid foundation for addressing the following research questions:

1. What can bodily data collected through biometric devices tell us about the audience's bodily engagement with art?
2. What can the relationship between audience personal context, dynamics of bodily engagement, and post hoc cognitive reflection reveal about audience experience of (VR) art?

5.1 Directed engagement – *Bristol*

Bristol's programme was experienced by the audience at the same time while seated, which allowed me to explore the entire experience and compare

components of the event. Data from the accelerometer was irrelevant as movement did not influence the participants' physiology during the seated *Bristol* experience. I timestamped[11] the start of each film and recorded information about the duration of the welcome and final (decompression) parts. Each part of the experience was marked on the graphs to support comparisons. The emotional load of the content of the programme somewhat differed. The participants first experienced two environmental films – a documentary about the Ethiopian endangered wolf and, second, an animation about the last song of an extinct Hawaiian bird. In the third film, the audience encountered prisoners in California.

In the case of *Bristol*, due to the number of participants matching the number of Garmin and Ring devices, it was possible to track the physiological responses of most participants. However, there were significant differences in the levels of detail in data from both devices, which limited the usefulness of Garmin recordings. The diversity of reactions was hardly visible on Garmin records. The Ring provided more precise data, allowing comparison of the experiences of eight people, two per each of the four presentations. I, therefore, decided to analyse all those participants. I first looked at the individual data from two people experiencing the same *Bristol* VR art programme simultaneously. All the changes in the content happened for each pair exactly in the same moment, and the immediate pre-experience environmental context was the same for each couple. Then, I compared participants from all four presentations. None of the attendees entered the experience being physically stimulated – there was no rush or steps to climb. Other factors related to, for example, food, drinks, medication or sleep that might have affected participants' physiology were not controlled. As I mentioned in the methodology chapter, the study involved real audiences of four presentations, which meant that participants for the below comparisons were paired unsystematically. The descriptions below include a mix of pseudonyms and first names, as some audience members have agreed to use their first names.

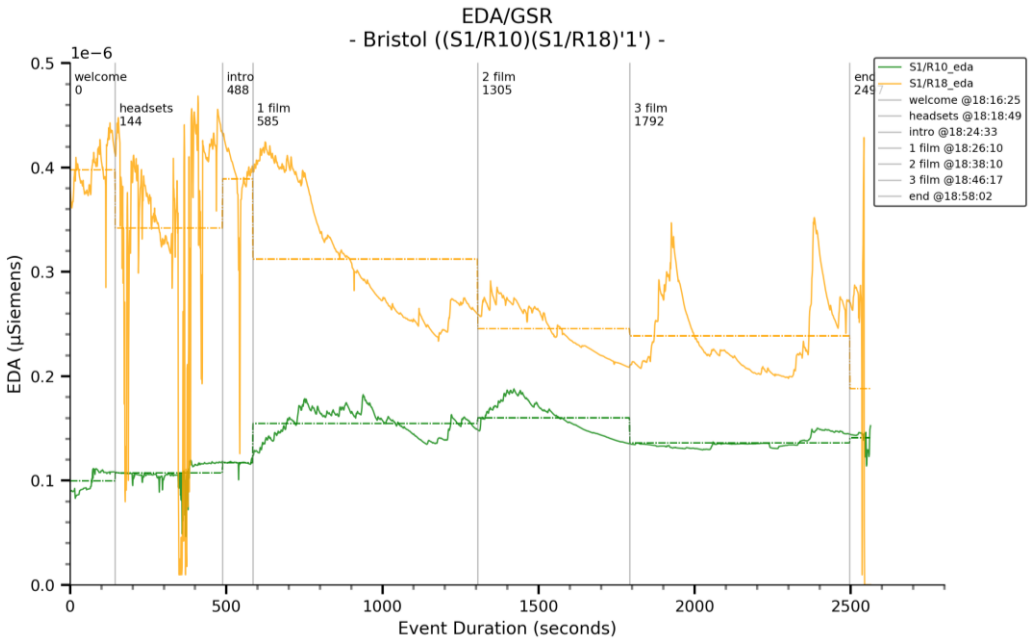
The analysis of the first pair of participants is explained in full to demonstrate the analysis processes. The following pairs' experiences are presented in short, through graphs and comparisons of individual analysis findings.

[11] I did this using www.unixtimestamp.com on my phone.

5.1.1 Ines and Max

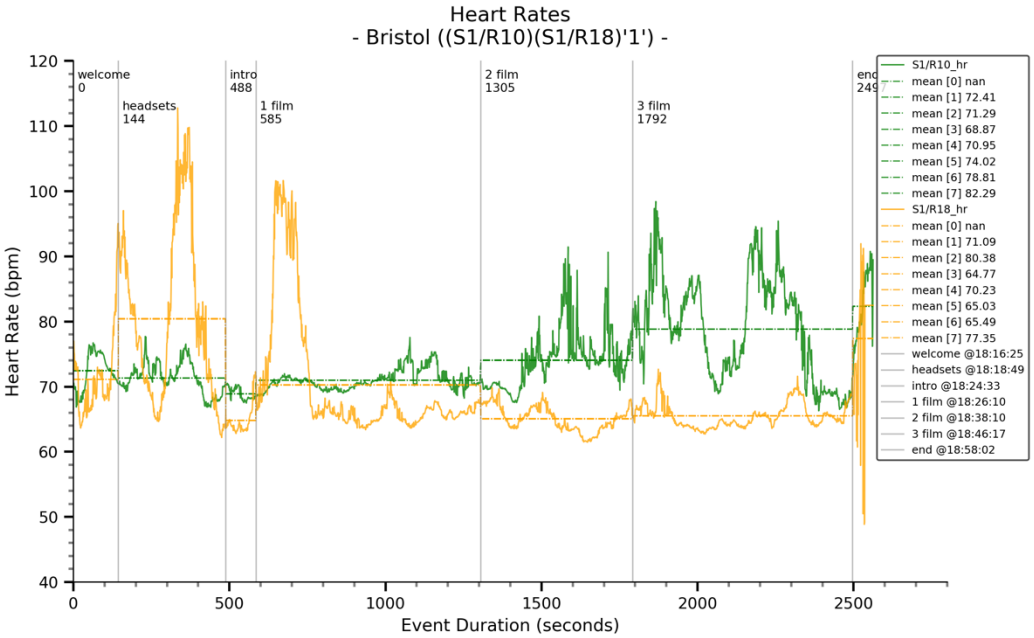
Two participants from the first projection were of foreign origin (Portuguese and Italian) in the age brackets 45–54 and 55–64. In the questionnaires, Ines expressed a “tech/ART” attitude (so moderate “tech” and high “ART” focus[12]) both pre- and post-experience. Max demonstrated a change from pre-experience “tech” focus (moderate propensity for tech) to very high “TECH!” and high “ARTS” satisfaction post-experience. The first pair of participants’ EDA shows some similarities, while participants’ hearts reacted differently.

Figure 5.1 *Bristol*, Ines (yellow) and Max (green) comparison of EDA



[12] The coding of propensity for arts and technology was described on pages 109–113.

Figure 5.2 *Bristol*, Ines (yellow) and Max (green) comparison of HR



Between Ines's pre-experience "tech/ARTS" focus (moderate tech and high propensity for the arts) and post-experience assessment of quality of engagement matched, there was no change of attitudes. Before the start, Ines expressed very high anticipation, while my evaluation of pre-experience context (explained in the methodology) suggested moderate bodily arousal. In her case, initial values of EDA indicated activation and supported her high pre-experience anticipation. Heart rate was, however, in the rest zone at the very beginning of the recording. Calculated as moderate pre-experience arousal was visible in HR, but not EDA. Ines's main motivation for participation was to experience VR, experience art and discover something new.

Ines's heart rate and EDA (on the above graphs in yellow) in the first minutes after having the VR headset put on, indicated a very high reaction to virtual reality that calmed down during the first film. The bodily data graphs matched her reflections on the programme. Like most participants, she marked (post-event) emotional engagement with three films on a scale from a low of one to a high of five, giving two points to the first, one point to the second, and five points to the third film. Initial physiological measures could suggest higher arousal during the first film, but those amplified reactions concern virtual reality, not artistic content. At the end of the first story, the EDA again rose from 0.24 to 0.28 µS. According to my criteria, this represented a rise in arousal. The first minutes of the second story stay at this ca. 0.28 µS level to fall into 0.22 µS, which suggests emergent emotional detachment. In the last film, Ines was

> feeling the same emotions as the inmates. I'm empathic, and I am easily moved. It felt like I was actually with them, in person.

The EDA graph changing amplitudes in the highest (of three stories) range from 0.20 to 0.35 μS clearly supported that statement. If I considered a change of 0.03 μS as a sign of arousal, then a change of 0.15 μS signifies high arousal. Ines EDA graph's shape and level (but not calculated means), in general, affirm the ranking provided by her after the event. Heart rate, on the other hand, did not demonstrate significant variations apart from the start of the presentation. The regular heart beating indicates attention to external stimuli and no cognitive effort, so possibly domination of parasympathetic neural activity. Internal sympathetic activation is, however, visible in the EDA. Ines's heart rate suggested that cognitively she felt comfortable during the whole experience, while EDA endorsed statements about changes in emotional engagement.

The post-experience attitude expressed in four aspects of the O'Brien scale remained the same as the pre-experience focus. Ines highly valued the aesthetic appeal of the VR art that was compatible with her high artistic focus; she assessed perceived usability as moderate (which was compatible with initial moderate tech focus); attention and reward factors both scored very high. The score for general quality of engagement (4.25) was within the very high range and was mostly negatively influenced by technology usability issues. Nevertheless, Ines reported in the questionnaire that the VR art completely fulfilled her expectations (giving a maximum of five points), even if the graphics quality of the second film was a bit distracting. Very high anticipation before the event aligned with Ines' (assessed by her later) very high engagement, and her internal activation is visible in the EDA graph. The heart rate records suggested that calculated (based on answers to the pre-experience questionnaire) moderate bodily arousal (good level of comfort) continued during the whole experience.

The second participant of the first presentation, Max's pre-experience moderate propensity for technology was higher than his low propensity for the arts, even though he usually attends artistic events three or four times a year. Max expressed pre-experience maximal, very high anticipation, while his calculated pre-experience context suggested potentially moderate bodily arousal. In his case, near the resting average heart rate and low EDA supported indicated medium arousal at the beginning of the experience. The main motivation for attendance was a wish to experience virtual reality, as well as emotional and spiritual engagement, as Max mentioned fascination with the theme of reality versus perception.

Max's physiological data and reactions were particularly intriguing. After the experience, Max recalled:

> I found myself restless in trying to decide where to focus. I suppose I need to become comfortable and relaxed with 360 [degree] projection. I was concerned about missing essential parts of the visuals.

This state is what many first timers of virtual reality, me included, experienced. The “restless trying” manifested itself in small changes in his HR, indicating attention to the virtual environment until the middle of the second story.

EDA suggested something different. During the first film, EDA formed a wave increasing from 0.12 to 0.18 μS, then falling to 0.14 and going up again to approximately 0.17 μS – those data confirmed changing but lasting sympathetic nervous system activation. The start of the second film indicated EDA rise from 0.16 to 0.19 (during one-third of the film) and a decreasing trend during the last two-thirds of the story. This suggested diminishing (affective) arousal. Yet, while EDA started to drop, the heart began to race. The EDA line during the third film remained flat, predominantly on the same level as the end of the second story. During the third film, the heart indicated significant change (going up to 90–95 bpm) compared with the first and the start of the second story. When assessing emotional engagement with three films, Max gave three points to the first, two to the second, and five points to the third film:

> I was surprised to see that the human content and the human presence in 3D at a close distance had a much bigger impact on me than landscapes. That is why the second movie was less engaging, and the third had the maximum engagement.

The EDA during the two first films supported Max’s assessment of his levels of emotional engagement. However, the EDA stayed at a higher (than initial) level but did not change during the third story. That (surprisingly) did not correspond with Max’s emotional state, marked in his post-experience reflection and my notes from the event. Max cried during the third film, and this was not visible in his EDA data:

> The last video on inmates was the most touching and engaging and moved me to tears. The level of details in the scene was impressive. Total immersion, like I was part of the group.

This suggested that Max shared high arousal with the film’s protagonists. “Being them” in the experience of high tension potentially increased Max’s heart rate (DiMascio, Boyd & Greenblatt, 1957, in Peräkylä et al., 2015) and “being them” in the experience of empathy might keep EDA on a low level (Voutilainen et al., 2018, p.9). The heart rate could confirm arousal during the third film but at the same time would suggest that the second, not the first story had a sizeable impact on him. That differs from the analysis of EDA data and Max’s assessment of his emotional engagement. In the time of the second film,

both EDA and the heart rate were fluctuating. That might suggest arousal, but the activation could have a negative direction as Max said, “watching animation does not have an effect on me”. EDA indicated varying engagement during the first story, and its decreasing values suggested emotional detachment in the second film. During the third one, his heart was speeding up while EDA remained flat on the middle level. If I analysed only the first two films, Max’s reflection would find confirmation in his physiology.

Heart rate values suggested that Max paid attention to the external environment until the beginning of the second film. By then, Max adjusted to virtual reality and took mental control over the experience – discovering that the VR animation did not work for him. Ravaja and colleagues proposed that when attention to external actions decreases after a peak in an event, cardiac parasympathetic activity also decreases, resulting in increased heart rate (2005, p.10). The heart rate, guided by the parasympathetic and sympathetic branches of the autonomic nervous system (ANS), could indicate different things at different moments. For example, withdrawal of attention from the second film (decreasing parasympathetic activity resulting in growing heart rate) or cognitive effort and mobilisation of resources (increasing sympathetic activity also resulting in increased heart rate) in the third film. However, both heart activation and changes in EDA are sympathetically mediated. Increased heart speed and stable (middle-level) EDA might demonstrate mixed emotions that Max experienced during the animation and the third film, or tears being an act of emotion regulation during the third story. I have found only a few studies discussing opposing levels of HR and EDA, and the research on the physiology of tears during the artistic experience, in general, is limited (Mori & Iwanaga, 2017). Several studies of tears during watching film clips reported both EDA and HR increases (e.g. Bylsma, Gračanin & Vingerhoets, 2016; Wassiliwizky et al., 2017). Max’s physiological data presented complexity, which could not be explained by his (available) reflection on the emotional aspects of the experience or insights from previous empirical studies.

Max's responses before and after the experience indicated a change. His post-experience attitude expressed in O’Brien’s scale showed very high satisfaction with the quality of technology and high satisfaction with the quality of the art. In the case of technology, there was a change from moderate to very high; in terms of art, from low to high assessment. However, Max seemed to underrate his arts focus. His standards for cultural engagement might have been high, so in comparison to them, he assessed his arts focus as low. His art attendance – three to four times a year – could generally put him in a group of highly engaged with the arts. Although usability of technology scored very high, Max’s

post-experience reflection indicated that technology started to have a sense for him only with the worthy (for him) artistic content. Both reward factor and attention scored very high rates. In general, Max assessed the quality of the engagement as very high (4.58), which aligned with the very high anticipation he expressed pre-event. However, when asked whether the VR art fulfilled his expectations, he answered “highly” giving it four points due to problems with the quality of the image. Despite the issues with technology, Max indicated very high satisfaction with technology (giving the perceived usability sub-scale the highest possible scores). At the same time, even if one of the VRs deeply moved him, he gave aesthetic appeal high (thus lower) rates. Such appraisal could support my thesis on the unconscious importance and high standards for artistic experiences. One of the three films deeply touched Max and got his highest praise. But as the two other stories were less appealing, the total aesthetic appeal scored high, but not very high.

The graphs and the reflection on experience suggested that the power of virtual reality manifested itself differently in both participants. It seems that Ines's strong heart and EDA reaction at the beginning of the experience was caused by the perceptual immersion of the VR, and the rest of her physiological response habituated to it and was directed by the artistic content and form. On the other hand, the virtual reality itself was not a cause of Max's arousal until he surrendered to VR and started to concentrate on the artistic content. Virtual reality first-timers reacted to the initiation of virtual immersion differently. Ines's higher initial EDA aligned with her high anticipation. But moderate heart reactions at the beginning of recordings indicated a neutral state, challenging both participants' declarations of high anticipation pre-event. Ines' heart rates suggested that calculated medium arousal (good level of comfort) corresponded with her heart’s initial state and, except for the strong heart reaction to the first images coming through the headset, continued throughout the whole experience. In Max’s case, the average heart rate supported estimated medium arousal from the beginning until the middle of the experience. Ines’s and Max’s EDA lines had very similar shapes starting from the middle of the first film, throughout the second, and until the beginning of the third story. Ines’s (but not Max's) verbal reports across questionnaire responses were coherent. EDA shape and levels, but not heart rates, affirmed the emotional ranking of the films provided by Ines after the event. There was a partial coherence between Max’s physiological data and his reflection on the experience. There was a match of the reactions to the first two films. Bodily and cognitive responses to the third one differed.

5.1.2 Alison and Rose

The second pair of participants, the two British women were in the 25–34 age category. Alison's pre-experience focus was “tech/ARTS” while the post-experience assessment revealed a “TECH/arts” frame of mind. Rose demonstrated a change from a pre-experience “tech/arts” focus to a post-experience “tech/ARTS” assessment. It is unclear why Alison’s graphs finished earlier than the other participants.

Figure 5.3 *Bristol*, Alison (blue) and Rose (red) comparison of EDA

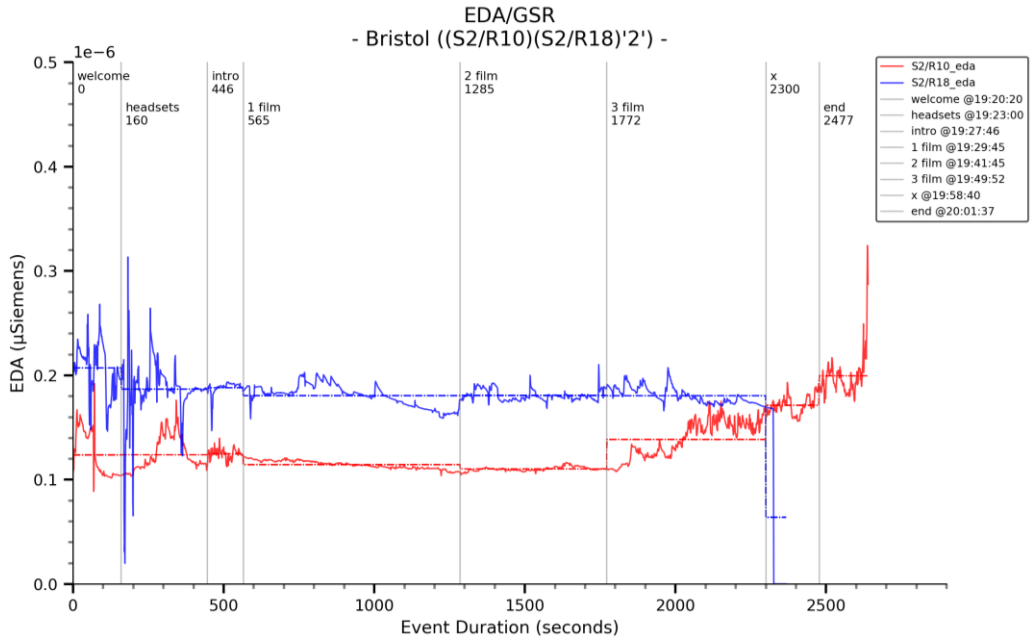
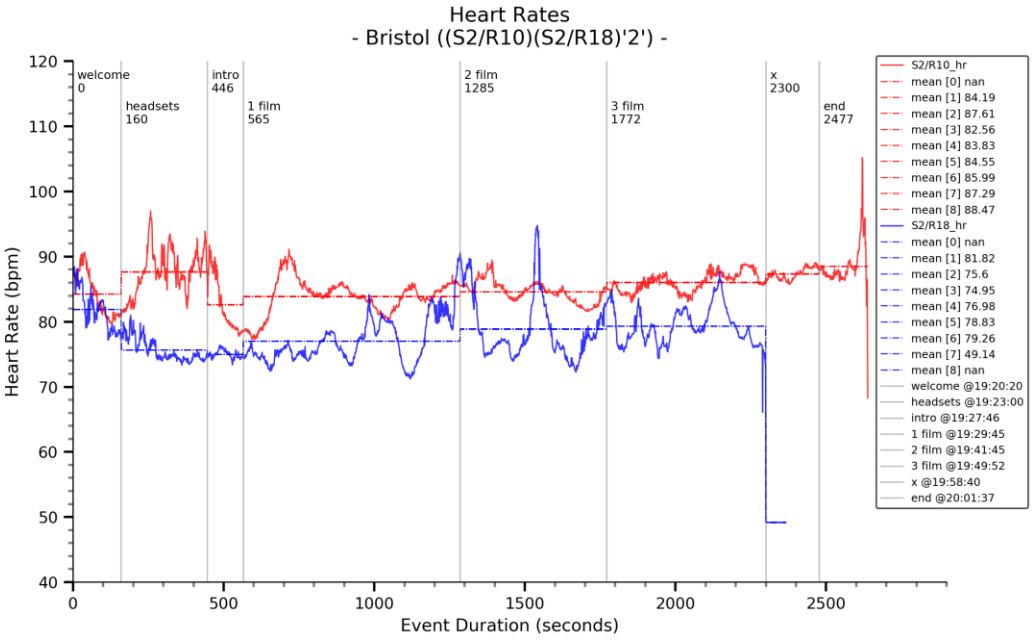


Figure 5.4 *Bristol*, Alison (blue) and Rose (red) comparison of HR



The physiological graphs indicated that physiological reactions at the beginning of the recordings matched the expressed high anticipation of both participants.

They also showed that both were aroused during the headset mounting section, but quickly calmed down. However, these moments of arousal are visible in their different physiological signals – in Alison's EDA and in Rose's HR. During the experience, Alison's EDA was flat during all films but on a higher level than Rose's, whereas Rose's significantly increased during the third story. Alison's HR line showed more changes in the heart rate, but the average level was only just below 80 bpm, which is close to the women's average heart rate. Rose's heart was not dramatically changing speed but, in general, was on a higher level (just below 90 bpm). Both women reported high emotional engagement during the third movie, but their physiological data demonstrated it differently.

Both participants' bodily data were not coherent with their detailed reflections on engagement during the three films. The physiology did not match Alison's own assessment of her emotional engagement during three stories, which she assessed as three, two, and five points, respectively:

> The third film really resonated with me and the first one too because I would see the people involved with a true story and felt close to them – seeing what they could see particularly.

Rose scored her emotional engagement with the three films as two, three and five.

> The first film was visually very engaging, and I enjoyed the personal element of the central figure and his relationship to the wolves, but it didn't feel any more engaging than say, a normal nature documentary. The second I connected with more during the section where the researcher played the songbirds call accidentally. I don't think the VR played into this, I think if it was a video or even just a story I was told I would have reacted the same way. It was the story that got me. [Although] the 'ō'ō bird film was hard to follow as I often lost sight of the birds. The third really hit home because all elements worked together. The story. Placing me IN the line. Putting me in a place and with people I would never normally interact. The claustrophobic feel of the prison room and cell. The whole thing was more immersive and was far more enhanced by the VR. It felt more personal and real.

That emotional state was visible in Rose's rising EDA level during the third film but not in her heart rate, which was high but did not show significant differences between the three stories. Rose's heart rate was high all the time, while EDA was high only during the third movie. Alison's HR and EDA measurements did not indicate changing engagement. Based on just the heart rate it would not have been possible to estimate the impact of each film on Rose.

After the experience, both participants assessed their general engagement as high. Both, however, assigned points in the lower range of “high” – Alison gave 3.67 and Rose 3.83 out of possible five points. Alison’s reflection on experience was coherent across different sections of the questionnaires, but it was unclear why Rose answered that the experience moderately fulfilled her expectations, even though a few questions earlier she indicated on O’Brien’s scale the high “quality of the engagement”. It is also important to mention that those participants knew each other, and both marked being quite distracted before the event (answer to question 25 of pre-experience questionnaire). This might have influenced their experience or reflection on experience (as they filled in questionnaires together).

5.1.3 Adam and Flavia

The third set of participants, European and Brazilian, were in the 25–34 years age bracket. Adam’s pre-experience focus was “arts” while post-experience assessment revealed a “TECH!/ARTS!” frame of mind. Flavia demonstrated a change from pre-experience “ARTS” focus to post-experience “TECH/ARTS!” assessment.

Figure 5.5 *Bristol*, Adam (magenta) and Flavia (purple) comparison of EDA

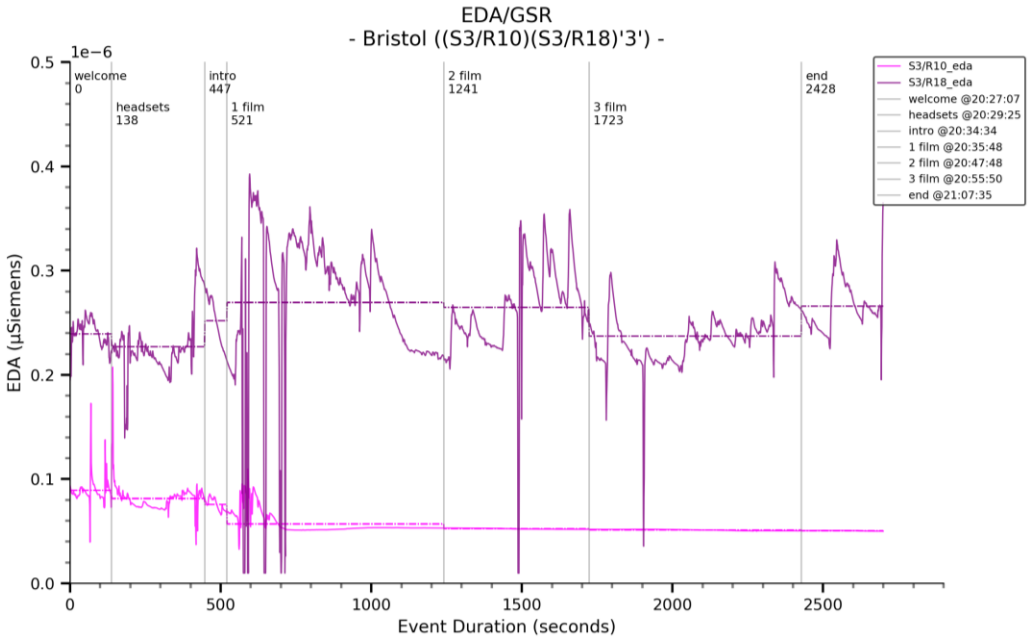
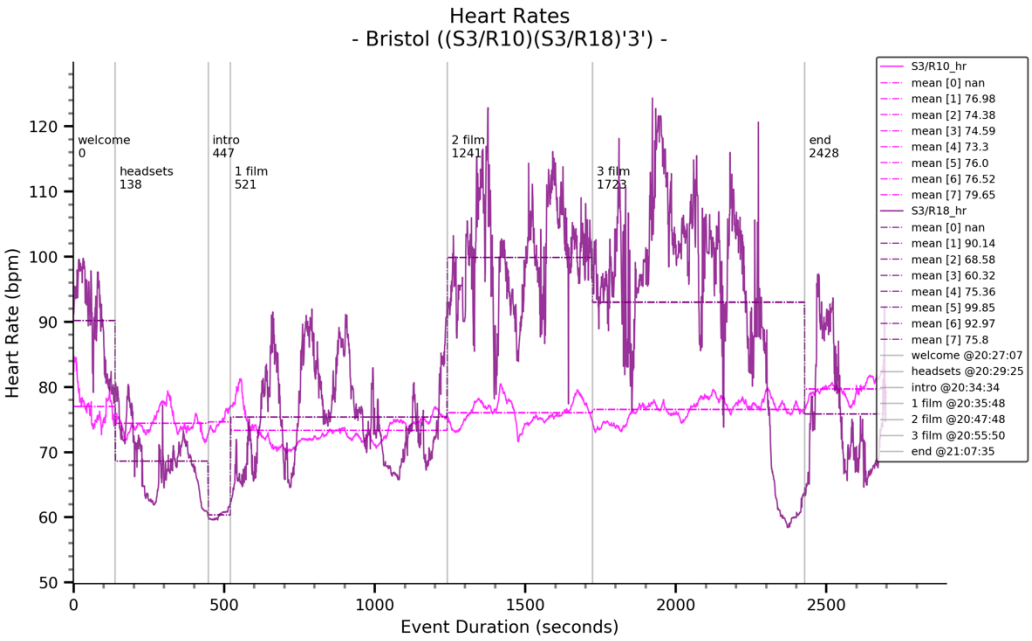


Figure 5.6 *Bristol*, Adam (magenta) and Flavia (purple) comparison of HR



Heart values at the beginning of the recordings matched expressed high anticipation of both participants. However, their subsequent graphs look very different, even if they both assessed themselves as very highly engaged. Adam scored his emotional engagement during the three films as four, two and five:

> The third story had a lot of personal stories about hardships people had faced, and I felt a real connection with them while using the VR.

This means that the third and first films should impact his bodily reactions more significantly. That was, however, not visible in his heart rate records, which did not demonstrate noteworthy differences during the three films. Flavia's physiological records presented some errors, but her data showed significant variability both in heart rate and electrical properties of the skin (EDA). The heart was extremely active during all three stories but on much higher levels during the second and third films. Flavia's EDA during the whole event presented considerable variability compared to the other participants' records. The first contact with virtual reality during the first film and many clearly visible orienting responses significantly influenced the shape and level of her EDA graphs. She assessed her emotional engagement as high, giving the films four, four, and five points:

> I was emotionally engaged by all of them, but the third one was the most impactful one for me because I felt so close to those people. Their stories were really strong and sad.

The cognitive assessment of the experience was in line with her significant physiological reactions. Both participants' responses across the questionnaire were consistent, and Flavia's significant bodily reactions were compatible also

with her reflections on the experience. Even if for Adam “the second film was too artificial, cartoon like”, he concluded that virtual reality art “is something I would consider paying to go to see now”. Flavia also reported problems with the heavy headset and feeling of sickness. Nevertheless, both participants indicated very high “general engagement” (4.58 and 4.67) and when asked whether the VR art fulfilled their expectations, both answered “very highly” (giving it five points).

5.1.4 Hanna and Joseph

The last set of *Bristol* participants, European and British, were both in the 25–34 age range. Hanna’s pre-experience focus was very high in both instances and her post-experience assessment was the same “TECH!/ARTS!”. Joseph demonstrated a change from pre-experience “tech/arts” focus to post-experience “tech/ARTS” assessment.

Figure 5.7 *Bristol*, Hanna (brown) and Joseph (cyan) comparison of EDA

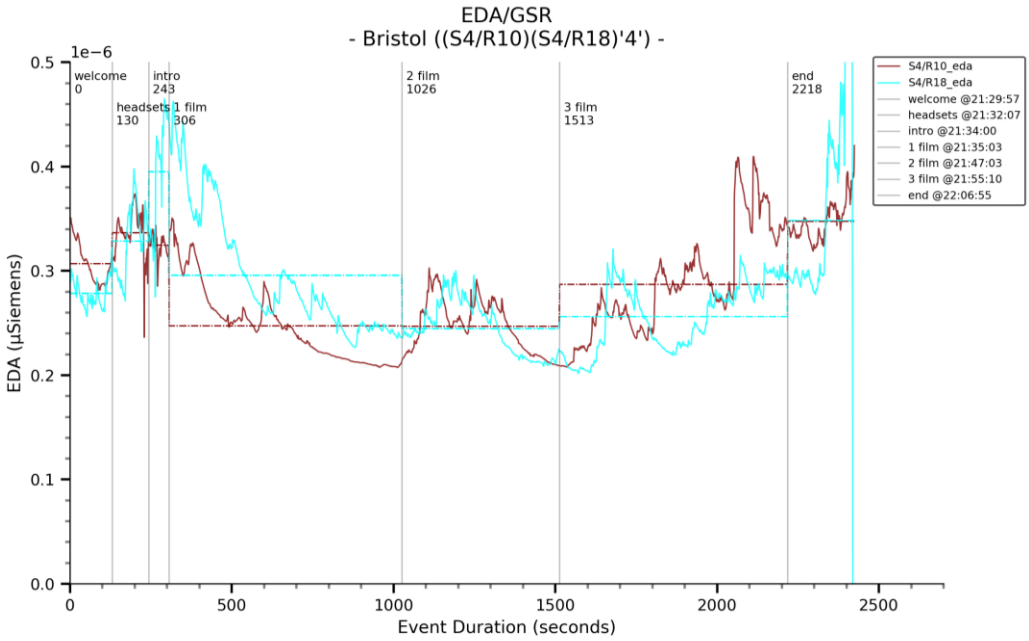
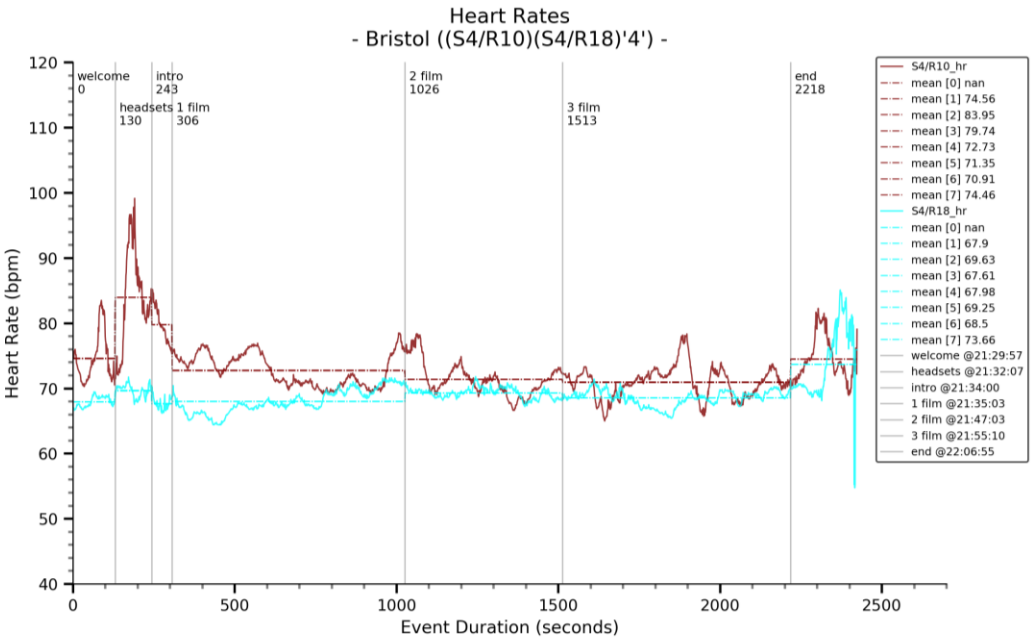


Figure 5.8 *Bristol*, Hanna (brown) and Joseph (cyan) comparison of HR



Interestingly, high engagement was visible in both participants' EDA, while both heart rates remained close to the normal at rest results for women and men. Hanna expressed very high anticipation, but the context suggested low arousal and a good level of comfort. In her case, EDA supported high initial anticipation, while heart rate suggested low arousal. Joseph expressed very high anticipation before the start of the event, while the context data implied high arousal. Skin conductance data showed high arousal, but also in his case HR level was all the time close to the normal at rest state. Hanna's assessment of her emotional state matched her EDA data. She assessed her emotional state during the films as five, four and five points, so there was no difference between the first and the last story and a minor difference in the assessment of the second film. Hanna underlined that she

> was touched by the content of the movies. Usage of the VR helped me to understand the situation and the context better.

Her skin suggested higher engagement during the last film, *Step to the Line*, but the differences to the other films were hardly visible. Hanna's permanent high activation was visible in her EDA. Joseph assessed his emotional engagement with three stories as two, two and four points, respectively. He explained:

> I am more empathetic to humans; I put myself in their shoes; the third movie was more of a rollercoaster of emotions, something out of the ordinary (felons getting degrees) and the feel-good factor.

After adjustment to the virtual setting, Joseph's skin was in line with his assessment of the emotional load of the films. On the other hand, both

participants' changes in the heart rate were within the normal range, and their heart rate graphs did not demonstrate substantial variations. As this final presentation started at 9pm, fading evening light might have influenced the last participants' heart rates (slowing them down), as light influences our circadian rhythms (Scheer et al., 2004a, in Vandewalle et al., 2007, p.149).

In the case of Hanna and Joseph, there were similarities in the physiological reactions but differences in cognitive assessment of the experience. Hanna was very highly engaged (4.50) and VR art fulfilled her expectations fully (five points) even if she was emotionally exhausted afterwards (which was visible in the post-VR EDA level). In the post-experience questionnaire, Joseph favourably valued the general "quality of engagement" giving it 3.75 points within the high range. Joseph praised the "wonderful selection of programmes", but when asked if the event fulfilled his expectations, he also answered "highly" (giving it only four out of five points). The reason for such a score might be explained by his qualifying statement "not yet good quality of VR images". It is essential to note that Hanna previously co-designed immersive artistic experiences and collaborated with the arts and tech sectors and Joseph's indicated moderate technological and high "ARTS" focus. Yet, Joseph's EDA shape very much resembled Hanna's, even though the levels of focus differed, they did not know each other and their cognitive valuation of emotional reactions to three films and "quality of engagement" differed.

5.1.5 *Bristol*, summary and preliminary discussion

As this chapter was dedicated to the comparison of physiological (quantitative) and reported (qualitative) empirical material, the comparison of eight *Bristol* participants will refer to pre-experience, during the experience, and post-experience timeframes.

Before the experience

Before the experience, participants waited calmly in the comfortable foyer of the VR cinema. When filling in the pre-experience questionnaire, participants assessed their anticipation level as high (six people) or very high (two people). For the question about a psychological state (between focused and distracted), two participants indicated they were somewhat distracted before the event, three people were in a neutral state, and three reported being highly or very highly focused.

During the analysis phase, I calculated the participants' potential bodily arousal based on their answers to the pre-experience questionnaire. Calculation

suggested that seven people should have pre-experience moderate arousal, thus feeling relatively comfortable in the situation; Hanna was very experienced and thus her level of arousal should have been low, indicating a good level of comfort. Initial values of EDA suggested seven people's high levels of anticipation. Out of these four HR records were also in tune with high anticipation; three participants (including Hanna) had high EDA but standard heart rate. Only Max's physiology (EDA and HR) did not match his expressed high anticipation and corresponded with my calculated medium arousal. However, in general, Max's physiological data did not align with his assessment of the experience, which means that he was the (intriguing) exception rather than the rule. In general, in the *Bristol* case study, the calculated bodily arousal did not help assess the pre-experience state, as apart from Max, all seven participants had higher physiological activation confirming their expressed high anticipation.

During the experience

However, during the introduction or at the beginning of the first film, initial arousal in most participants quite quickly dropped. Rose's general HR level was higher (on average about 85 bpm) than the rest of the participants but did not differ between the films. Except for Flavia's and Max's records, heart rates between the films did not differ in a meaningful way, which suggests that most of the participants paid attention to external stimuli. Only the shape of Flavia's HR graph supported the assessment of her emotional engagement with the three films. In general, if only heart rate data were available for the *Bristol* case study, it would be impossible to put all three films in order of the magnitude of engagement.

EDA levels were more informative. One recording stopped, so only seven EDA reactions were compared. Three people's EDA was highest during the first film. That was possibly the result of high arousal caused by the novelty of virtual reality, as *The 500*, a VR documentary about endangered wolves, was for the audience the second-best film. Participants assessed their emotional engagement with it between two and four points. The third film, *Step to the Line*, was, according to all participants, the most emotionally engaging as most gave this VR story about prisoners a maximum of five points. The second film, the animation, was the least emotionally engaging (according to everybody). The EDA original data displayed this, but mean values calculated in two-minute slices (Figures 5.9–5.10) did not. The below graphs show that only three out of seven participants engaged more with the third film. But the EDA peaks of all

films (except Hanna's) are on those graphs quite similar. Those smoothed (using mean values of two-minute periods) graphs, however, had a particular role in my analysis. They supported the understanding of whether there were similar trends in the data of people having the same experience at various times. Indeed, as demonstrated in the graphs below, there were some similarities in EDA reactions to the same art content experienced in different *Bristol* sessions.

Figure 5.9 *Bristol*, comparison of EDA of Max from session 1 (green) and Flavia session 3 (purple), with Alison (blue) and Rose (red) from session 2 (smoothed mean values)

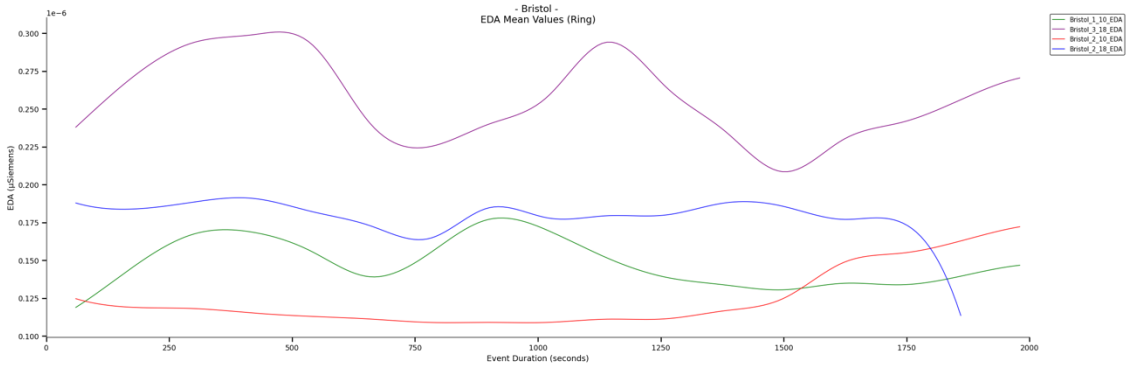
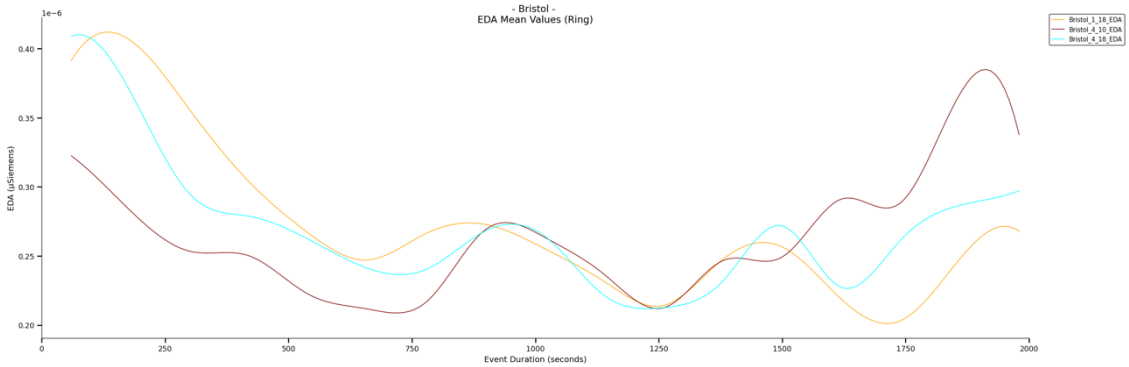


Figure 5.10 *Bristol*, comparison of EDA of Ines from session 1 (orange) with Hanna (brown) and Joseph (cyan) from session 4 (smoothed mean values)



Those two graphs present people grouped due to similarities of their (smoothed) EDA graph shapes. There is no correlation between the similarities in those shapes and pre-experience or post-experience appraisal of the engagements. Presented earlier, raw data EDA graphs' shape and amplitude variation more clearly validated the assessment of emotional engagement with each story of four participants; additionally, one person (Max) with the first two films; and one person (Rose) with one (the third) film.

To sum up: during the experience, five people's heart rates fluctuating within the standard rest levels could signal attention to external stimuli and be interpreted as a lack of emotional arousal (which other data did not confirm). It could also indicate their general well-being (and safety) during the experience, even if some reported physical discomfort in the second part of the programme due to heavy VR headsets. The EDA indicated participants' arousal during the whole event. Its raw graphs (but not the graph based on two-minute means) also promisingly demonstrated the same intensities of engagement with specific parts of the experience as declared by participants. The value of EDA, but not of the heart rates, was demonstrated in the study of engagement during the *Bristol* event.

Post-experience

Regardless of their physiological responses, all participants assessed the quality of their engagement on the O'Brien's scale as high or very high. However, Alison's, Rose's, and Joseph's scores fell in the lower range of the high response. With Alison and Rose (from session 2), such valuation might communicate their quite distracted psychological state before the event and mutual social influence (they knew each other). In the case of Rose, that answer, and three points given for moderate fulfilment of the expectations, might be caused by a VR headset hurting her head 40% of the time and frustration with an inability to find a bird in the second VR film. Alison's, Rose's, and Joseph's heart rates graphs do not show differences during the programme, although Rose's indicated general arousal. Joseph's EDA graph indicated good differentiation between the three movies, Rose's with one only and Alison's with none. This does not differ from the general tendency of the group. Seven participants declared that the experience fulfilled their expectations highly (three people) or very highly (four), and only one moderately, even if six out of eight indicated issues with the quality of vision or the equipment. In the *Bristol* case study, differences in the heart rates did not support and differences in EDA did support the explanation of connections between the unconscious (presented in the physiological data) and conscious engagement (reported after the event). Regardless of the bodily arousals, all participants assessed the quality of their engagement as high or very high.

5.2 Semi-directed engagement – *Whist*

Whist (in my study) was considered to be semi-directed. Its authors recorded nine VR scenes that might be experienced by each audience member in a different order, and some scenes might not be encountered at all. The camera in the phone inside a VR headset captured the movement of the eyes. Attention paid to a specific part of the screen was calculated automatically and determined the sequence of the presentation of the scenes. After each episode, participants saw on the screen an image of a physical object that they had to find in the room and reach to trigger the next part. As I had experienced *Whist* a few months earlier, I knew that it was unnecessary to take the headset off at that moment (in that part, the authors used augmented reality). Still, some audience members decided to do so. After watching all elements of the artwork, each person received from the artists a number and a website address to check their personality trait prepared in the spirit of theories of Freud. This number was based on the individual's order of episodes. While completing the post-experience questionnaire, each audience member revealed the number they received and thus also their order of scenes.

I received from the artists precise information about the construction of the artwork to enable an analysis of individual experiences. I assumed that knowing the order of episodes and having movement registered by Ring, I might observe differences in the bodily reactions to the same artistic content experienced in different sequences. Especially, the "table II" scene, one of the *Whist* episodes, might have caused more intense physiological reactions. The audience member, in that scene, was positioned in the middle of the table while four protagonists consumed the flesh of human hearts. That scene became a reference point in my data analysis. Empirical material obtained through biometric devices provided insights into the internal engagements of people that went through the VR scenes in the same or varying order.

In case of *Whist*, even though it comprised several (up to nine) episodes, it was possible only to track general physiological responses to the VR art. The audience experienced the artwork mostly standing but transitions between episodes required a few steps to be made and some audience members decided to temporarily sit down on the floor. As I did not have any assistance, those observed behaviours were not noted. As each person's experience was initiated (and progressed) individually, I could only timestamp the moment when the first person put the VR headset on. Before the event, participants were standing in an operating shopping mall foyer and completing the pre-experience questionnaires in not very comfortable positions. Nevertheless,

according to my knowledge, none of the attendees entered the experience being extensively physically stimulated – there was no rush or steps to climb. Other factors related to food, drinks, medication, or sleep that might have affected participants' physiology were not controlled. In line with my research conceptualisation, I decided to (primarily) explore two mini-groups of participants: first, three people that went through the same order of episodes; second, the experience of two pairs of people with similar characteristics.

5.2.1 Three people on the same path

Three people, after the event, received number 13. One of them, Tahani, took part in the third presentation on Saturday noon; two others – Ray and Ann – in the last (tenth) session on Sunday at 2pm. I did not interview those participants, so the body-mind comparison was only based on their physiological data and questionnaires answers. Therefore, I had no information about if those participants asked for help or a restart of the projection (which sometimes happened).

Path number 13 included six episodes of the following durations (1) 0:66, (2) 5:07, (3) 4:15, (4) 6:24, (5) 5:38 and (6) 1:26, and five transitions between them. As each start of the experience and subsequently, the beginning of each episode happened at a different time it was impossible to timestamp them. The accelerometer data did not clearly mark the transitions. Thus, I divided *Whist* graphs into two-minute slices to support the comparison of changes in the physiology of the same participant. The fourth episode (lasting 6:24 minute) was the "table II" scene causing (according to participants) the feeling of disgust. The reaction to that part should vary from the rest of the data. In the case of path number 13 after that fourth scene, the remaining two parts lasted about seven minutes. Therefore, the last fifteen minutes of the experience (sections 10 to 15) required my special attention.

Tahani, from "?" to "TECH!/ARTS"

Tahani' was an educated young man (in the 25–34 age group) of mixed British/Arab cultural background. His pre-experience context revealed an unclear focus as both technological and arts focus were low.

Tahani wore Ring on his palms during the whole experience. His graphs (below) show a few data loss moments possibly associated with movement that caused the disconnection of sensors from the skin. That is best visible on the EDA visualisation (Figure 5.11). Heart rate initial value was high, which equally supported Tahani's pre-experience expressed high anticipation and calculated

high arousal. The heart rate graph (Figure 5.12) revealed varying and significant activation during the experience. There is a prolonged decrease visible in sections 10 and 12 (possible “table II” scene), and HR raised again at the end of experience. On the other hand, EDA remained flat during the whole event.

Figure 5.11 *Whist*, Tahani – EDA visualisation

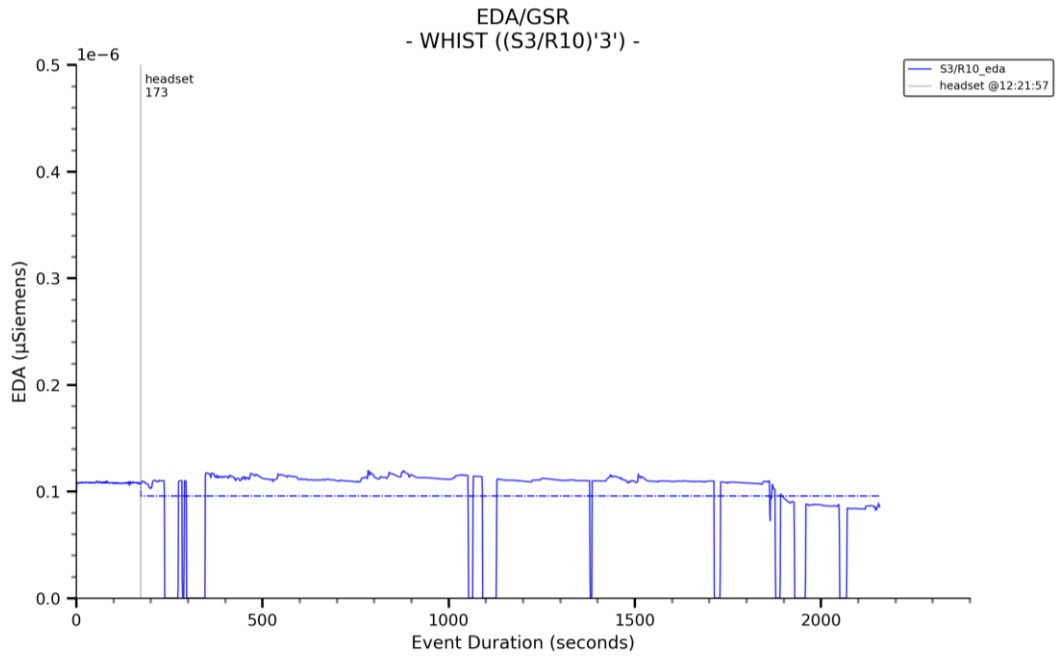
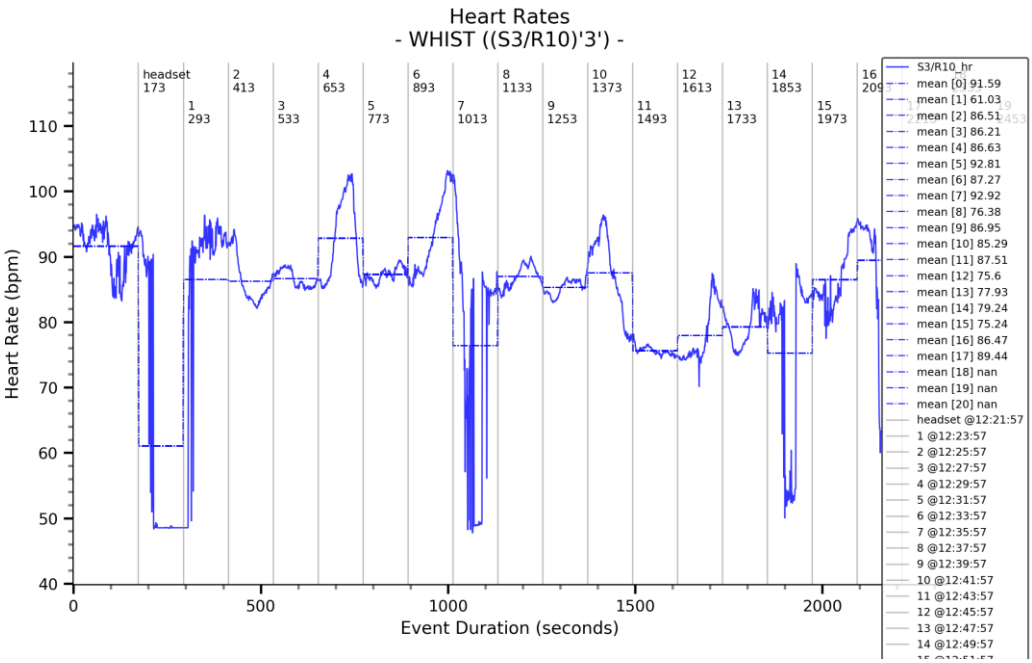


Figure 5.12 *Whist*, Tahani – HR graph



Before the event, Tahani’s focus of both aspects of the activity (coded as “?”) was generally low. Post-experience, Tahani indicated high “general

engagement" (4.17). Responses to O'Brien's quality of engagement scale indicated a change to "TECH!/ARTS". However, when asked how this VR art fulfilled his expectations, the answer was "moderately" (three points). At the same time, Tahani voluntarily added a final reflection:

> Great experience. Was not sure what to expect at the start but did not disappoint. Would recommend to others.

This answer did not match the moderate fulfilment of the expectations. Interestingly, Tahani's anticipation was high, even if he was unsure of what to expect. On the other hand, the fulfilment of expectations was mild, even if he was uncertain about what to expect. I will return to that issue later, as two other participants assessed that aspect similarly. In the post-experience questionnaire, Tahani did not describe the best or worst things about this VR experience and indicated that neither the structure nor the story was attention grabbing. That is not compatible with his heart rate graph demonstrating heightened and varying activation, mobilisation of resources and internal processing. Perhaps Tahani had no experience in assessing his artistic experiences (his arts focus was low). Yet, it did not stop him from having an engaging arts experience (visible in his HR graph and O'Brien's scale answers).

Ray, from "TECH!" to "TECH/arts"

Ray's (educated British man in the 45–54 age group) pre-experience context was "TECH!" due to his scores of very high tech and very low arts focus. Ray was not interested in arts at all, but he attended to discover something new, for social reasons and to expose others to technology. He attended because one of a previous day's participants suggested that the event might interest him. Ray expressed very high anticipation pre-experience, but calculated context suggested moderate arousal.

Also, Ray wore a Ring during his *Whist* participation. The initial heart rate value was high, which supported Ray's expressed high anticipation and not the calculated moderate arousal. Heart rate varied up to 120 bpm, pointing to high bodily activation during the performance. There was a significant decrease in the HR from the section 14 to 15 of the performance. On the other hand, as in Tahani's case, EDA remained flat during the whole experience.

Figure 5.13 *Whist*, Ray's EDA graph

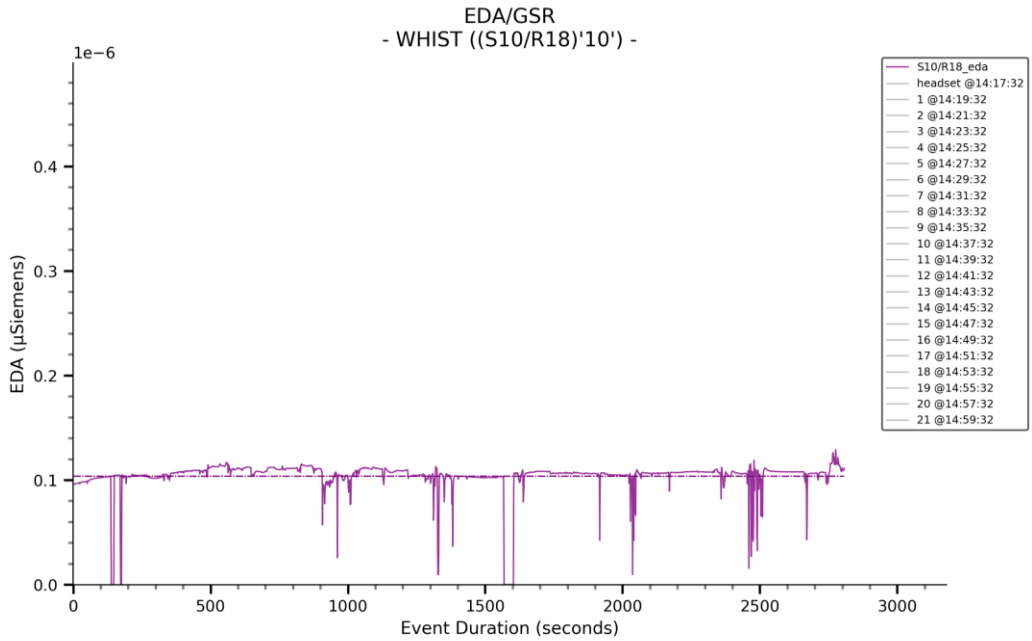
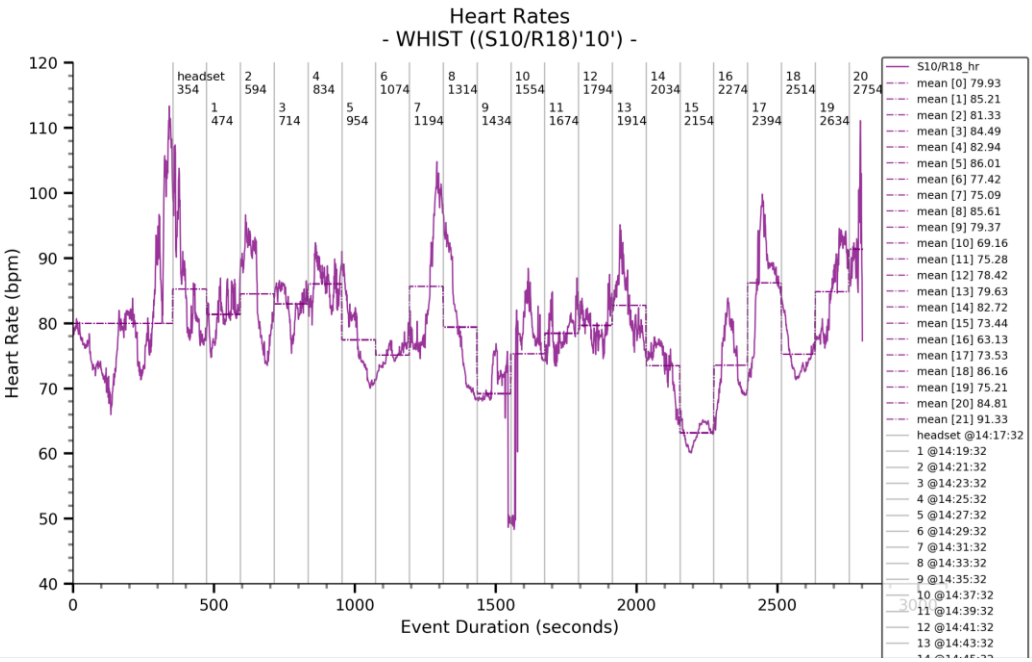


Figure 5.14 *Whist*, Ray's HR graphs



Ray's answers to O'Brien's scale (3.75 out of five points) and Ray's heart rates showed high engagement, but when asked how this VR art fulfilled his expectations, he responded "moderately" (giving it three points). He mostly liked "the feeling I was there! I felt very close and personal", and he did not like the "occasional shaking of screen images". The art might have been too abstract and unclear for him, as he mentioned those factors as reasons for his lack of arts attendance. Even if he mentioned "interesting use of VR" and sees "huge potential" of VR art, *Whist* only moderately fulfilled his expectations. Still,

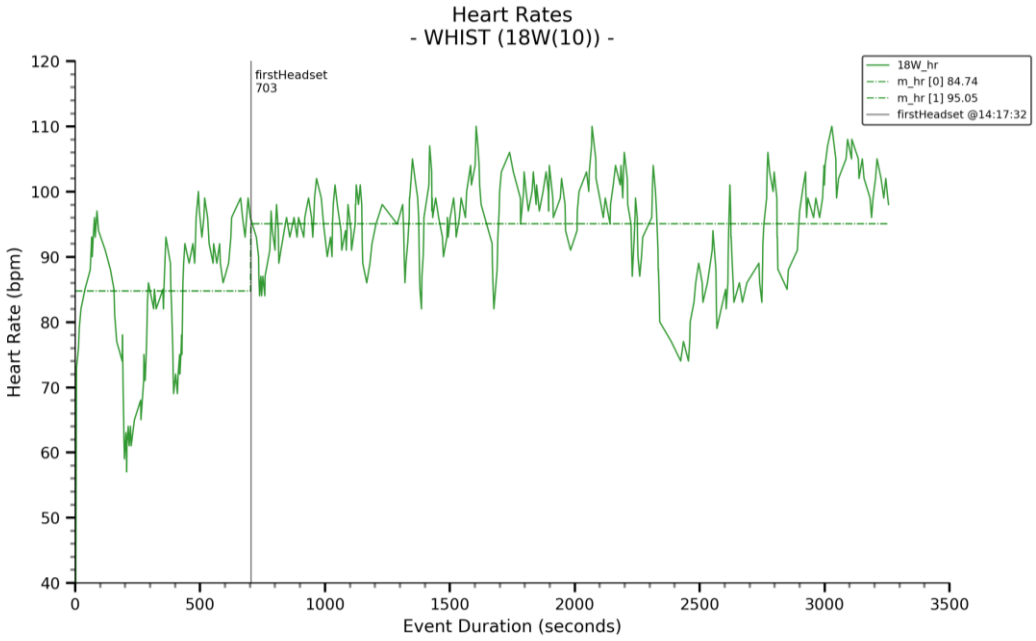
there was a change from pre-experience “TECH!” to post-experience “TECH/art” focus.

Ann, from “arts” to “TECH/ARTS”

Ann (educated British woman in the 45–54 age group) indicated an “arts” focus, so low tech and moderate propensity for the arts. She expressed pre-experience high anticipation and context suggested high arousal.

Ann wore a Garmin smartwatch on her wrist, so I only registered her heart rates. Her HR initial value was within the resting norm, but its subsequent behaviour showed considerable variations. As HR quickly rose, I considered HR as confirming Ann’s expressed high anticipation and calculated high arousal. During the experience, the mean heart speed was 95 bpm, but often rose as high as 100–110 bpm. That indicated significant activation during the whole event. In Ann’s graph (Figure 5.15), the drop in the heart rate is also visible at the end of the third quarter of the performance (at about the 2,500 seconds mark), followed by the rise until the ending.

Figure 5.15 *Whist*, Ann’s HR and EDA graph



Post-experience, Ann assessed her general engagement as high (3.75 out of five points). That self-assessment signalled a change from “arts” to “TECH/ARTS”. Ann was highly engaged, but she also responded “moderately” (giving three points) when asked how the VR art fulfilled her expectations. She mainly liked immersion, but at the same time, she did not appreciate the feeling of "elevation", which might be the result of the body-less VR experience

impacting her body balance. *Whist* only moderately fulfilled her expectations and was moderately rewarding. However, answers to O'Brien's scale and Ann's heart rates show high activation throughout the experience.

Summary and preliminary discussion

The bodily reactions of the three participants experiencing the same path revealed some similarities. The heart rate graphs indicated high activation – high level and significant variations in the data. Interestingly all three visualisations showed a decrease in (proportionally) two-thirds of each experience. This might demonstrate the bodily response to the fourth scene, which could be described as disturbing: the actors ate human hearts while participants "stood" in the middle of their table. Heart rate deceleration has been previously observed in states of disgust (Davidson, Jackson & Kalin, 2000, p.892). Two available EDA records show no variation during the show. Therefore, in this regard, the nervous system produced two different results: heart acceleration and skin conductance stability.

The propensity for the arts of those participants before the experience was rather low (low, very low, and moderate) they also answered that the experience fulfilled their expectations "moderately" (all giving three points). The content and the form of *Whist* might be challenging, especially for people not familiar with contemporary dance or theories of Freud. That might offer a clue to understanding their responses about the fulfilment of expectations as participants highly (and Tahani very highly) valued virtual reality usability and potential. On the O'Brien's scale, the general aesthetic appeal of *Whist* was assessed as high, moderate, and high, which indicated at least temporal satisfaction with the artistic component of the experience. However, the answers to three questions that constitute the aesthetic appeal enquiring about VR art attractiveness, aesthetical appeal, and appeal to the senses were the lowest and, therefore, influenced negatively (even if in the range of high) the general score of quality of engagement. That is especially visible in Ray's case. The changes from pre-experience low and moderate art focus to moderate and high art assessment are still positive. They might signal short-term satisfaction with the artwork (rather than a permanent change in attitude towards arts). Flat EDA graphs suggested more intellectual mindsets during the experience. They might also illustrate the relation between the pre-event not-very-artistic personal context of the three participants and their post-experience evaluation of the experience.

5.2.2 Records of high and very high engagement

Out of the people I selected for post-experience interviews, four had occupational similarities: all were university educated (which is a general feature of most of my participants), two men worked as teachers, two women were very art focused, one being an artist and another an art historian. As previously mentioned, the start of each experience was impossible to detect. The participants journeyed on different paths, but their arrangements had some similarities. This part of the analysis looked for parallels in similar but divergent experiences and differences in experiences of people with a similar profile. The unpleasant “table II” scene was a point of reference also in this case. Even if related to individual experiences, analysis of these empirical materials brought up a few new issues relevant for a general understanding of audience engagement with art and the methods used.

Faye, from “tech/ARTS” to “TECH!/ARTS”

Faye’s (an educated female British artist, in the 35–44 age group) pre-experience context was specified as “tech/ARTS” with propensity for tech moderate and for the arts high. She expressed very high anticipation, but the context suggested moderate arousal.

Faye wore a Ring during the *Whist* experience (path 31). Her initial bodily data visualised high anticipation of her first virtual reality experience: “I was very eager to give it a go because I now try new things.” In her case, the calculation of moderate pre-experience arousal was not confirmed. Initially, she felt a bit confused but quickly adapted to 360 degrees of vision in VR. Her path included six parts and five transitions. Based on the length of each episode and the length of total experience, I could assume that the “table II” scene might have happened in sections 10–12 of the graph. Yet, falling HR in sections 13–15 would also fit this assessment. That is because graphs of three previously described participants indicated a decrease during that (in their view) eliciting the disgust section. Faye, however, reacted differently to that scene: “Yeah, it just made me laugh. It seems silly to me, but it made me laugh.”

During exhilaration and amusement, physiological arousal is exposed in, among others, heart rate and skin conductance increases (Ruch, 1993; Whalen, 2010). Thus, my initial calculation might be accurate. HR acceleration is much more visible during laughter than other emotional responses (Santibañez-H. & Bloch, 1986, in Ruch, 1993). But it lasts only during the act of laughing (Fry & Savin, 1988, in Ruch, 1993, p.5). Skin conductance, however, was previously reported to remain elevated after laughing for over a dozen

seconds (Whalen, 2010, p.30). Therefore, Faye's HR and EDA reacted with different dynamics after that scene. I interviewed Faye a couple of days later, and she reflected on the event:

> I enjoyed it really. I guess I probably found it more intellectual than emotional. I didn't really get any emotion from it apart from laughing.

She also felt fully immersed in the last ten minutes of Whist:

> I could have stayed there for hours. It was really relaxing.

Both heart rate and EDA (Figures 5.16 and 17) indicate Faye's very high and varying activation during the whole performance. If Faye felt relaxed at the end, it happened on a high level of her physiological resources, as, at the end of the experience, her heart rate rose and was far from the female rest state of about 75 bpm (Figure 5.16).

Figure 5.16 *Whist*, Faye's HR graph

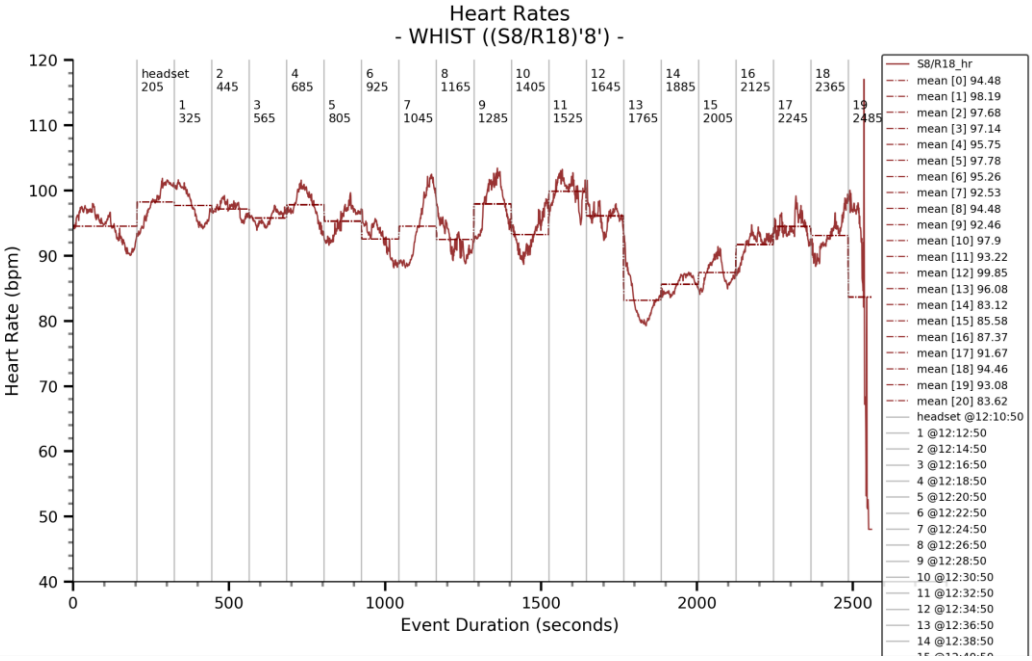
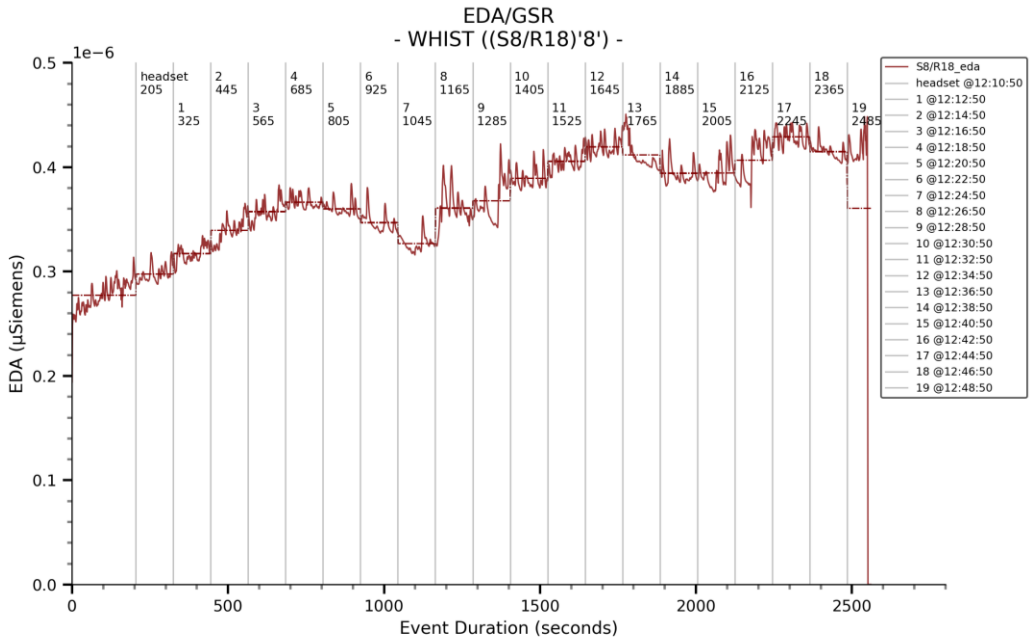


Figure 5.17 *Whist*, Faye's EDA graph



Faye's answers to post-experience on O'Brien's scale showed very high general engagement (4.5). The change from "tech/ART" to "TECH!/ART" indicated an increased confidence in technology and a sustained positive outlook on arts. Faye stated that the VR art fully fulfilled her expectations, giving it five points. That score matched her very high engagement. After the experience, Faye spoke with two young colleagues, who had experienced *Whist* a day before:

> It was interesting to hear what they had to say and what they got from it. And most of them found it scary. And they were quite surprised that I found it funny. They are younger than me though. So, I don't know. Maybe, I have been through more in life and find things funnier, that they might find scary because they have not been through it.

Unfortunately, there are no records of the physiological reactions of those colleagues, just the questionnaire responses. But their low scores on the O'Brien scale might be highly influenced by the disturbing images in *Whist*. I will return to this issue in the next chapter. Interestingly, even if Faye indicated intellectual rather than emotional engagement her EDA graphs suggested the significant changes also in affective response.

James, from "ARTS" to "TECH!/ARTS"

James, British educated man (in the 45–54 age category) expressed pre-experience "ARTS" focus (low tech and high arts focus) and high anticipation. Context suggested moderate arousal.

James (experiencing path 36) wore a Ring, and the accelerometer graph recorded permanent change of hand position. His initial data indicated moderate arousal rather than high anticipation. Yet, James explained that:

> I guess in the beginning there was certainly a moment when, you know, you get a bit nervous because you really do not know what to expect.

Although, it is unclear what James meant as “at the beginning”, his statement aligns with neuroscience’s stance on the arousal caused by novelty. James's initial bodily state did not show nervousness, but that state might have been activated a bit later. His graphs’ analysis was more difficult as he “clicked the wrong thing on the side of the VR thing" at the second transition and went back to the beginning. His records also indicate several errors.

James did not notice a change in his engagement during the experience:

> Initially, it was obviously a bit of uncertainty. And then there are some quite strong images that came thru, some weird images. So, it was quite (hmm) challenging. I was trying to work out if there was a story. What it was. I clearly knew it was not or quite well hidden.

He found the “table II” scene:

> quite unpleasant to say the least [...]. You are trying to think of what sort of madness the artists, the creators, were in when they came up with these hearts. I think it was pretty, pretty disgusting.

Due to errors in data, it was harder to estimate the position of the “table II” scene. However, in section 11 and the beginning of section 12, heart rate (Figure 5.18) indicates the trend to decrease.

Figure 5.18 *Whist*, James’ HR graph

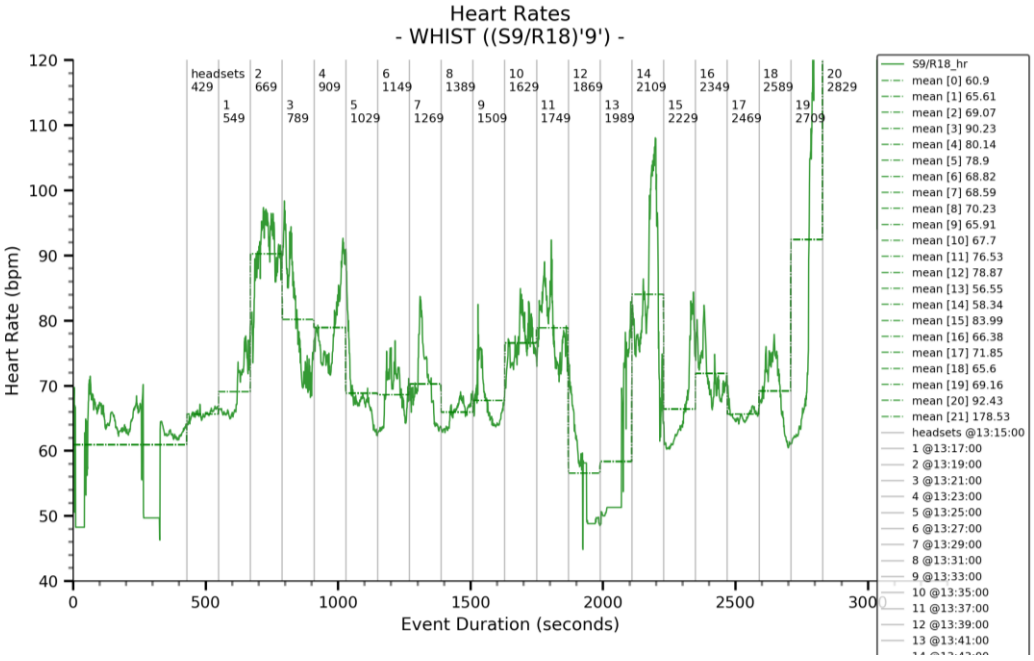
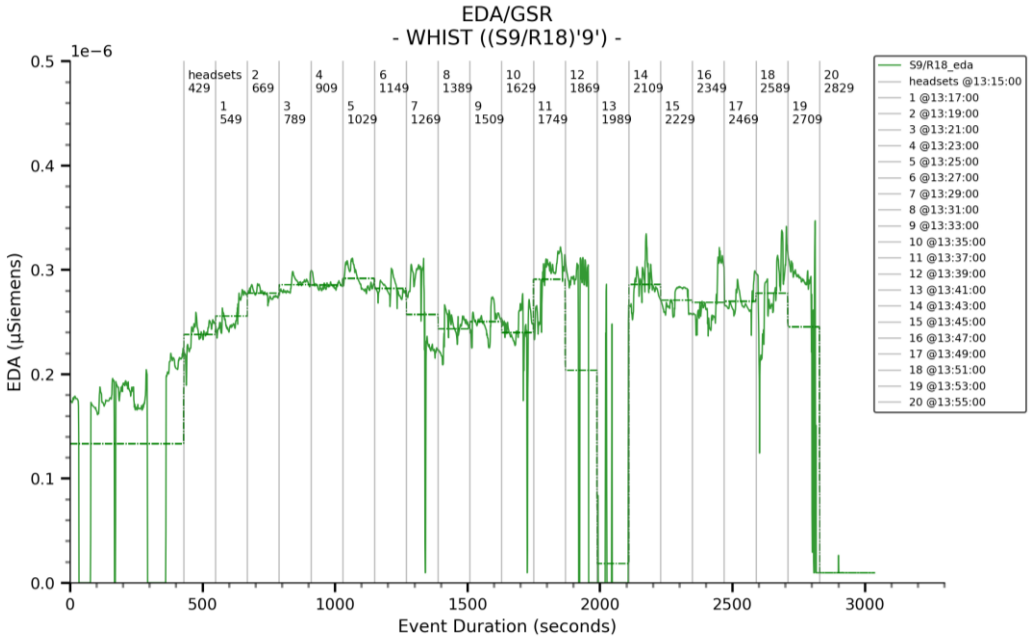


Figure 5.19 *Whist*, James' EDA graph



James's responses to post-experience on O'Brien's scale indicated high general engagement (4.0). His responses were similar to Faye – there was a change from "ARTS" to "TECH!/ARTS", so technology got a very high endorsement, and the arts focus remained the same. In the post-experience questionnaire, James' answer to the question of how this VR art fulfilled his expectations was "highly" (four points) "even if aims of the art were not clear". This assessment matched his high engagement visible in his bodily data. However, James also flagged a pertinent issue:

> Comparing the expectations to the result? Ah! Well, that is because I had no expectations. I didn't know anything about what it was about. It was fine. Was it what I was expecting? No, because it was so exciting, weird in that sense. Was it as immersive as I was expecting? Probably about what I was expecting. Right. I am not hugely experienced doing VR stuff.

This feedback signalled a problem with my question and the interpretation of answers to it. During the interview, James was not the only person that mentioned a lack of expectations. All participants, however, rated an association between pre-experience expectations and the artistic experience and its perceived quality. In that way, they numerically estimated and defined a relationship between personal and artistic disposition. I will review this issue in the next chapter. Although James did not notice changes in his engagement during the experience, his bodily data presented his high activation during the overall experience.

Mark, from “?” to “TECH!/ARTS!”

Mark, an educated British man (in the 55–64 age group) before the experience expressed very high anticipation, and the context implied high arousal. Pre-experience focus was coded “?” as propensity for tech and the arts was low. Mark attended artistic events, mostly more established art forms, once or twice a year. I decided to analyse Mark’s experience even if his records indicated 31% errors (marked black on the graph). I selected Mark due to his low arts and technological focus.

Mark (path 37) wore a Garmin smartwatch, so only his heart rate was available for analysis. Mark's initial HR value was about 75 bpm (it is not visible as I removed the first ten minutes of waiting from the graph for clarity of the rest of the data), so not much elevated from the male rest state. Then his heart sped up and stayed at a slightly heightened level throughout the event. Mark found virtual reality easy to adjust to. He mentioned that:

> the VR pulled me in, but it did no longer become important after the first five to ten minutes. So, then it was all about the experience, not the VR.

Based on the script of Mark's path, it was possible to say that sections 12–14 indicate the “table II” part of *Whist*. Section 14 finished about seven minutes before the end of the experience, which fitted the duration of the last scenes of the artwork. Mark’s heart rate followed the path of those who considered the “table II” scene as disturbing. But he possibly was too close to other participants during that part, so one of the artists touched and moved him. That moment

> felt so strange. It was really because at that moment, I was in a particular part of the show where you stood in the middle of a table surrounded by four people. And it's one of the parts of the performance where you feel most observed by the participants. And then to have your hands touched, almost felt like they were doing it, was really a bit "oh!". Right. And then I realised what was happening. Well, for that moment, the first touch, it felt really odd. It was like being in another world but having contact with your present, you know, your real world. That was a bit strange.

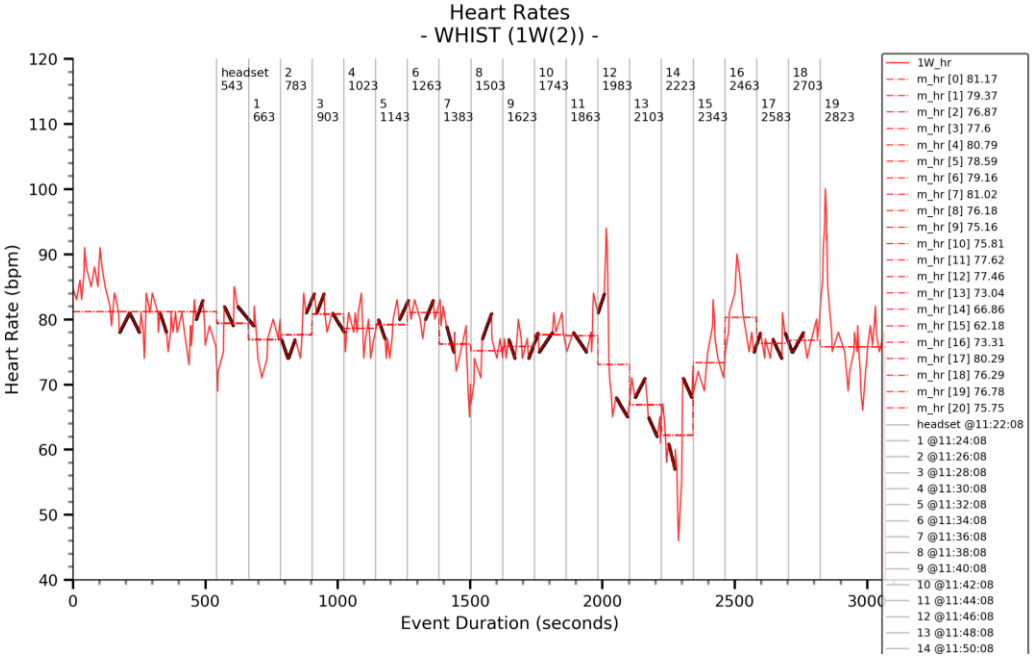
Therefore, if sections 12–14 are the “table II” scene, then the HR reaction was augmented by the touch. Mark called the scene intense but did not describe it as troubling. He found another, the first scene, disturbing and uncomfortable. He immediately felt glad that his partner was not there, as that would remind her of difficult personal experiences:

> So, I started off with some trepidation about that. And then I said to myself, well look, this is a woman, it is a performance, these are

> adults. So set your worries aside about the age of the girl and just see what else comes on later.

The heart rate at the beginning of his experience did not record those uncomfortable feelings and thoughts differently, indicating a rather steady activation until the “table II” part.

Figure 5.20 *Whist*, Mark’s HR graph



Mark’s responses to the O’Brien’s scale showed very high quality of “general engagement” and each of its questions got a maximum of five points. Mark confessed during the interview:

> I was a bit high. I came out really sort of: wow! What was it? What I have just been through? I have never experienced anything like that before. [Later] I said to my partner that I was buzzing, really buzzing. And I was buzzing. Definitely. And… I was disappointed it stopped.

Before the experience, Mark had unclarified focus. His post-experience frame of mind was “TECH!/ARTS!”. Mark remembered many details from the performance and processed a lot:

> You never felt – Oh, I know what is going to happen now. Never, literally from one thing to the next. I could not connect them. I couldn't perceive them, let's put it that way. And that I really liked. A lot. I was just surrendering to it. I was just surrendering.

The VR art fulfilled his expectations (five points), which aligned with his very high engagement. If the male heart rate at rest is, on average, about 70 bpm, Mark’s heart speed was elevated during *Whist*. The difference might seem unremarkable when compared to other participants. However, the levels of human physiological responses are different. Mark felt fully immersed even if

he had many personal reflections and maintained an internal dialogue. Immersion will be a subject of further discussion in the next chapter.

Regina, from “ARTS!” to “TECH/ARTS!”

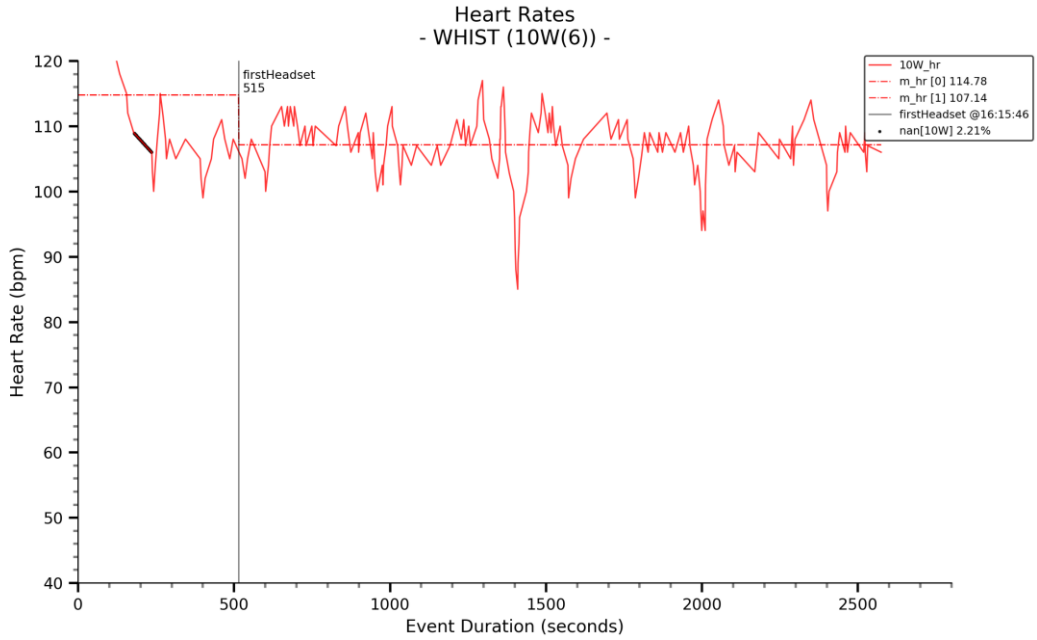
Regina’s (an educated woman from Hungary living in the UK, in the 25–34 age group) pre-experience context was “ARTS!” due to low propensity for tech and very high arts focus. She expressed high anticipation, but the context suggested moderate arousal.

Regina used a Garmin during the experience (of path 35), so only her heart rate data were available for analysis. Her heart's initial speed was very high, which supports high anticipation (and not calculated moderate arousal). It remained very high, which signifies very elevated arousal before and during the experience. That speed might have multiple causes: in the beginning, the novelty of virtual reality, then the complexity of the art. Because this was her first VR experience, she was a bit lost. But during the interview, she explained that:

> I quickly found the way through the technology. And after that, I was very much just absorbed in the experience. I wasn't really thinking about that device that much, I just was inside the story.

Regina lifted the VR headset in between episodes. She used the task of looking for the object triggering the next piece “as a kind of break to ground myself, to be aware of the space around me” and to calm down the feeling of being dizzy with the headset. She was conscious of other people in the room and “trying not to bump into anyone”. Regina’s heart stayed on a very high level during the experience, and their reaction to the “table II” scene is indistinguishable on her graph (Figure 5.21).

Figure 5.21 *Whist*, Regina's HR graph



Post-experience Regina reported a "TECH/ARTS!" frame of mind. Her general quality of engagement was very high (4.67) and VR art fully fulfilled her expectations. During the interview, she talked a lot about the art content and form:

> It definitely felt like an adventure. And I like that it had something a little bit more cinematic in it. Not just the VR standing or seating, but you were supposed to walk a bit and discover. So, we were transitioning between the scenes. I actually really liked that. And I loved the sculptures. I think it added a new layer to the whole experience because it was about searching.

But it was also a very personal experience for her:

> I was very, very absorbed in it. This very human condition, of sexuality, religion… You know, finding space, relationship. The self, how you see yourself, the destructive. That was very me. And seeing it in virtual reality was something beyond anything I've ever seen or experienced.

Regina's very high engagement is very much visible in her highly increased heart rate.

Summary and preliminary discussion

The physiology of the four participants supported assessments of their significant engagement during *Whist*. The Ring graphs indicated considerable activation – high level and significant variations in the data. The visualisation of Garmin's material, except for Mark's "touch" episode, showed less variations in the data. But Mark's reaction to the controversial scene was augmented by the

experience of external and unexpected touch. Faye's graphs indicated the "table II" scene, but differently from other participants, as she reacted to it not with disgust but with a laugh. Two available EDA graphs showed significant variation during the performance. In this regard, the nervous system produced similar results – both the heart and skin conductance increased and exhibited variation in similar directions during the experience.

The propensity for the arts of those (four) participants before the experience was different: low, high (two people), and very high. Later, the aesthetic appeal of *Whist* was, respectively, assessed as very high, high (two people), and very high. This indicates (at least temporary) high satisfaction with the artistic component of the experience regardless of the pre-experience arts focus. Even though James found *Whist* weird and challenging, all participants answered that the experience highly or very highly fulfilled their expectations. Three out of four audience members remained highly or very highly arts focused. There was also a change from low arts focus to very high satisfaction with VR art. All four people were significantly satisfied with the capacities of virtual reality. Questionnaires demonstrated that the four, like the three previously described, experienced *Whist* very intellectually. Available EDA data, however, suggested that those participants also engaged in a different way. There is a cohesion between those four participants' bodily data, quick and intuitive responses to O'Brien's questionnaire, and the satisfaction question, which connected the pre-event context with the post-experience evaluation of the experience.

5.2.3 *Whist*, the summary and merged analysis

Before the experience

Before the experience *Whist* participants waited in a moderately busy shopping mall. When filling in the pre-experience questionnaire, all participants assessed their anticipation level as high (four people) or very high (three people). Two participants from the first cluster described their psychological state as neutral – neither focused or distracted, whereas the rest of the group was very highly or highly focused. During the analysis phase, I calculated the participants' potential bodily arousal (as explained in the methodology chapter) based on their answers to the novelty questions in the pre-experience questionnaire. Calculation suggested that four people should have pre-experience moderate arousal and three participants should have high arousal. Looking at the whole group, only one person's heart rate indicated moderate arousal, the heart rates of six participants were high. EDA data was available only from four analysed here participants. Its initial values did not verify arousal. In the *Whist* case

study, the calculated bodily arousal endorsed the high pre-experience activation of participants with a low arts focus. In their case, expressed high anticipation matched estimated (by me) high arousal. However, apart from James, six participants' physiology had high activation, confirming their expressed high anticipation regardless of the pre-experience focus and level of novelty/comfort. In general, initial heart rates endorsed the expressed high anticipation levels of most *Whist* participants.

During the experience

Ring graphs presented increased levels and variations in data. Heart rates indicated all participants' arousal during the whole event. Out of four participants with skin conductance measurements, EDA confirmed the arousal of two participants. EDA levels vary across two described groups of participants. The EDA of Tahani and Ray, who experienced the same *Whist* path, remained flat during the experience. The EDA of Faye and James, from the second cluster, exhibited the same features as their hearts – it was rising and changeable. It is unclear what caused such the distribution of EDA behaviour between the two groups. That aspect will benefit from reflection on the rest of the available data (done in the next chapter). Garmin graphs confirmed high levels but displayed fewer clear changes. Yet, in the rest of Garmin's data (not shown in the thesis), a decrease caused by "table II" is frequently visible.

Post-experience

All analysed *Whist* participants assessed the quality of their engagement on O'Brien's scale highly (three participants) or very highly (four participants). There is an alignment of participants' high bodily activation and their general assessment of the engagement. However, three participants from the same path assessed the quality of engagement as high, but two of them in a lower range of values (3.67 and 3.75). All three declared that the experience fulfilled their expectations moderately, giving it three points. That might be associated with lower levels of pre-experience arts focus and inflated but unclear expectations. The other group was more satisfied. Three other participants, one with low, one with high, and one with very high arts focus, assessed both issues very highly. Compared to *Bristol*, there were fewer complaints about the quality of the image in *Whist*. Yet, the audience understood the artists' idea to blur the images of seductive dancing (which in VR would feel very real, causing a strong bodily reaction), not as a creative concept but as a technical problem.

The practical issues related to virtual reality, however, in most sub-cases, did not influence the appraisal of the experience by the participants.

5.3 *Bristol* and *Whist* – cross-case analysis

Previous academic research has shown that pleasant or unpleasant stimuli produce more bodily reactivity than neutral ones (Bradley & Lang, 2000, p.258). *Bristol* and *Whist* case studies participants' data revealed significant physiological reactions during the experiences, which indicated fluctuating engagements of all participants during those VR art projects. Individual engagements had some similarities but also varied. In both case studies, the knowledge of heart rates alone provided limited insights, while EDA indicated changing response to the content.

5.3.1 Heart behaviours before and during arts experiences

In both case studies, initial heart rate values supported expressed high anticipation of all but one participant. In each group, one outlier data matched moderate arousal calculated based on the level of novelty (explained in the methodology, p.109). In general, regardless of the high or low propensity for the arts or technology declared before the event, the initial arousal, visible in the audience members' hearts levels, was high. Calculated by me, pre-experience bodily arousal endorsed the high pre-experience activation of participants with low art focus. But regardless of the strength of the novelty factor, all participants exhibited initial stimulation of different duration.

As for the *Bristol* programme, most of the heart levels quickly decreased after the initial stimulation. Half of the analysed participants (four of eight wearing Ring) heart rates varied during the whole event, but they stayed close to the rest state range. That might be explained by circadian rhythms, which indicate slower heart rates in the evening and night (Scheer et al., 2004a, in Vandewalle et al., 2007, p.149). In general, heart rates near the resting level could signal attention to external stimuli (Andreassi, 2000). They could also indicate general comfort during the experience of the more traditional form of the *Bristol* programme. However, the physical discomfort in the second part of the event that some participants reported due to heavy VR headsets was not recognisable in the heart data. Four other people's hearts showed more activation and variation. Two participants' heart rate was high during the whole experience, and two others during the second and third films. The heart activation of those four participants might indicate internal information processing (Dawson, Schell & Filion, 2007, p.172). If only heart rates were

available for the *Bristol* case study, it would be impossible to observe the differences in activation levels during three VR films.

The hearts of *Whist* participants behaved differently to *Bristol*. During *Whist*, all analysed heart rates exhibited high and changeable values, in most cases significant. The accelerometer graphs did not demonstrate strong movements, so short motion periods did not significantly impact other physiological processes (also noticed by Andreassi, 2000). The most meaningful changes of heart rate were registered (also by Garmin smartwatches) during the controversial “table II” scene, which caused some feelings of unpleasantness in most participants and heart rate deceleration. One person's heart rate decrease was augmented, or caused, by unexpected touch. Another participant reacted to that scene with a laugh, so her heart rate accelerated. After that scene, all participants’ reduced heart rates rose again within a few minutes. *Whist* participants’ heart rates revealed varying arousal and internal processing during the event.

This internal processing, especially during the controversial “table II” scene, could be associated with emotion regulation. According to the theory of constructed emotions, heart deceleration might show the activity of emotion regulation rather than a specific emotion (Siegel et al., 2018, p.2). That emotion regulation can have a form of “avoidant coping strategy” (automatic withdrawal of attention) associated with reducing cardiac arousal in situations of brief external stressors (Grassmann et al., 2017, p.279). Faye’s laughter is an example of positive coping (also automatically engaged self-preserving strategy) (Hofheimer & Lester, 2008, p.429) with the (unpleasant) images. I will return to the emotion regulation in the next chapter.

I observed two trends in heart rate data. Half of *Bristol* (analysed in this chapter) participants’ heart reactions to a more traditional storytelling VR programme remained near the rest state range. More contemporary in form and intricate in the narrative, *Whist* (and immersive performances in the pilot phase) seemed to make participants’ heart actions more dynamic. The heart slowing down (increased cardiac parasympathetic activity) is associated with resting and quiet conditions (Bizzego, 2017, p.8) and/or paying attention to an external stimulus and information intake (Lang, 1994, p.102; Porges, 1995, in Ravaja, 2004, p.201; Andreassi, 2000, p.420). This can be considered “relaxed alertness” (Hofheimer & Lester, 2008, p.430). The heart’s speeding up (related to the increased cardiac sympathetic activity) is associated with the mobilisation of resources to allow the regulation and coordination of emotional responses to stimuli, indicating emotional arousal (Andreassi, 2000; Ravaja et

al., 2005, p.3). Even if I could not assess the strength of heart responses (due to lack of individuals' specific baseline data), heart rates differentiated participants into two groups: those who mostly paid attention to external stimuli and those (the majority) more engaged with internal information processing (Dawson, Schell & Filion, 2007, p.172), and emotion regulation (Andreassi, 2000; Ravaja et al., 2005, p.3). The interpretation of participants' engagement based on heart rates could herald attention and a colder/cognitive attitude of half of the group to *Bristol* and more active cognitive and emotionally active engagement of the whole group with *Whist*. But the other available empirical material indicates that such an interpretation is not entirely credible. If we consider that *Bristol* presentations happened in the evening (from 6pm) and *Whist* (analysed) presentations in the late morning and early afternoon, the circadian rhythms (Scheer et al., 2004a, in Vandewalle et al., 2007, p.149) could also explain lower heart rates of *Bristol* participants. The interpretation of the trends of heart rates is, thus, not straightforward.

5.3.2 Skin conductance during artistic experiences

Standard levels for skin conductance, contrary to heart rates, have not been established, as EDA varies across and within each human (Dawson, Schell & Filion, 2007, p.163). The calculated EDA mean values (average in the specific timeframe), were useful only when calculated for shorter timeframes (in my study – two-minute segments). Such prepared graphs indicated the moments of participants' similar reactions, which were especially visible in transitions between the films in *Bristol*. The mean value covering the duration of each film (like in raw data graphs in this chapter) did not provide valuable information about changes in engagement between the three *Bristol* stories. The EDA shape and amplitude variation, on the other hand, displayed fluctuations of arousal in both projects. In the context of continuous stimuli, the most useful EDA measure is skin conductance level (tonic level) (Dawson, Schell & Filion, 2007, p.171). Skin conductance level has previously been used to examine processes of "activation, attention, and significance or affective intensity of a stimulus" (Dawson, Schell & Filion, 2007, p.168). Differentiation of different types of internal processes that can cause EDA changes within the artistic experience is thus (also) not straightforward.

In the case of *Bristol*, there were seven sets of EDA data available for analysis. The EDA initial values of three participants show high arousal, which possibly marks the novelty reaction and subsequent decrease – adaptation to virtual reality immersion. But, due to smaller differences in EDA levels, it was harder

to interpret if initial EDA values confirm the initial arousal of other participants. Later during the experience, the presented EDA graphs' shape and amplitude variations illustrated the most elevated arousal of five people during the third film. The tears of one participant during this third story were not visible in his EDA graph, which remained stable (but on the middle level between his initial and highest data). Previous research showed that "tears induced physiological calming during physiological arousal (slow, deep breathing and accelerated HR)" (Mori & Iwanaga, 2017, p.8), while other studies reported increases in both HR and EDA during episodes of tears (e.g. Bylsma, Gračanin & Vingerhoets, 2016; Wassiliwizky et al., 2017). For five participants, the second most arousing experience in *Bristol*, as far as EDA was concerned, was the first film and the least arousing was the second one – the animation. One participant's graph was flat during the experience, and another remained flat during the first two films. Apart from those two participants, the EDA graphs' structure indicated participants' changing sympathetic arousal during the whole event. When analysed together with post-experience surveys, they also promisingly demonstrated compatibility with the intensities of engagement with specific parts of the experience of most *Bristol* participants.

There were four sets of EDA data analysed in the case of *Whist*. Two participants' graphs demonstrated variability, and two others remained flat during the experience. Based on just the skin conductance records, the first pair of graphs could be considered a confirmation of "activation, attention, and significance or affective intensity of a stimulus" (Dawson, Schell, & Filion, 2007, p.168), while the second's the lack of thereof. It is unclear if the second pair of participants' electrodermal responses are generally or usually low or if EDA indicated a slightly lower assessment of the aesthetic part of the experience. It is also possible that those participants belonged to the group of galvanic skin non-responders, as it has been estimated that about 10% of the population may not show EDA responsiveness (Hopkins & Fletcher, 1994, p.117). But the heart rate data provided evidence for the second couple's cardiac arousal associated with internal processing. These diverse reactions might also be related to the interpretation of the concepts of activation and attention.

The lack of activation is problematic in VR, as in each art project, participants were mentally placed in the middle of the story, very close to the VR protagonists or as one of them. Due to the specificity of a virtual reality experience, attention to the external environment could be considered high and unquestionable in all participants' experiences. Escape to non-related topics was likely reduced to a minimum in both projects. If general activation and observation of the external stimuli were unquestionable in my case study, then

EDA changes (and lack thereof) might be explained by the (remaining causes specified by Dawson, Schell and Filion) stimulus' significance and affective response. Those aligned with and were (partly) caused by the affective intensity of the triggers. If stimulus significance and affective response manifest in EDA changes, then (in my study) the EDA indicated the moments and levels of emotional response to elements of artistic experience for the specific participants. However, as I wrote earlier, standard levels for skin conductance are not established. Each person's EDA changes might display different behaviour on different days. Therefore, it is impossible to attribute value to the quantitative EDA data and define which participants' levels of affective responses were higher. The affective responses might be marked in EDA, but if about 10% of the population may not show EDA responsiveness (Hopkins & Fletcher, 1994, p.117), then a lack of EDA changes may not mean a lack of affective response. Nevertheless, during the *Bristol* and *Whist* projects, EDA data revealed information about the significance and moments of affective reactions of most audience members. EDA marked a specific affective response of tears of the outlier in an unexpected way. It, however, indicated sympathetic arousal of most participants displaying dominating affective tendencies during the experiences of both art projects.

5.3.3 Intermediate conclusion

Almost all initial physiological reactions indicated arousal before the start of the events. Yet, it is important to note again that without the baseline physiological data, knowledge of daily patterns of each participant's bodily response, and statistical analysis, it is impossible to assess the level of significance of the HR and EDA modifications. It is also impossible to unequivocally indicate the reason or cause of the initial HR arousal. Mandryk and Inkpen's pilot experiment revealed that "the act of filling out the questionnaires and communicating with the experimenter can alter the physiological signals" (2004, no pagination). As subsequent bodily arousal levels differed, and assessment of the experience (somewhat) varied among the participants, it is unlikely that the initial arousal and anticipation of projects' value impacted the bodily processes all the time during the event.

The physiological reactions (also) indicated the moments of some mental shifts during the experiences. My data trends suggest that EDA is a more useful physiological measure for studies of audience experiences of engagement. EDA validated affective engagement expressed by the participants in both modes of engagement, directed and semi-directed, regardless of their personal

arts or technological focus. The sub-cases of outliers in both studies indicated that information about the heart rates (e.g. in Max's case) provided interpretation-changing insights. Max's report on his experience allowed me to add valence, subjective negative and positive value, to similarly looking parts of his HR graphs. Thus, the exclusive use of EDA data can distort the image of the audience's individual experiences of engagement. Moreover, relaxed alertness of HR (in the rest state zone), signalling attention paid to external stimuli, also indicates (a different kind of) engagement. The most useful seems to be the simultaneous use of both physiological measures, even though HR and EDA have varying reaction times. My study also highlighted the need to discuss the relationship between HR and EDA physiological reactions, which I will do in the next chapter.

The study indicated the difficulty in understanding the bodily data as the artistic experiences involve "mixed emotions" (overlapping emotions) or, using the arts philosopher's term, "garden-variety emotions" (Carroll, 2003, p.73). Physiological reactions do not indicate specific feelings but may suggest the emotion regulation strategies of participants (further explored in the next chapter). The analysis of outliers effectively revealed particularities of engagement. Visualisations of data gathered by Ring during the two VR art projects demonstrated similarities in the experiences of different audience members experiencing the same content at various times. That suggests that if we have bodily data and an understanding of the artwork, we can infer elements of the internal engagement of some people even if they do not provide full cognitive feedback. Most of the participants' sub-cases indicated the alignment of physiological EDA reactions with their mental assessment of the events. The reflection, especially during the post-event interviews a few days later, supported their understanding of their own engagement processes.

Chapter 6
Towards understanding of adaptive experience of engagement

The previous chapter revealed that the analysis of a whole set of data is beneficial for the discussion. In this chapter, I build deeper connections between insights from the literature review, pilot studies, and *Bristol* and *Whist*'s artistic experiences. In line with critical realism, I search for causal mechanisms and try to understand what it is about the subject that enables the operation of those mechanisms (Harre & Madden, 1975; Sayer, 1992, pp.104–106). I keep the order of discussion in line with the experience timeframe. Yet, I debate some concepts and audience reactions throughout the analysis. I add to each discussed subject the implications of the findings and suggest avenues for future research to address all three research questions. This part ends with a discussion about the concept of adaptive engagement. The whole chapter discusses issues directly related to my research questions and expands an understanding of phenomena influencing experience and facilitation of audience engagement.

6.1 Personal context of engagement – the pre-experience mindset

The personal context of the participants in this study was expected to influence the experience. As mentioned earlier, psychology challenges the assumptions that behaviour results only from fundamental and stable properties of the person (e.g. Mischel, 1968; Chaplin et al., 1988; Simon, 1992). Thus, this research examined the influence of the audience's pre-experience disposition (a temporary state) and more enduring individual features (e.g. representing personal traits or interests) on audience arts experience. As indicated in the methodology, those two aspects were part of the construct of personal context comprising (1) pre-experience mental state – declared anticipation (feeling), and (2) propensity for the arts or technology (related to previous e.g. knowledge and behaviour)[13]. The starting point of the analysis was the pre-experience personal context and participants' liabilities – a variety of (causal) dispositions, inclinations, or tendencies (Harre & Madden, 1975; Sayer, 1992, pp.104–106; Bhaskar, 2011). Knowledge of enduring characteristics or patterns of a person's behaviour (trends) allows for predicting behaviour based on past actions. This is useful for marketing activities aimed at audience development.

[13] More on pages 108–113.

In this study of audience engagement, the customs of past actions concentrated on (aligned with the VR art specificity) the levels of propensity for the arts and technology. However, previous behaviour does not guarantee consistent performance, as this might also depend on the features of the situation (state). I will discuss the impacts of more enduring characteristics later in this chapter. Now, I review aspects related to more volatile pre-experience feelings.

6.1.1 Feelings of anticipation and motivation for attendance

During data analysis, I noticed an interpretation problem with two related concepts – anticipation (about which I asked in the pre-experience questionnaire) and fulfilment of expectations (question 13 of the post-experience survey). Those questions required participants to assess, on a numeric scale, the level of their anticipation and fulfilment of the expectations. Each of the participants could have a different understanding of the concepts. The answers to both questions might have been quick rather than slow and reflective, as I did not ask for justification for the score given (at least not in direct relation to those questions). The feelings of anticipation relate to expectations and motivation for attendance, as they all contribute to a positive pre-experience attitude and mindset. The concepts of anticipation, expectations and motivation will be thus discussed separately and in relation to each other.

Anticipation

Most participants expressed high or very high anticipation before the events. Only one person in *Bristol* and three in *Whist* communicated a moderate level of anticipation. The one in *Bristol* had a “TECH/arts” focus and attended to experience VR, and (also) because it was a free event. In *Whist*, one person (moderate “arts” focus) attended for social reasons and to discover something new, and two others (both high “ARTS” focus) to discover something new and experience art. Three of those four participants revealed that they felt distracted before the event (two points given in question 25), while the fourth felt neutral (three points). The analysis indicated that social interaction could contribute to the lack of focus of some of the distracted participants. Other participants reported being in similarly neutral or distracted states, yet their level of anticipation was high or very high. Thus, the feelings of lack of concentration before the experience might link to the lower levels of anticipation, but they did not define it. The average score for the anticipation (on a scale from zero to five) in both case studies was similarly high: in *Bristol*: 4.13, in *Whist*: 4.15.

Participants reported curiosity and confidence about enjoying the artworks. Therefore, while answering anticipation questions, they simultaneously expressed their general expectations about the events.

Most participants had no previous virtual reality experience, but all had (at least some) familiarity with attending artistic events. Anticipatory behaviours have been thought to be connected to memory and reflect recalls of previous events (Hofheimer & Lester, 2008, p.429). In new situations, particular features of an experience might activate some positive memories and affect. In my study, people with a higher arts focus could potentially transfer this positive affect to virtual reality, and people with a high propensity for technology might shift their confident outlook from VR to arts. Also, if our brain is a prediction machine that tries at the same time to deal with the past, present, and future (e.g. Friston et al., 2009; Clark, 2013; Barrett & Simmons, 2015; Thornton, 2017), participants could have (also) built their prediction on the expectation of the future. The anticipations could not relate to similar previously experienced virtual reality art (because it was a new experience for most participants) or knowledge gained before the event. Responses to the pre-experience questionnaire indicated that only two participants (one per art project) looked for more information about the content and the artists. Given the declared reasons for attendance, the experience of new (for them) virtual reality was expected to be valuable and not risky for both the arts and tech groups. Regardless of the degree of artistic or technological pre-experience focus (or lack of both) majority thought that their effort and decision to participate would be rewarding.

The anticipation questions were answered intuitively, as participants did not have details to make a more informed judgement, but they had enough information to decide to attend. That does not reflect Kahneman and Tversky's prospect theory, proposed as a model of choice between risky opportunities when expected gain or loss is compared to a reference point rather than absolute outcomes (Kahneman & Tversky, 1979). It is more probable that participants knew little about the event, but they had enough information (reducing the risk) to make a rational decision. That links to the theory of bounded rationality (Simon, 1983) and heuristics (Kahneman, 2003). Both bounded rationality and heuristics acknowledge the decision-makers cognitive limitations related (respectively) to incomplete information and effortless intuition – foundations of immediate yet effective and satisfactory enough judgements (Simon, 1983; Kahneman, 2003). Using the valuable opportunity to experience something new might have made the costs and anticipated effort related to engagement matter less (or seem reasonable).

The intuitive answer that the anticipation was high or very high should not be surprising. In my case studies, participants' primary motivation was related to personal motivation(s) and not to social obligation. Without at least high anticipation, the person would not attend the event. The participants' assessment of the value of the attendance and the participation costs (referring in this study to mental, physical effort and opportunity cost only, as both events were free), was done earlier. It connects to the decision-making processes a few weeks/days before and again on the performance day when people implemented that decision – "[t]he value of an anticipated rewarding event is a crucial component of the decision to engage in its pursuit" (Malvaez et al., 2019, p.762). My participants' high anticipation is similar to participants of Brown and Nowak's (Brown & Novak, 2007) and Brown and Ratzkin's (Brown & Ratzkin, 2012) studies. Their research has also indicated that anticipation for the majority of audiences is consistently relatively high. These being distinct in time and space studies, one exploring free and the other ticketed events led to similar results – audiences before the event expressed high anticipation. That suggests that the starting point for all (or most) audiences is comparable. Responses to the anticipation questions did not provide new insights into participants' engagement, so the pre-experience anticipation inquiry in audience surveys might have limited value for audience studies and actions facilitating arts involvement. But this analysis offered a valuable suggestion – studying the (moments of) decision-making about attendance might be more informative for audience studies dedicated to audience development than the queries about anticipation.

Self-centred motivation for attendance

Many participants attended because of interest – "a desire to explore and engage with the object, and a sense that it has personal meaning and value" (Ainley, 2017, p.5). However, this interest was not their primarily interest in arts. Participants chose and prioritised the three most important reasons for attendance. To "experience arts" was not the participants' first choice and was mentioned less frequently (19 times), even among people with a high or very high propensity for arts. The most recurrent response was to "experience VR" – used 27 times. "Discover something new" (used 32 times), "broaden myself culturally" (17), or "intellectual stimulation" (11 times). These answers indicated openness to experience and signalled the growth mindset (Dweck, 2016) of the vast majority of participants (Figure 6.1).

Figure 6.1 *Bristol* and *Whist* – coded responses to question 24: "Why are you here today?"

Art, in the participants' view, was an instrument for the processes of personal development. Such reasoning is similar to motivations to attend live theatre quoted in the study of Brown and Ratzkin (2012). The importance of self-growth was also visible in the participants' responses to question 27: "Why do you usually engage with art? What are the most important reasons for you to attend an art event or visit an arts institution?" (Figure 6.2). Participants' usual motivations for attending artistic events were to "expand horizons" and "experience something new", which were the most frequent answers (given, respectively, 18 and 16 times). To "experience emotions" (10 responses), due to "interest" (9), for "social reasons" (8), "professional" motives and "seeking stimulation" (both: 7 answers) were also recurrent. Attendance was motivated by personal focus – audience behaviour is selective and incited by the conscious awareness of a person's unique needs (Manolika & Baltzis, 2022). In my research, like in other studies, the VR art was (only) an instrument for satisfying personal needs.

Figure 6.2 *Bristol* and *Whist* – responses to question 27: "Why do you usually engage with art?"

But attendance decisions are the result of multiple determinants (McCarthy & Jinnett, 2001; Swanson, Davis & Yushan Zhao, 2008; Manolika & Baltzis, 2022). Causes and reasons that activate liabilities are person specific, but conditions that support their pre-experience activation depend (also) on the situational context of the specific arts institution and its offer. Searching for causes and reasons that activate liabilities and the conditions that support their pre-experience activation require further exploration to increase the effectiveness of audience development strategies. In my VR art experiences study, audience members' wish to experience something new might be an expression of a broader response tendency of the group (Mischel, 2009) or a manifestation of the personality trait openness to experience, the only trait associated with the satisfaction from experiencing arts (Reber, Schwarz & Winkielman, 2004; Silvia, 2007; Silvia et al., 2009; Jola, 2014). Both are not fixed dispositions but are situation specific and depend on context (Orom & Cervone, 2009; Mischel, 2009). This finding further confirms that loyalty, even if it is the desired outcome of the cultural institutions, is less salient for contemporary audiences. If audiences want to experience something new, this "new" may have many different manifestations. Understanding the need for novelty opens opportunities for the creativity of different organisational departments and in different phases of involvement with the institution. Collecting (and studying) multiple causes and reasons why people attended specific artistic events of an arts institution at a particular moment might be more informative for effective institutional decision making (and audience development) than socio-demographic data or frequency of attendance. Focus on those latter aspects weakens attention to contextual factors that institutions can more effectively influence. For instance, due to knowledge of causes and reasons for (specific programme) attendance, an institution can review how it advertises its message, what types of programming it offers, and what tactics to employ to increase participation (McCarthy & Jinnett, 2001). When participants' liabilities (dispositions) are activated, the actual effects of causal mechanisms subsequently depend upon the presence and configuration of conditions in which they work (Sayer, 1992, p.107). During artistic experience, the liabilities (but not necessarily the ones causing attendance) operated in situations designed by the artists.

The desire for self-growth was also visible in responses to question 24 of the post-experience questionnaire. Most of the participants responded that they would have liked to attend a discussion with the artists. The majority of attendees of *Bristol* and two-thirds of *Whist* (regardless of the level of propensity for the arts) would attend such a talk after the event. Participants

were also able to choose the time of the talk. Except for one person in *Bristol* who would have preferred the conversation before the event and two people from *Whist* that would like to have it both before and after the experience, participants expressed a higher preference for post-event discussion. It suggests that participants did not want to be directed towards the “right” understanding(s) beforehand but valued their personal impressions during the events. Yet, after the experience they were open and curious about other interpretations of the artworks and the artists themselves. The functions and adequacy of externally and internally directed actions of meaning-making, for instance, based on “scaffolding” (Bruner, 1961), are potential directions for further explorations.

According to Kahneman, expressed motivations are salient. They influence decision-making processes but also the experience itself. Yet, motivation is a state and not a fixed property of a person. The graphs and participants' testimonies in the previous chapter indicated that the novelty factor (which was a major motivation) ceased after a few minutes. Arousal caused by the virtual reality novelty habituated (participants got accustomed to it) and, subsequently, the attention shifted to other issues. That is because the causes for attendance and causal mechanisms during the experience of engagement need not be the same. The attention relies on a dynamic combination of top-down/internal and bottom-up/stimulus-driven processes (Kandel, 2012; Firestone & Scholl, 2015; Nadal & Skov, 2017). Then, in my case studies, the predominant motivation for self-growth was mixed with processes inspired by artworks. The shifts of bodily energy were an interplay of internal (potentially also including self-growth/curiosity-driven) and artistic content-driven processes in the environmental context of the virtual reality setting. The potential fluctuations in motivation(s), and their adaptation (also) during the artistic experience, might be an intriguing subject for art engagement studies.

6.2 Internal processes during engagement

Our body and the brain are permanently active, affect always shapes our visual experience, emotions and cognition interrelate, and fast/automatic and slow/controlled mental mechanisms interact. Generally, all cognitive processes (reflective and reflexive) constantly influence and support our engagement with arts. Some have suggested that perception should be distinguished from post-perceptual judgement (Firestone & Scholl, 2015, p.59). This was impossible due to the methods used in this study. In this part, I interpret internal

processing during the event visible in participants' bodily reactions and respond to two first research questions:

1. What can bodily data collected through biometric devices tell us about the audience bodily engagement with art?
   a/ What similarities and differences can be observed in bodily responses in different modes of engagement in the technology-augmented art projects?
   b/ What similarities and differences can be observed in the engagement trajectories of audiences having different and similar profiles and motivations?
2. What can the relationship between audience personal context, dynamics of bodily engagement, and post hoc cognitive reflection reveal about audience experience of (VR) art?

6.2.1 Interpretation of initial and continuous bodily arousal

The causes of the pre-experience physiological state (obtained from each participant's bodily measurements in the first minutes of experience) were too ambiguous. Physiological data at the beginning of the Ring and Garmin recordings indicated that, in both studies, initial heart rates endorsed expressed high anticipation levels of most participants. The bodily arousal, calculated during pre-experience questions analysis, did not help assess the level of the participant's pre-experience mental state. In theory, people are more alert when they enter new territories and experience new things (Eagleman, 2020, p.435). Thus, participants with low arts or tech focus should have high (at least) initial arousal, and those with higher propensity scores should feel comfortable and have low or moderate bodily arousal. That was not the case. Most participants' heart rates were higher, at least at the beginning of the data recording. However, initial arousal could be a result not of the novelty factor but of mixed emotions related to anticipatory feelings related to the artwork (e.g. a mix of curiosity, excitement, and nervousness of the unknown), issues associated with partaking in the research, reaction to the touch of the device, or other personal matters. Nevertheless, it was clear that the participants did not enter the experience in a bodily rest state condition.

Moreover, constantly changing psychological and physiological states influenced engagement on the go, so while it happened. If, as described in the methodology, the Law of Initial Values (Wilder, 1950, in Wainer, 1991, p.147; Wilder, 1967) operates continuously, the physiological baseline was applicable as a general reference but less relevant in the extended timeframe. The

changes in the physiological measures' values depended not only on the stimulus but also the function on the preceding stimulus. Considering the Law of Initial Values, the differences are minor if previous and current stimuli had the same function (e.g. excited-excited or calm-calm) and larger if the response changed (e.g. excited-relaxed). Therefore, the full recognition of the changes in response to different episodes was impossible in *Whist*, as many had similar functions, and participants' prevailing reactions did not change. The same happened in my pilot studies. For example, my leading response to the romantic story was "relaxed". Thus, there were no significant variations in my physiological reactions during this experience. Arousal might not change (continue to be high or medium), so its strength did not significantly change, but the arousal appraisal might change, e.g. raised positively if someone was impressed by the art. That, again, indicated that interpretation of the physiological reactions needed to acknowledge their context.

6.2.2 Signs of engagement in bodily reactions

Chapter 5 highlighted the necessity to discuss the relationship between HR and EDA physiological reactions. EDA, better than heart rate, differentiated responses to different parts of experiences, but examined alone could lead to incorrect interpretation of experience. Heart rate and EDA graphs, in both studies, demonstrated both similar and distinct shapes and moments of acceleration and deceleration as the experiences unfolded in time. Some differences might be explained by the heart's and skin conductance's diverse speeds of reaction, with EDA changes being slower (Berntson, Cacioppo & Quigley, 1991, p.483). But, in addition, in my sub-cases analysis, HR and EDA frequently displayed opposing potencies. If heart rates and electrodermal activity are indirect measures of audiences' cognitive and emotional engagement (Richardson et al., 2020), then variants of HR and EDA coactivation (concurrence and divergence) may represent variations in the experience of engagement. Regrettably, most previous studies of physiology during artistic experiences have not analysed the relationship between heart rate and EDA measurements, concentrating only on "outcome measures such as performance" (Horvers et al., 2021, pp.19–20). My review of the literature did not help to clarify if and what different paths of joint analysis HR and EDA reveal about engagement with arts and what conditions promote different physiological activation patterns in engagement. I, therefore, had to additionally examine if my empirical material provided insights in that regard and based my interpretation on more general studies of physiology. I exposed six configurations of heart and skin joint responses in my research, five identified in

my main case study and one during the pilot phase.

Modes of joint HR-EDA physiological responses

To examine the size of the tendencies in the whole study, I classified the rest of the available HR and EDA data. There was no more data available from *Bristol*. Table 6.3 includes data from an additional eight *Whist* participants and presents the distribution of trends among participants of *Bristol* (seven people, as I excluded one participant with shorter data) and participants of *Whist* (twelve people).

There were five patterns of activation of physiological reactions of nineteen participants with full EDA and HR records (Table 6.3). First, eight participants had constantly varying EDA and high and varying HR (group coded as VV). Second, four participants had mixed combinations (coded MM). Their graphs showed levelled or varying data in different parts of the experience (so some parts were flat and others variable). The third variation of two *Bristol* participants, included varying EDA and relatively flat HR in the rest zone (code: VRest). The fourth trend, represented by three participants, had flat EDA and high and variable HR (group code: FV). A category DV was created for experiences causing decreasing EDA when HR was high and varying. The most frequent paths of EDA and HR relationships in my main case study were a combination of varying skin conductance levels with varying and high heart rates (VV).

Table 6.3 The trends in HR and EDA coappearance in *Bristol* and *Whist* experiences (19 participants)

Nr of people	Bristol (7)	Whist (12)	EDA Sympathetic	HR Para & Sympathetic	Code
8	2	6	varying	varying & high	VV
4	2	2	mixed	mixed	MM
2	2	0	varying	in rest zone	Vrest
3	1	2	flat	varying & high	FV
2	0	2	decreasing	varying & high	DV

The diversity of physiological paths could be explained by the specificity of psychophysiological measures that build upon the actions of multiple brain and body regions. Skin conductance (EDA) is controlled by the sympathetic, while the heart actions are controlled by sympathetic and parasympathetic nervous systems. Contemporary science acknowledges that parasympathetic and sympathetic nervous systems are coactivated rather than operate disjointedly

(Lacey, 1959; Berntson et al., 1994; Critchley, 2002; Berntson, 2019). The two autonomic nervous system divisions may have different thresholds for activation, so functionally significant variations of the parasympathetic and sympathetic systems may be apparent only at higher levels of activity (Berntson, Cacioppo & Quigley, 1991, p.466). Moreover, various organs can concurrently stimulate responses of different branches of the central nervous system, while some stimuli can simultaneously activate parasympathetic and sympathetic controls of the heart (Berntson, Cacioppo & Quigley, 1991, p.465). The multiple modes of autonomic control, the sympathetic and parasympathetic responses' variants – which Lacey called “directional fractination” (Lacey, 1959) – are not (yet clearly) associated with distinct behavioural conditions. Recognition and diversification (Critchley, 2002) and quantification of the specific activities of the ANS divisions are, in general, challenging (Berntson, Cacioppo & Quigley, 1991, p.482). Therefore, examinations of patterns of interaction of sympathetic and parasympathetic activation are sporadic.

However, Berntson and colleagues noted that novel or challenging environments in which optimal or adaptive behavioural responses are unclear are likely to evoke or promote coactivation of (so increase in) both the sympathetic and parasympathetic divisions (1991, p.483). Yet, in longer experiences, the coactivation trend cannot be enduring as there is a limit to a heart rate increase or decrease. In longer experiences of art, a diversity of autonomic responses is rather probable. The graphs visualising physiological reactions to *Bristol* and *Whist* art projects in the previous chapter, even if I could not associate HR changes with specific branches of the nervous system, made this diversity visible.

According to Peifer and colleagues, coactivation of sympathetic and parasympathetic systems is “related to active coping with and the preparation for successful adaptation to challenging situations – a context in which flow is likely to appear” (2014, p.67). The reference to flow in this context is confusing if juxtaposed with the above Bernston statement about coactivation happening in a novel or challenging environment. Moreover, it was suggested (also by Peifer et al.) that flow is associated with a moderate level of arousal (de Manzano et al., 2010; Peifer et al., 2014) and moderate heart rate and skin conductance (Tian et al., 2017). If I used that proposition, I would have to conclude that participants with high HR and exponentially rising EDA were not in a flow state, while those with moderate levels were. However, that might not be the case, as the research on flow conducted in the context of arts experiences has not examined the flow expressed in audience members' bodies. It has covered comparisons of the flow of professional and amateur

performers (e.g. Grape et al., 2003) or professional artists (Harmat, Manzano & Ullén, 2021), e.g. pianists performing known and unknown pieces of music (de Manzano et al., 2010). Audience experience of engagement rarely involves the performance of tasks and possession of skills developed during the sustained practice of activity. It is yet unclear how the research on the physiology of task-related flow experience can contribute to analyses of audience experience of arts engagement. My research suggests that flow during the artistic experience not requiring (hard) skills might differ from a competence-oriented and achievement-motivated flow that is extensively studied (e.g Peifer & Engeser, 2021).

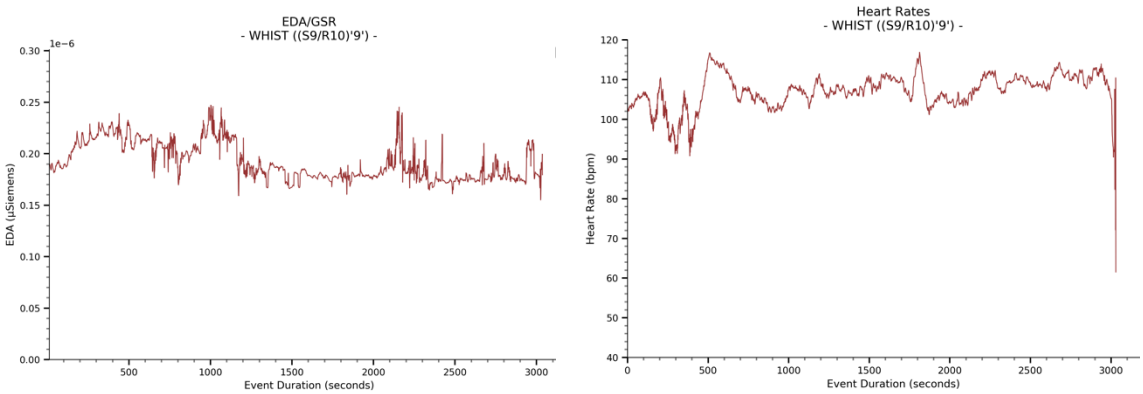
Future developments in the psychophysiology of flow and “directional fractination” of the autonomic nervous system (Lacey, 1959) could support the exploration of different kinds of processes of engagement with arts. However, as a comprehensive physiological study goes beyond the scope of this research, I analysed the participants' artistic experiences grouped under VV, MM, VRest, FV, DV, and (my pilot) FRest labels.

VV and MM groups (varying EDA and varying HR)

The main difference between the VV and MM groups was the distribution of physiological fluctuations. To the VV group, I classified people with permanent and substantial changes (increase or decrease) in both physiological measures. The smaller MM group included participants whose graphs depicted the moments of significant changes and the moments of steady/levelled responses. Most of the participants, including those already analysed in the previous chapter, belong to one of those groups: eight people to VV and four to MM.

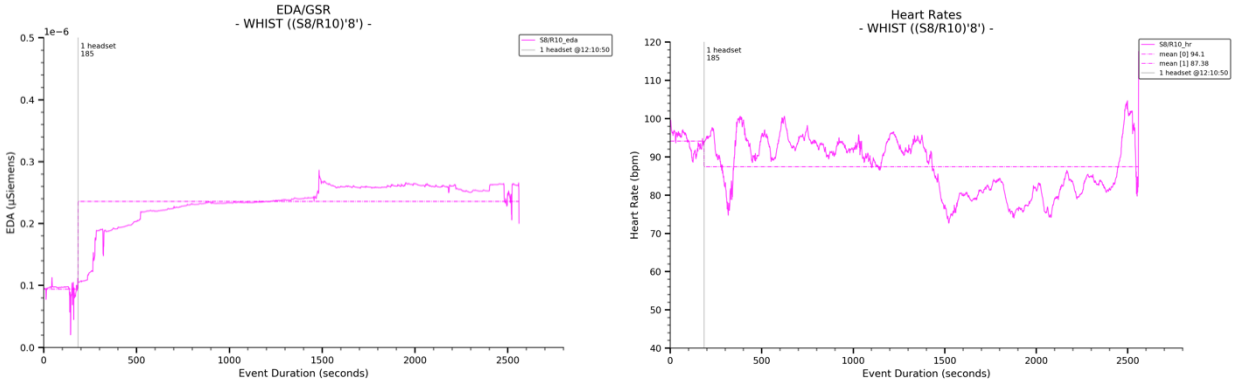
The MM group included two participants already described, Max and Rose from the *Bristol* study, Paul participating in *Whist*, and Esteban, a co-author of *Whist* (whose physiological reactions were also recorded). Paul, the third person from the MM group, took part in *Whist* (path 34). Figure 6.4 below presents his EDA and HR graphs. His initial and final HR and EDA responses were clearly fluctuating, which would put him in the VV group. But in the middle (between 1,200 and 2,100 seconds) of the experience, the EDA was more static, while the heart was still highly active. That is why I assigned him to the MM group. In Paul’s case, orienting responses (sharp lines up) at the end of the experience are visible in the EDA graph. Max and Rose assessed their quality of engagement as high, and Paul as very high.

Figure 6.4 Paul's EDA and HR graphs



The MM group also included Esteban, a co-author of *Whist* (Figure 6.5). Esteban's EDA reaction potentially indicated familiarity with the artwork. The EDA graph, after the initial high increase of arousal, demonstrated stability, while the heart rates implied a permanent, vivid reaction to the content. Esteban co-designed the artwork a few years earlier and had not experienced it since. He engaged with the content in a specific affective manner. The orienting response, in the middle of the experience (possibly at the start of the "table II" scene), concurrently triggered EDA increase and HR decrease, which sustained their respective median levels (still above the regular HR and initial EDA) until the end of his experience.

Figure 6.5 Esteban's EDA and HR graphs



Additionally, I labelled as MM two immersive theatre experiences in the pilot phase due to the diversity of my bodily reactions. During the beginning of *These Rooms*, I was moderately aroused, while the second half and its dramatic finale caused high physiological activation. The second one, *For King and Country*, clearly involved less sympathetically and affect-driven responses (showed in my EDA), which is especially visible in the more neutral response to the end of the performance. Nevertheless, I appraised the first immersive

theatre very highly and the second one (less so but still) favourably. The difference in affective responses probably caused this minor difference in assessment within the high satisfaction range.

The VV and MM groups included participants from both case studies. The groups were not only similar in their physiological reactions' trends but also in very positive assessments of their VR art adventures. The same positive appraisal came from the participants assigned to the VRest group.

VRest group (varying high EDA and HR in rest zone) group

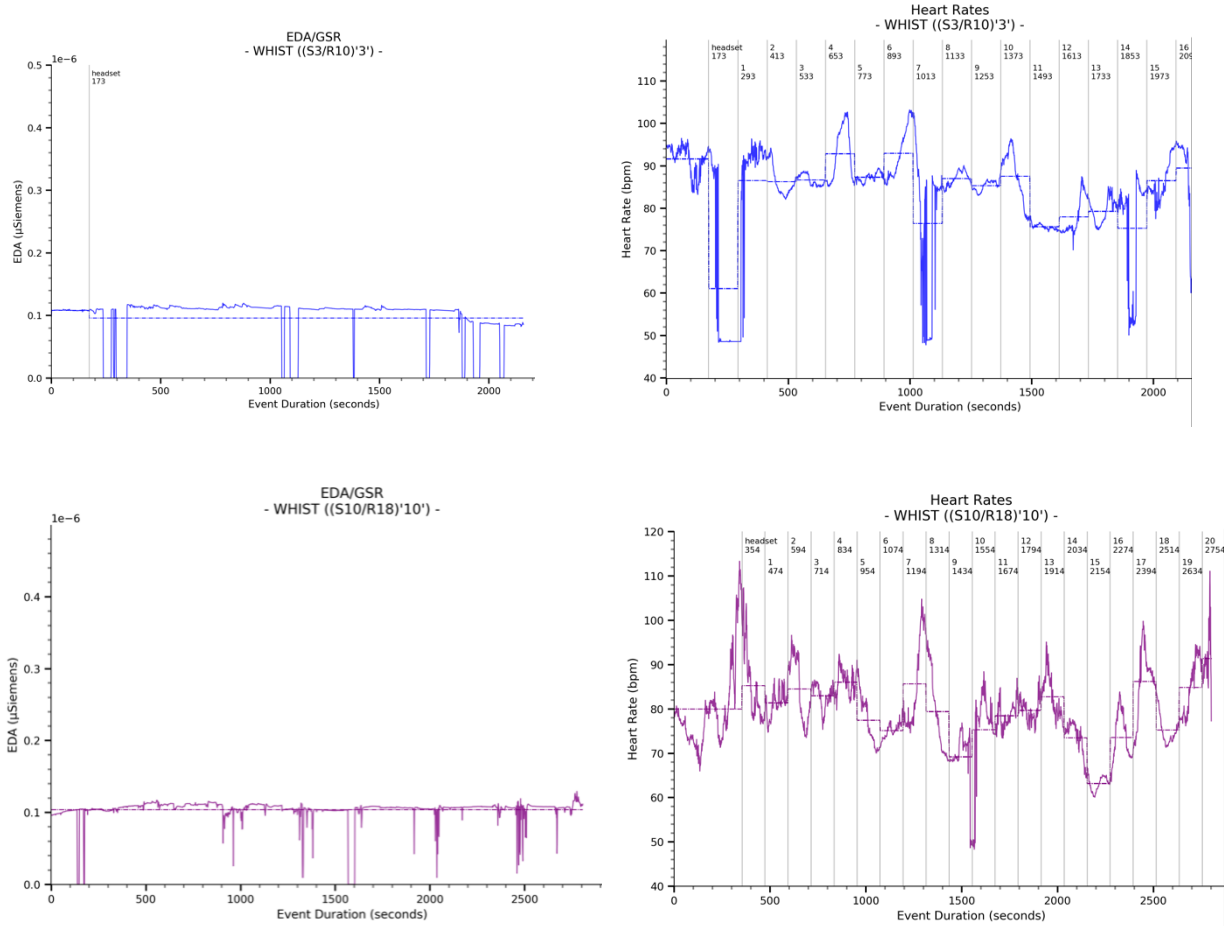
Two participants from the VRest group (Hanna and Joseph) took part in the late evening presentation of Bristol (9–10pm). That could explain lower heart rate values, as light influences circadian rhythms (Scheer et al., 2004a, in Vandewalle et al., 2007, p.149). In general, hearts beat more slowly in the evening. Changing EDA indicated, however, emotional arousal. Both Joseph and Hanna assessed the experience highly and very highly. The VRest group's bodily responses showed that EDA visualisation itself could provide insights into the experience of engagement if the art embraces varying emotional content.

FV (flat EDA and varying and high HR) group

The FV group comprised people with balanced EDA and varying (and high) heart rates. The shape of the graphs of the participants with balanced skin conductance levels suggested that they were not EDA non-respondents. If EDA changes presented individual significance and emotional arousal, then balanced EDA would reveal a more cold/cognitive attitude during the experience. The personal contexts of three participants from the FV group partly supported this statement.

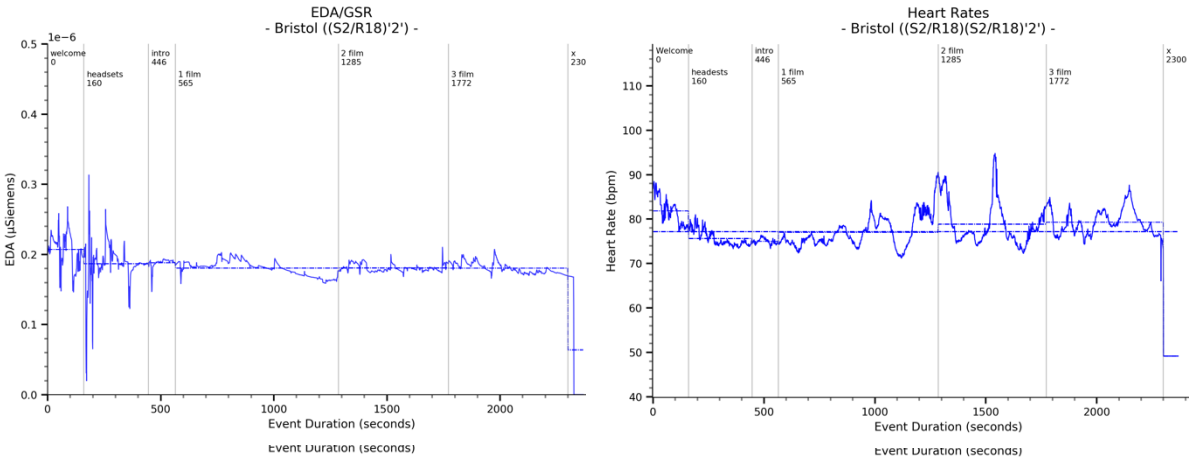
Two *Whist* (Tahani and Ray, Figure 6.6) and one *Bristol* (Alison, Figure 6.7) participants assigned to the FV group were already discussed in the previous chapter. Their general engagement scores from the O'Brien questionnaire were high (respectively 4.17, 3.75 and 3.67). These scores were influenced by a high or moderate assessment of the aesthetic appeal of the experience (3.67, 3.0 and 3.0 points). These assessments were similar, but the pre-experience arts focus of the three participants was different: of both *Whist* participants was low, and *Bristol*'s one was high. Tahani's pre-event propensity was unclear (coded as "?"), and Ray came to the performance because of technology ("TECH!" focus). Both *Whist* participants answered that the event moderately fulfilled their expectations.

Figure 6.6 FV group EDA and HR graphs. *Whist*: Tahani and Ray



Alison's personal context differed as she indicated high arts focus ("tech/ARTS"). Although her EDA was balanced, as I explained earlier, Alison demonstrated variations in her emotional engagement during the three *Bristol* stories, pointing out the highest emotions during the third film. She also reported problems with vision due to the heat caused by the headset. Those additional comments indicated positive and negative aspects that EDA failed to differentiate. As the previous chapter indicated, there was a correspondence between those participants' bodily activation and their (slightly less positive) general assessment of the engagement.

Figure 6.7 FV group EDA and HR graphs. *Bristol*: Alison



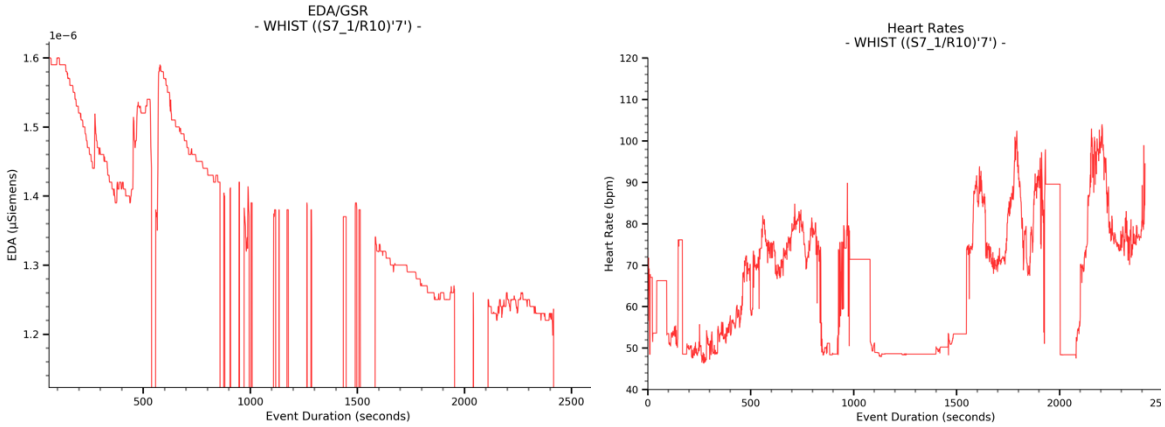
It is unclear if the FV group participants' electrodermal responses are generally or usually low or if EDA indicated a lesser assessment of the aesthetic part of the experience. Despite those slight drawbacks and participants' levels of emotionality, their scores for the general quality of engagement and reward factor were high. The other features of the VR artwork were very highly rewarding, compensating for discomfort and distinct aesthetic preferences. Still, the balanced EDA might visualise (not mutually exclusive) reduced emotional engagement. Looking at my pilot immersive theatre experiences and Max's reaction to the prisoners' story, balanced EDA and varying HR might also represent mixed emotions.

DV (decreasing EDA and varying and high HR) group

The DV group incorporated people with a visibly decreasing skin conductance level and high and varying HR. This group included Anna and Sabine, two *Whist* participants with different satisfaction levels with the experience. Due to problems with Ring during my first *Whist* recordings, I do not have physiological data from a few other participants negatively reacting to this experience. Anna was part of the organisation team, so her positive questionnaire answers might be biased. For example, she might have felt that she had to like the event as she invested effort in its delivery (effort justification bias). Despite many errors in the data and the fact that she stopped participating in the experience (explaining a need to go back to work), her EDA graph presented a minor decreasing trend. This might suggest that the artwork experience was not worth justifying a break at work or that she could not concentrate on the artwork due to thoughts about her duties. The only representation (even if with multiple signal losses) of the less pleased group could be Sabine (Figure 6.8). Sabine's

EDA presented a significantly decreasing trend, while her heart rates were notably variable.

Figure 6.8 Sabine's EDA and HR graphs



Sabine, a highly educated woman (with a PhD), expressed high anticipation before the event. Her technological focus was low and propensity for the arts scored high (pre-experience focus was coded: "ARTS"). Her answers in the post-experience questionnaire indicated a change of attitude to moderate "tech/arts". Her general engagement was moderate (3.17), and her assessment of the aesthetic appeal was in the low range of moderate (2.67). Sabine also gave a low two points to the question about the fulfilment of the expectations. Yet, during the interview, she mentioned:

> I didn't have any expectations, because I just was not sure what, what it would be.

She was not impressed with this VR art "as it feels like TV, not real". But after the experience, Sabine decided to learn more about the artists, talked about the event with her husband and friends, and wrote a letter to the organisers saying:

> I really enjoyed it, but I think [the] advertising wasn't done properly... It is a famous company and people did not know about it.

During and just after the event, Sabine's reactions were rather negative. Later she realised that she enjoyed the show and demonstrated it through an email to the arts centre. The physiological data documented temporary negative (aspects of) responses to the art, and the post-event questionnaire supported it. Yet, the post-event reflection changed the initial negative appraisal into a very positive one. That change might be (also or partly) related to a kind of (here post-event) framing by the acquired information about the previous success of the artists. The framing did not affect experience but the opinion about it. Sabine's example shows that (both) the study of bodily reactions

during the artistic experience and the post-event immediate reflection in questionnaires might offer a distorted and temporary appraisal of the experience.

Looking at the personal context of two participants in the DV group, there might be two reasons for the EDA decreasing trend. One related to a negative (rejecting) response during the experience and a lack of satisfaction with it. The second might signal a problem with concentration and an attention shift from VR art to other, outer or inner, issues. If people are permanently mentally and bodily active, then decreasing (and not flat) EDA might signal disengagement (or rather more negative reactions) during an art experience.

FRest (flat EDA and HR in rest zone)

None of my sub-cases displayed the physiological state with rather a flat EDA and HR in the rest range, which could indicate a fully relaxed state of the body and neutral response – relaxed alertness (coded as FRest). The FRest state is visible on the graphs from my cinema experience in the pilot phase. While I watched *The Guernsey Literary and Potato Peel Pie Society* (the romantic story) my flat EDA and close-to-resting heart rate displayed a relaxed state. The film did not require a high investment of my bodily energy. It did not evoke strong emotions and significant changes in my heart rate, as both measures stayed near the baseline. Low and not changing EDA could be interpreted as a lack of personal relevance, while the rest state's heart rate might indicate attention to external stimuli and lack of internal processing. Yet, the latter is questionable since (as explained in the second chapter) internal bodily and mental processes are permanent. Such balanced reactions are also signs of (in my case positive and satisfied) engagement.

6.2.3 Physiological engagement trajectories

The above analysis suggests that the physiological reactions did not significantly associate with different modes of studied engagement (directed and semi-directed) and the levels of propensity for the arts. Iffland and colleagues (2014), who studied social rejection, suggested that patterns of physiological reactions might be influenced by inter-individual differences in life experiences, gender, and expectations of acceptance and rejection. To examine if the individual contexts and assessments of experience provided information about causes or correlations of variations in physiological reactions, I analysed the participants in five relevant groups to check if one can predict the level of engagement based on the reactivity visible in the co-analysed HR

and EDA data. Three people (whose bodily data was analysed) were not asked to complete questionnaires. These were *Whist* creator (Esteban, group MM) and two Hungarian participants of *Whist* (group VV). Those two participants (one experienced in VR gaming and one who has never experienced VR) expressed enthusiasm after the experience but, due to language differences, could not complete the questionnaires and be included in this analysis. Thus, this part of the exploration comprised sixteen participants from the two case studies combined. Their data provided the answers to two components of the first research question.

Are there similarities and differences in bodily responses in different modes of engagement?

The bodily activation patterns did not depend on the type of – directed or semi-directed – engagement, as demonstrated in Table 6.9 below. The VV, MM and FV groups comprised participants from both case studies. Two participants from the VRest group experienced *Bristol* in specific external circumstances, which explained their lower heart rates. Also, the DV group comprised two participants from just one case study – the semi-directed experience of *Whist*. But Anna and Sabine's bodily reactions did not depend on the form of engagement but on personal matters. My data analysis indicated similarities and differences in physiological engagement irrespective of the type of engagement designed by the artists. The level of the audience's agency in directed arts experiences and directed engagement with the audience having no control over artwork developments (*Bristol*) and the semi-directed form of experience and engagement, combining structured and spontaneous engagements (*Whist*), have not differently influenced trends of bodily reactions. My research did not provide evidence that agency significantly impacts audiences' experiences. It showed (through O'Brien's scale responses) a slightly lower appraisal of the semi-directed experience (*Whist*) and, through a lower level of heart rates in *Bristol*, the lower mental effort needed for this programme. Those, however, might relate to the more challenging theme of *Whist* than its structure and the evening time of data collection in *Bristol*. The inner, personal, psychological, or emotional engagement did not depend on the participants' levels of agency and their control over the experience in my case study.

Table 6.9 Combined quantitative and qualitative analysis of *Bristol* and *Whist* participants

Name	Code	Art	Pre-experience focus	Post-experience focus	General engagement score
Inez	VV	Bristol	tech/ART	tech/ART	4.25
Flavia	VV	Bristol	ART	TECH/ART!	4.67
Faye	VV	Whist	tech/ART	TECH!/ART	4.5
James	VV	Whist	ART	TECH!/ART	4
Simon	VV	Whist	TECH!/art	TECH/ART	4.42
Christine	VV	Whist	art	tech/art	3.67
Max	MM	Bristol	tech	TECH!/ART	4.58
Rose	MM	Bristol	tech/art	tech/ART	3.83
Paul	MM	Whist	tech/art	TECH/ART!	4.33
Hanna	Vrest	Bristol	TECH!/ART!	TECH!/ ART!	4.5
Joseph	Vrest	Bristol	tech/art	tech/ART	3.75
Alison	FV	Bristol	tech/ART	TECH/art	3.67
Tahani	FV	Whist	?	TECH!/ART	4.17
Ray	FV	Whist	TECH!	TECH/art	3.75
Sabine	DV	Whist	ART	tech/art	3.17
Anna	DV	Whist	ART!	TECH!/ART	3.5

What similarities and differences can be observed in engagement trajectories of audiences having different and similar profiles?

Table 6.9 also demonstrates that the bodily reactions did not align with the arts and technological focus of the participants as there were participants with diverse levels of pre-experience propensity in all five groups. To explore this closer, Table 6.10 assembles participants based on their pre-experience propensity for the arts from very high (“ARTS!”) to very low (lack of the word “arts” in the individual code). The table shows that specific physiological reactions did not relate to pre-experience or post-experience focus. However, the participants in the VV, MM and VRest groups had at least medium propensity for the arts (codes: “arts”, “ARTS” and “ARTS!”), while FV and DV groups included people from across the spectrum (from no “arts” to “ARTS!” focus), so also those with low or very high arts focus.

Table 6.10 Physiological response vs pre-experience focus and post-experience assessment of general engagement

Name	Code	Art	Pre-experience focus	Post-experience focus	General engagement score
Hanna	Vrest	Bristol	TECH!/ART!	TECH!/ART!	4.5
Anna	DV	Whist	ART!	TECH!/ART	3.5
Flavia	VV	Bristol	ART	TECH/ART!	4.67
James	VV	Whist	ART	TECH!/ART	4
Sabine	DV	Whist	ART	tech/art	3.17
Inez	VV	Bristol	tech/ART	tech/ART	4.25
Faye	VV	Whist	tech/ART	TECH!/ART	4.5
Alison	FV	Bristol	tech/ART	TECH/art	3.67
Christine	VV	Whist	art	tech/art	3.67
Rose	MM	Bristol	tech/art	tech/ART	3.83
Paul	MM	Whist	tech/art	TECH/ART!	4.33
Joseph	Vrest	Bristol	tech/art	tech/ART	3.75
Simon	VV	Whist	TECH!/art	TECH/ART	4.42
Ray	FV	Whist	TECH!	TECH/art	3.75
Max	MM	Bristol	tech	TECH!/ART	4.58
Tahani	FV	Whist	?	TECH!/ART	4.17

Looking at data trends of people having different and similar profiles, it is notable that half of the people with high and very high arts focus belonged to the VV group. The other half was distributed between the DV, FV and VRest groups. Participants having medium or low arts focus (as depicted in the lower half of Table 6.10) are also distributed among all physiological reaction groups, but slightly more often belonged to groups MM (mixed bodily reactions) and FV (less emotionally engaged). The bodily reactions of those groups might represent different trends (e.g. more distorted flow), but their reflections on engagement do not explain these differences, as almost all participants from five groups assessed their quality of engagement highly or very highly. The distribution of physiological reactions among different groups exposed that higher arts focus might moderately accurately forecast the possible physiological reactions (VV) but did not guarantee a highest positive assessment (by the participants) of the quality of the engagement. The methods used in the study did not allow me to assess if medium or higher arts focus is a cause of specific bodily reactions or a matter of data correlation. However, the distribution of physiological reactions among different groups revealed that (at least) medium propensity for the arts may help to increase levels of EDA and HR responses but does not guarantee it.

6.2.4 The causes of diversity and similarity of physiological engagement trajectories

The most significant factors influencing bodily engagement were the artworks themselves. An arts experience has pattern and structure (Dewey, 1980, p.44), so the artistic vision guided temporal changes in engagements, while individual differences caused variations in those reactions. Just as Vessel, Starr, and Rubin's (2012) research indicated, my case study also demonstrated similarities and variations in bodily engagement. In line with Höijer's observation (2008, p.288), they existed simultaneously and reflected different aspects of a complex reality. The commonality in my case studies reflected mostly the features of the artworks (beginnings and endings, emotional content), while the principal source of variation came from individual responses to them. However, there were also commonalities in those individual responses, as some aspects of human reactions might be universal or more common (e.g. avoiding coping strategy to disgust).

The physiological reactions to the VR art content are similar but not identical. Virtual reality has not yet established a specific "language" (as in film), e.g. principles for affective image framing and editing. The up to 360 degrees of vision allows the audience to look around and experience the story from various points of view. Thus, although *Bristol* can be considered classical in form, and *Whist* as non-classical, the principles discussed in chapter 2 of Bordwell's (1985) thesis, as well as by Kovács and Papp-Zipernovszky (2019), about the high similarity of reactions in artworks with classical form, had not fully applied to VR. The physiological reactions in my case studies could have similarities, but the level of similarity is moderate, even in a classical *Bristol* narrative. While all participants heard the same sounds, they might omit some visual aspects of the scenes as each person might look somewhere else at any given moment. EDA graphs revealed more similarities in responses to *Bristol*, while only strong reactions to the "table II" scene indicated similar changes in bodily engagement during *Whist*. But analysed together, HR and EDA displayed similarities across both case studies. Similarities were more visible when HR and EDA trends were assessed together as trends rather than similarities in exact individual reactions.

This is (also) because participants filtered the content through their own mental perspectives. The two arts projects in my case study differed as far as the mental activity required from the audience members was concerned. In the *Bristol* documentaries, the audience was smoothly guided through the narratives and the deeper inferential mental activity was unnecessary (hence the generally lower and less varying heart rates during the first two films).

Longer scenes (with limited editorial cuts) made the audience's cognitive reactions more homogenous. The non-classical, conceptual and more abstract content of *Whist* did not provide most audiences with clues for the understanding of its episodic content, which was all the time rather enigmatic. Therefore, heart rates operated at higher levels, and the participants' reactions visibly differentiated only the controversial “table II” scene. Interviews with the *Whist* audience suggested that some differences might be caused by the approaches to the content and moments when participants “surrendered to” (stopped interpreting) the artwork. As Mark, whose HR was high and attitude change was from “?” to “TECH!/ARTS!”, described:

> You were just waiting for something to happen. There were elements of surrealism throughout it [...]. I couldn't connect them [the scenes] [...]. I was just surrendering to it. I was just surrendering. I really, really couldn't predict. Nor was I trying, after a while, to predict what was going to come next. I really didn't know who would pop out of the box or when even a scene would finish. And who would appear next. There seemed to be an array of some consistent figures, obviously. But then there appear to be different characters coming in at different times. So, it really was very refreshing from that perspective [...]. I liked it. I like that non-predictability.

The moments where participants cognitively surrendered most probably varied. At the same time, the experience involved moments more prone to cause surrender and moments of high mental inference. This might explain some changes in the physiological responses, especially the heart rates.

The specificity of the two artworks differently influenced participants and their bodily reactions. Although five trends in HR and EDA were visible in both modes – directed and semi-directed – engagements, the level of heart rates seems, in most cases, higher in *Whist*. That indicates that the more conceptual *Whist* mobilised more physiological resources, which serve the regulation and coordination of responses to psychological stimuli (Andreassi, 2000). However, some of *Bristol*'s participants also had heart rates above the resting level. The mobilisation of energy for cognitive processing was demonstrated in bodily reactions during both experiences.

6.2.5 Models of engagement

The models of engagement presented in chapter 2 were moderately useful and compatible with my analysis. Only Loke and Poonkhin Khut’s Facilitated Interaction Framework and O’Brien and Tom’s Model of User Engagement were relevant for this study. *Whist*, like the Facilitated Interaction Framework of Loke and Poonkhin Khut, embraced not just the core but also activities that

directly preceded and followed the experience. The *Whist* artists welcomed the audience at the beginning of the event, explained how VR works and how to start each scene. They also created an additional layer of engagement by facilitating the post-experience reflection and discussions, as participants received access to the *Whist* website, which explained the numbers they received at the end of the experience. The Model of User Engagement (O'Brien, 2008; O'Brien & Toms, 2008, pp.957–958; O'Brien & MacLean, 2009, p.2; O'Brien, 2016b, p.14), described in chapter 2 (page 60), very accurately presented the scheme of bodily and mental engagement. However, my study indicated that not all attributes of points and periods of engagement and disengagement apply also to the artistic experience. For example, an arts experience does not build on a specific, experiential goal (as goals differ from motivations) or require just a positive affect. According to O'Brien, the rising and falling attributes communicate different intensities during an engagement episode, which contribute to users' overall evaluation of the experience. (O'Brien, 2008; O'Brien & Toms, 2008). In an arts experience, value does not necessarily lie in higher intensity of engagement. Audiences may engage with arts projects that may be designed with and offer varying (between low and high) or sustained levels of intensity. Thus, this model of engagement is only partly useful for discussing engagement with art.

My research did not support the need for or usefulness of universal models of engagement during the experience of the arts. Applicable in an interactive experience and exhibition design, discussions about attributes of experience that initiate, sustain, and lead to re-engagement, were not able to be identified in the collected bodily data. That is because my study did not focus on just interaction and attention. Also, the Arc of Engagement (Brown & Ratzkin, 2011) that covered a timeframe of the "total experience" and combined actions related to (not differentiated) audience development and audience engagement was not relevant to my study. The existing models of user engagement or audience engagement need, in general, to be treated with caution as each understands the key concepts differently. This reduces their transferability between different academic domains or even studies. My research suggested that the facilitation of audience involvement might benefit less from universal models of engagement and more from an understanding of the processes unfolding during the experience of a specific artwork. It endorsed the analysis of particular artwork's storyboard (the chronological sequence of scenes) from the perspective of different audiences' experiences of engagement.

My research recognised the independence of artists and the audience. In this context, the Facilitated Interaction Framework of artistic practitioners Loke and

Poonkhin Khut is the most useful. It does not suggest outer-directed (Riesman, in Bruner, 1961, p.7) pre-experience education but uses a form of pre- and post-event scaffolding (Bruner, 1961). It introduces audiences to novel technology (so they understand what to do) and stimulates innerly directed reflection after the experience. Empathy-driven design of involvement during the event (e.g. supported by analysis of body reactions) and stimulation of innerly directed reflection after the experience might endow the memories and interest development that could stimulate future art engagement.

6.3 Appraisal during and post-experience

Our brains run (mostly) on autopilot, and arts experiences combine fast and slow reactions: “judgments and intentions are normally intuitive” but “can be modified or overridden in a more deliberate mode of operation” (Kahneman, 2003, p.716). It is vital to remember that my study did not manipulate the artworks or the participants' involvement as they did not have any instructions from me apart from the request to behave in line with their natural tendencies. I did not encourage systematic processing in any direction (which is often the case in psychological experiments). The bodily reactions collected during the principal exploration of arts experiences indicated a dominance of reflective processes with some fast reactions of orienting responses. The items of pre- and post-experience questionnaires, which as an answer requested numerical valuation, possibly involved some fast and intuitive responses, which are more prone to mental shortcuts. Both questionnaires also required qualitative answers, which were more reflective and detailed. My analysis showed that the semi-structured interviews provided the most valuable material for understanding the causes of physiological fluctuations during the engagement.

6.3.1 The relation between reflexive and reflective

The second research question – “What can the relationship between audience personal context, dynamics of physiological engagement, and post hoc cognitive reflection reveal about the audience experience of art?” – links personal context with bodily and cognitive reactions of the participants. According to O’Brien and colleagues (O’Brien, 2008; O’Brien & Toms, 2008), the level of mental effort of, for example, attention, intellectual and emotional engagement during the event contribute to the post-experience assessment of the experience. However, in arts experiences in vivo, the mental effort might also relate to the expectations of the effort expressed in motivation for attendance and the felt effort. It might also not be considered a problem.

One of the main motivations for most participants was a wish to experience something new, which both experiences delivered. Increased heart rates should be and were prevailing. The high mobilisation of physiological resources (increased HR) during the engagement was not perceived by the participants as a problem. The post-experience responses indicated that the (median) quality of the engagement during the events was assessed as “high” (*Bristol* 4.15, *Whist* 3.92). The challenging content was perceived highly (in the high range of scores) positively. Participants could (consciously or unconsciously) predict higher mental effort (and its bodily cost) before they engaged with a novel experience. Physiological reactions revealed and confirmed the extent to which their motivation to experience something new was fulfilled. If “people are more sensitive to cost (time, effort) than utility” (Bitgood, 2013, p.64), then in my case study participants’ openness to experience (so higher tolerance for new and unknown) merged with a physiological and psychological state accepting higher effort for the body.

That inference does not exclude other motivations for attendance and the impact of social interaction that additionally influences the experience. But, if the art projects guide bodily engagement, then the design and explorations of the physiological reactions could also benefit from probing the participants' reasons for attendance and causes of reactions during the experience. Associating the motivation for attendance with the artistic content might provide clues to an understanding of specific participants' bodily reactions and post-experience appraisals.

It must be also noted that physiological data and post-experience questionnaires and interviews provided time- and context-sensitive insights. Physiological reactions unfold in real time of the artistic experience, while responses to the questionnaire and in interviews involved post-experience reflection in (we could call it) debriefing or introspection time. The post-event impressions might or might not match in-the-moment reactions. Each introspection just after or a day after might vary from an in-the-moment appraisal, which does not make them wrong or imprecise. The post-event appraisals might employ different cognitive processes than in-the-moment reactions. Real-time and introspective cognitive processing might depend on distinct factors.

For example, in my study, Sabine’s bodily reactions during the arts experience and the post-event reflection in the questionnaire revealed a physiological and mental rejection of *Whist*. However, later she highly praised the artwork. It is unclear if Sabine's critical thinking or the influence of follow-up information

about *Whist* creators being the “famous company” (as she called them in the email to the organisers) had a more decisive role in the change. Also, some people (for example, me) need more time for deliberation or can change opinions over time, which might relate to psychology debates about various cognitive styles. This another wildly confusing concept (Bendall, Galpin, Marrow, & Cassidy, 2016) refers to “a person's typical or habitual mode of problem solving, thinking, perceiving and remembering” (Allport, 1937, in Riding & Cheema, 1991, p.194). Studies of cognitive styles might offer insights into audience experience and its assessments. Why audiences change their post-event appraisal might be another subject worth studying.

6.3.2 The optimal bodily reactions and appraisal of experience

Adding to my response to the second research question, in my case studies, the expectation of novelty and challenge made highly variable EDA and HR reactions the most fitting physiological reaction. The audiences from the VV group, whose physiology displayed such a pattern, gave the highest number of points to the quality of engagement and fulfilment of expectations. Those whose bodily reactions to *Whist* included flat or decreasing EDA assessed their quality of engagement as lower, potentially due to problems with concentration or mixed emotions. I must underline, though, that except for one person from the DV group, the participants with both EDA and HR collected highly assessed the quality of their engagement.[14] The DV individual changed her appraisal also for a positive one a few days later. VV reactions might have been optimal for both studied projects, while the FRest trend (relaxed alertness) might have been optimal for my pilot film viewing. If the flow is analysed in the context in which it happens, then the issue requiring attention would be if both trends of VV and FRest could be labelled as flow. That is because, in both VV and FRest trends, physiological reactions match the respective artwork’s mode. This issue adds to the questions about flow in arts experiences but is beyond my study’s purpose.

The pilot and principal explorations jointly revealed that there are different natures of engagement and that a higher mental workload (visible in higher HR measures) did not mean that audiences engaged more or better. Generally, audiences might understand some genres' perceptual requirements beforehand due to knowledge or learning from previous experiences (Carroll,

[14] Additionally, among other participants whose bodily data I did not collect, there were a few assessments of the quality of engagement in the “moderate” range of scores.

2003, p.85). They might also consider (even if unconsciously) the physiological state (potentially interpreted as the mood) they are in before and want to be in after the experience. When people want to be relaxed or, in general, prefer relaxed experiences, they might choose a relaxing artistic experience which would indicate a relaxed (in my study coded as FRest) state of the body. When they sought stimulation and new experiences, they would select something new and challenging that would put their body in the aroused (VV or MM) state.

Divergences from those states (e.g. FV or DV) would present some drawbacks during the engagement that might also relate to unfulfilled expectations of desired or preferred bodily and mental state. That is because the audience's assessment might (also) rely on whether one gets what one expects (even if it is subconscious). Expectations of relaxation in experiences that challenge – and conversely, that were challenging when they were to relax – could potentially cause a negative assessment of the fulfilment of expectations and divergent to expected bodily responses. That does not need to be the case, as the audience could also be in a state of investing in the future and not just immediately overspending their energy resources. They might have a high level of energy available and so be flexible to adjust to different-than-assumed circumstances. The study suggested that there is no better and worse engagement, especially due to higher or lower mental effort, but there are different trajectories of engagement. If the artistic content guides most bodily reactions, then physiological engagement might be, to a certain extent, adapting to the functions of the art.

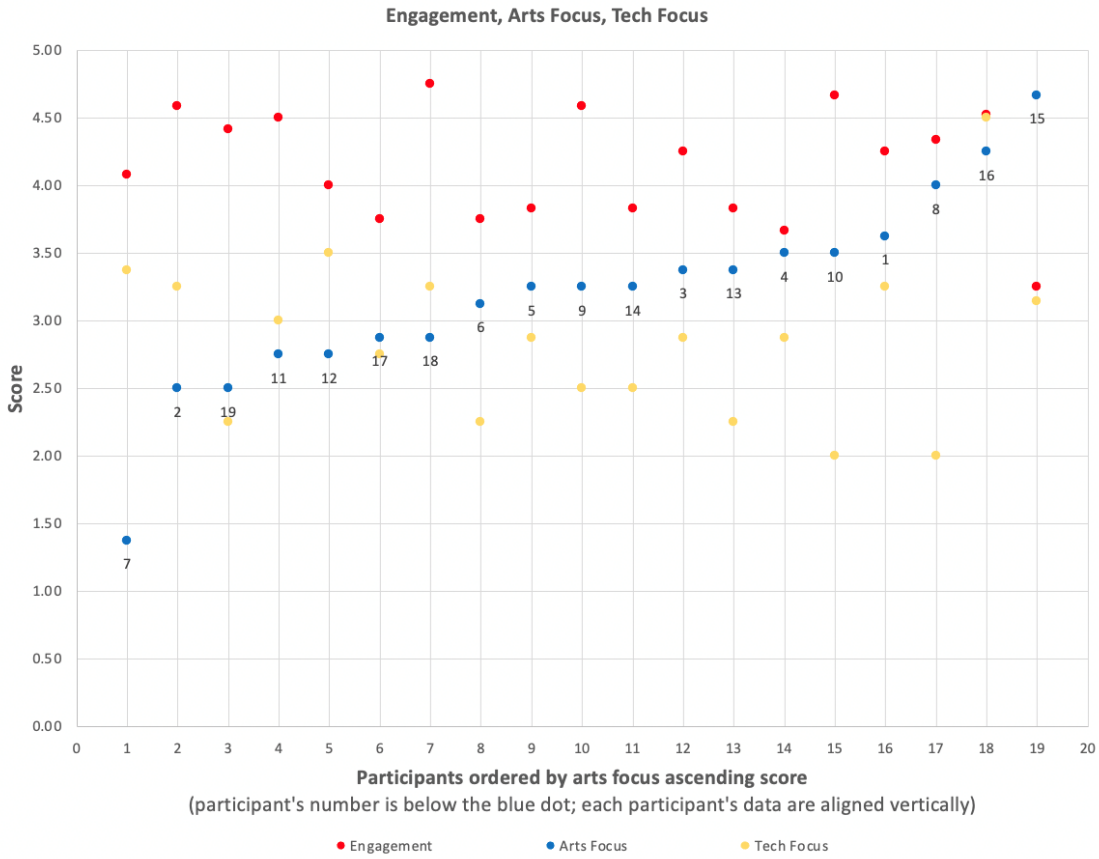
The studies of physiological engagement and issues of mental workload during the experience of arts are worthy subjects for audience art engagement studies. They might further support the thesis that the process, and not just the (prescribed) understanding of the artwork, might be the commendable outcome of the experience of engagement with art.

6.3.3 Effects of the propensity for the arts on engagement

Looking at the forty-nine pairs of fully completed questionnaires, there was no visible relation between propensity for the arts and technology and participants' assessments of engagement. The concept of personal context established thanks to the pre-experience questionnaire responses, comprised attitudes toward the arts and technology, artistic and/or technological interests, competences, skills and motivation for attendance. It included questions about previous actions – frequency of arts attendance and tech/VR usage and previous experiences with both arts and technology. Figures 6.11 (*Bristol*) and

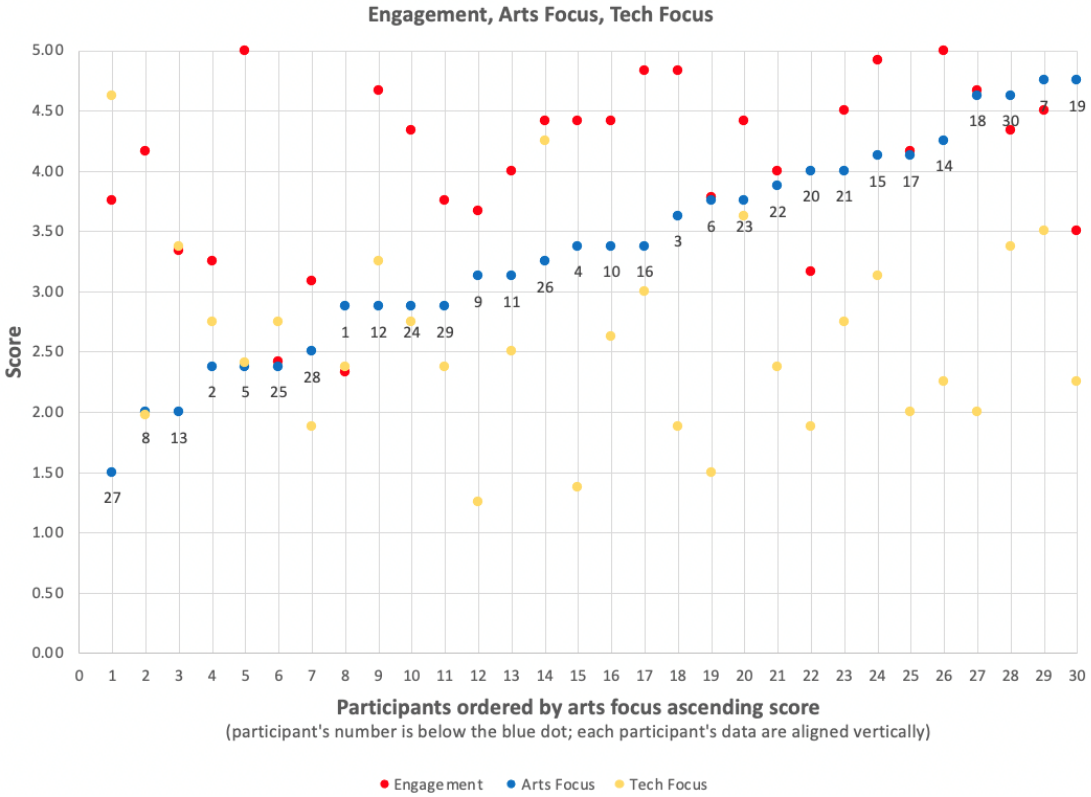
6.12 (*Whist*) indicate that participants' level of arts focus (blue dots) organised in the graph from the lowest to highest, and tech focus (yellow) did not define the level of the quality of engagement (red dots) measured with the O'Brien and Toms' scale. I represent each participant's answers with blue, red, and yellow dots aligned (for each person) vertically. Quality of engagement was high or very high regardless of the dominating pre-experience focus.

Figure 6.11 *Bristol*, visualisation of participants' scores for quality of engagement, arts focus and tech focus



The graph in Figure 6.11 demonstrates that pre-experience low arts focus did not determine low engagement. Only one participant with the highest propensity for the arts assessed the quality of engagement as moderate. A very similar trend is visible in the *Whist* graph (Figure 6.12). There were more people (seven) who assessed the quality of their engagement as moderate. However, in general, the level of engagement was higher compared to the pre-experience propensity for the arts, especially as far as people with a pre-experience low or medium arts focus were concerned.

Figure 6.12 *Whist*, visualisation of participants' scores for quality of engagement, arts focus and tech focus



In *Whist*, which was a more challenging experience (than *Bristol*), the highest scores were given by people with very high and no arts focus. For example, a very high appraisal came from Regina ("ARTS!"), who was able to interpret each segment of the experience:

> This was about Freud's psychology and self-knowledge. I really enjoyed the art, the artistic direction, the topics. I mean, I really like contemporary art. And I felt like I could interpret these scenes... I mean, I realised that there are a lot of layers, and also, I noticed that it tries to affect us as the viewers on a very personal level. So, I knew that every kind of interpretation I could come up with, every narration would be my own. Which is, well, obviously, always about the case. My personal kind of emotions and layers.

But the highest assessment of *Whist* was also given by one person with a low and six persons with a moderate arts focus. The propensity for arts or technology did not visibly influence the quality of the engagement of my case study participants.

These findings suggested that audiences do not always need to be prepared to engage with specific artwork, and lack of comprehension does not need to mean worse or less satisfactory engagement. A few other studies using different methods led to the same conclusions. Kawashima concluded that understanding might be unnecessary for artistic enjoyment (2000, p.70).

Jakesch and Leder demonstrated that moderate levels of ambiguity in modern artworks could elicit “the enjoyment of ambiguity when viewers perceive and attempt to understand” them (2009, p.7). A study of inconsistencies in narratives indicated that lack of understanding did not lead to negative emotional experience (Sukalla et al., 2015, p.7). Yet, depending on the artistic and emotional context, a lack of comprehension may lead to decelerated HR and EDA (Sukalla et al., 2015, p.7) or, like in my study, increased HR and increased or decreased EDA. Hence, the context defines the studies’ outcomes. Nevertheless, audience reflections and physiological data (in those studies) do not support understanding being the principal component of effective engagement.

These results do not contradict studies demonstrating that knowledge of meaning causes pleasure. A substantial number of studies have confirmed that the level of expertise modulates the aesthetic evaluation of art (see, e.g. Kirk et al., 2009). For example, Kirk et. al.’s research showed that “expertise modulates brain areas to both aesthetic processing and to cognitive or typological processing irrespective of aesthetic ratings” (2009, p.313). But neural activity in the brain’s pleasure centre (nucleus accumbens) “seems to record our enjoyment of objects regardless of the effects of education and background” (Chatterjee, 2014, pp.141–142). “Meaning influences even simple pleasures. Knowing the label of a Cola drink influences our enjoyment of its taste” (Chatterjee, 2014, p.182). Yet, depending on the context, drinking brown, sweet and sparkling water might bring pleasure, even when we do not know it is cola. The same applies to arts.

In my study, many participants accepted and even enjoyed their lack of comprehension, potentially experiencing it in an affective rather than interpretative way (cf. Reason, 2016, p.84). The affective reactions were visible in skin conductance responses. However, their heart rates revealed mobilisation of resources and signalled (also) other modes of cognitive engagement. *Whist* participants reported intellectual deliberations even if the majority could not interpret the content. Successful comprehension of artists’ intentions was, in their case, unnecessary for the high quality of their engagement. The reward factor could activate the brain pleasure centre and/or participants' brains might fill the gaps “actively and idiosyncratically building one’s own interpretations of environmental stimuli and events” (Ormrod, 2012, p.2728). People may find (their own) meaning in events. That suggests a need to distinguish processes from the outcomes of intellectual stimulation and accept both as signs of successful engagement.

6.3.4 Short-term impact of engagement in context

Both the pilot and case studies revealed that participants' appraisal of the artistic and/or technological aspects of the experience related to the level of their propensity for arts or technology. The relationship, however, differed from what audience studies (or heuristics – the mental shortcuts) suggested but was potentially aligned with what cognition would expect.

Neuroscience states that our brains constantly build on past, present and predictions of the future. Consequently, appraisals might rely on the memory of the participants' previous experiences; were concerned with the current event; and added expectations of future experiences. Thus, the first point of comparison was potentially different for participants with a very high and low arts focus. People with a very high propensity for the arts assessed the quality of the experience very highly only if they considered the event, compared to the previously seen artworks, as ground-breaking (for themselves, rather than generally). Lower scores do not necessarily refer to a lower value of the experience. Table 6.13 (below) and the pilot study (including my own scores given to *The War of the Worlds*) suggested that participants might have left themselves a space to assess (in the future) very highly events that (for them) were profoundly meaningful or innovative. Participants with low arts focus were more affected, as they often declared significant upgrades in their attitudes towards the artistic component of the experience. Generally, people with a lower score for specific propensity were more positively affected than those with high scores in their pre-experience dominating interests. That is because they have never (or rarely) experienced similar things, and future experiences might be hard for them to forecast. The same tendency was visible regarding the propensity for technology. Those with a high artistic but a low technological focus more positively assessed their attitude towards VR.

Table 6.13 below illustrates this phenomenon. It presents participants based on trends of their bodily responses and links them to other analysed concepts such as the pre-experience propensity for the arts or tech, post-experience appraisal of general quality of engagement, aesthetic appeal and the assessment of fulfilment of expectations. Positive changes of attitude (columns 7 and 8) and the high general engagement scores (column 9) indicated the rewarding experiences (also) of the participants with no or medium propensity for the arts. Meanwhile, people with high or very high arts focus indicated no change of attitude (sustained arts focus) or less enthusiastic assessment of the experience. After the experience, significant differences between pre-experience focus and post-experience appraisal vanished – all participants'

codes include some form of “arts” code. The same trend is visible in tables in appendix F, which includes a comparison of all participants who completed both questionnaires. Those are relevant aspects for cultural policy to consider when it seeks to find appropriate ways to evaluate, also through audience opinions, financially supported art projects.

Table 6.13 Physiological reactions, context and assessment of engagement

Name 1	Code 2	Art 3	Motivation 4	Pre-experience focus 5	Post-experience focus 6	Change re. tech 7	Change re. art 8	General quality of engagement 9	Aesthetic appeal score 10	Fulfillment expectations 11
Inez	VV	Bristol	experience VR, experience art, discover smth new	tech/ART	tech/ART	0	0	4.25	4	5
Flavia	VV	Bristol	social, discover smth new, was free	ART	TECH/ART!	+2	+1	4.67	5	5
Faye	VV	Whist	VR, discover smth new, familiarity with organisers	tech/ART	TECH!/ART	+2	0	4.5	4	5
James	VV	Whist	discover smth new, art, emotions	ART	TECH!/ART	+3	0	4	3.67	4
Simon	VV	Whist	intellectual stimulation, art, VR	TECH!/art	TECH/ART	-1	+1	4.42	4	4
Christine	VV	Whist	discover smth new, intelectual stimulation, broaden myself culturally	art	tech/art	+1	0	3.67	3.33	4
Max	MM	Bristol	VR, emotions, spiritual engagement	tech	TECH!/ART	+2	+2	4.58	3.67	4
Rose	MM	Bristol	broaden myself culturally, discover smth new, was free	tech/art	tech/ART	0	+1	3.83	4	3
Paul	MM	Whist	VR, discover smth new, social reasons	tech/art	TECH/ART!	+1	+2	4.33	4.33	3
Hanna	VRest	Bristol	VR, broaden myself culturally, familiarity with the venue	TECH!/ART!	TECH!/ ART!	0	0	4.5	4.33	5
Joseph	VRest	Bristol	discover smth new, VR, art	tech/art	tech/ART	0	+1	3.75	3.67	4
Alison	FV	Bristol	discover smth new, VR, was free	tech/ART	TECH/art	+1	-1	3.67	3	4
Tahani	FV	Whist	discover smth new, social reasons, all other responses	?	TECH!/ART	+3	+2	4.17	3.67	3
Ray	FV	Whist	discover smth new, social reasons, expose others to technology	TECH!	TECH/art	-1	+1	3.75	3	3
Sabine	DV	Whist	art, discover smth new, expose others to art	ART	tech/art	+1	-1	3.17	2.67	2
Anna	DV	Whist	VR, art, broaden myself culturally, all other responses	ART!	TECH!/ART	+3	-1	3.5	3.67	4

However, the short-term impact of any, including artistic, experience is rarely sufficient to change (especially the adult) audience’s general attitude towards the arts or technology. It is unlikely that matched or lower post-experience valuation reduced the general attitude of people with higher arts focus on the arts. Similarly, a singular good experience of people with a low propensity for the arts does not (or rarely) change them automatically into arts fans. Yet, almost all participants declared themselves not as having specific, fixed interests but as being open to new experiences or both – being open but also having specific interests. It is unclear if openness to experience (a constitutional preference for novelty and excitement) is associated with certain types of arts (e.g. VR art) or, generally, with arts attendance. Those rarely studied aspects would require closer attention from both art engagement studies and facilitation of engagement as it may indicate why people attend certain cultural activities or do not attend at all. My case study findings, in line with the work of, for example, Brown and Ratzkin, Kawashima, Reason, Tröndle and Tschacher, suggested a less judgemental approach to audiences.

My research indicated specifically stimulating the curiosity of the audience. Assessment of the event's potential for evoking situational interest and contributing to forming more enduring interests might be, at least in some cases, more beneficial for both audiences and arts organisations.

6.3.5 Emotions, cognition and immersion

The study revealed the complexity of emotions and processes of emotion regulation during the arts experiences. My own experiences during the pilot phase and Max's reaction to the prisoners' story presented in the third film of the *Bristol* programme led to the acknowledgement of complex structures and functions of emotions during the artistic experiences. Moreover, the analysis of bodily reactions during *Whist*'s emotionally loaded and controversial "table II" scene drew attention to emotion regulation. The spontaneous and highly emotional response to a stimulus can be resisted by the conscious withdrawal of attention (Kahneman, 2011, p.23). Emotion regulation can take the form of, for example, unconscious reactions of avoidant coping strategy – automatic withdrawal of attention, associated with reducing cardiac arousal in situations of brief external stressors (Grassmann et al., 2017, p.279), or a form of positive coping – automatically employed self-preserving strategy (Hofheimer & Lester, 2008, p.429). Reduced heart rates during the controversial part of *Whist* did not indicate attention to the external environment or "more attention paid to the narrative" (Sukalla et al., 2015, p.8). They indicated that the avoidant coping strategy was dominant during the "table II" scene among the *Whist* participants. Withdrawal of attention, in this case, could not mean disengagement but rather was an (engaged) act of avoiding direct engagement with the content. The appearance of mixed emotions and emotion regulation, in my study, endorsed the neuroscience stance that distinguishing emotions from cognition is impossible (for example, Richardson et al., 2020, p.7). Yet, the study also suggested that it potentially could be made if we knew the experience's context or spoke to the audience.

Previous research showed that positive motivation and affect relate to cognitive narrowing (Gable & Harmon-Jones, 2010; Threadgill & Gable, 2019). That was not visible in my participants' reports, which might be explained by the potentially different intensity of affect and the context – artistic experience being a safer environment than other real-life situations. The virtual reality headset and 360 degrees of vision enabled immersion and concentration on the artistic content minimising external distractions. Yet, it did not shut down the internal dialogues of participants stimulated by the art. That is especially evident in the

case of *Whist*. Participants referred to feelings of immersion but at the same time described conscious internal dialogues they led during the experience. Regina illustrated what was happening in her mind:

> If you knew anything about the topic you just start processing, what could it mean? And obviously, your brain starts to work as well, not just your emotions. That, oh, I think this could mean that, that maybe that's an interpretation of that. So, your brain has to work. I think, you, you definitely process that intellectually as well. How do they relate to each other? What can certain things symbolise?

Asked if she still felt immersed, she answered: “Yes. Yeah, absolutely” and if the intellectual rumination did interrupt her being there, she categorically answered: “No, no, no.”

Maria, although not familiar with Freud’s theories, similarly described her internal journey:

> To be honest, I didn't follow the story. Because for me, those were more like disjointed performances. I just saw several episodes, but I didn't link them into a story […]. I was thinking quite a lot rather than focusing on my senses. Although at the same time, it did arise, like I said, certain emotions. But I think my approach was more, a little bit more intellectual rather than sensory. I was trying to understand what the choreographer was trying to communicate with each piece. I think I was overthinking it a little bit. I was trying to understand what was being communicated in each piece. But also, what was the overarching message? Why was it so important to change the storyline depending on how the viewer was engaging with what was happening?

Mark also pointed out internal dialogues, which were (in parts) associated with other people’s potential reactions:

> I really at that point, was very glad that she [his partner] hadn't shared [the experience], because I think that would have been too disturbing for her. So, I started with some trepidation about that... And I imagined as well when I was watching what other people might think. Because I felt there was some people who might have actually stopped at that point and felt: I don't want to go any further with this.

The audience reflections showed that immersion, positive motivation (expressed by all participants), and affect did not stop participants from deep thinking. Although the participants felt immersed, their experiences could not be labelled as a “flow” experience in the classical understanding of the concept as an intrinsically rewarding state of complete focus during an activity, the state without conscious awareness of oneself and one’s surroundings and related to appropriate skills (Csíkszentmiháyi & Csíkszentmihályi, 1988; Csíkszentmihályi & Robinson, 1990; Nakamura & Csíkszentmihályi, 2009). This further suggests

that immersion and flow during the arts experience differ from immersion and flow in activities that include a task requiring hard skills. However, Nakamura and Csíkszentmihályi have seen in other authors' definitions of the flow universal contours of the flow state (Nakamura & Csíkszentmihályi, 2009, p.96). Original Csíkszentmihályi and Robinson's analysis of the flow of aesthetic experience has emerged from semi-structured interviews with museum professionals (Csíkszentmihályi & Robinson, 1990). This context has defined the study results as supporting the study's principal assumption stated in the abstract of the report "that rules and practices for looking at art exist and must be mastered if success is to ensue" (Csíkszentmihályi & Robinson, 1990). Yet, the results could have been different if the researchers had spoken not with cultural professionals but with the audience. Conceptualisations of flow by other researchers have suggested that it can have various forms, e.g. related to effortless and effortful attention (Wright, Sadlo & Stew, 2007; Romero & Calvillo-Gámez, 2014). Audience engagement studies will benefit from clearly identifying if they use immersion and flow in universal or specific academic terms. Moreover, further studies could increase understanding of flow and immersion during different (kinds of) artistic experiences.

6.3.6 Age, emotion regulation and assessment of the experience

As noted in the previous chapter, one of the participants, Faye, mentioned a discussion with her two young colleagues about their reaction to the *Whist* "table II" scene. Those participants belonged to the youngest group of 18–24-year-olds, a group which more often assessed aesthetic appeal in the low range. Those participants found the experience disturbing. One reported: "It was a bit too scary for me plus not very vegetarian friendly!" And the other: "Some of the images were disturbing and made me feel squeamish." Their low scores of aesthetic appeal and specific mentions of disturbing images of that scene being the worst of the whole experience negatively influenced their assessment of *Whist*. Still, they found the experience rewarding: "I had never experienced VR so [it was] great to experience it."

It turned out that Faye, during the interview, provided a plausible explanation of the difference between her laughing and their fearful and disturbed reactions:

> They are younger than me though. So, I do not know. Maybe I have been through more in life and find things funnier, that they might find scary because they have not been through it.

Previous research recorded a positive effect of age on emotion regulation and memories:

> positivity effect in older adults' memories seems to be due to their greater focus on emotion regulation and to be implemented by cognitive control mechanisms that enhance positive and diminish negative information. (Mather & Carstensen, 2005, p.496).

This example shows that knowledge of participants' age might explain assessments conducted by the participants. Artists should be aware of how audiences' emotion regulation impacts audience (not just children) experience positively or negatively depending on the age of participants. In the presence of content with a heavy negative emotional load, young adults generally experience more psychological distress, which also influences their overall assessment of the experience. This is a relevant matter for the studies of the experience of engagement and facilitation of involvement in art.

6.3.7 Fulfilment of expectations

After the experience, the participants assessed the level of fulfilling their expectations. As mentioned at the beginning of this chapter, the assessment of anticipation (in pre-experience questionnaires) referred (also) to expectations. In Bristol, two participants answered that the experience satisfied their expectations in a low or moderate way (due to the quality of the image). The rest of the group evaluated their expectations to be highly or very highly fulfilled. In *Whist*, two-thirds (twenty) of the participants responded that the experience highly or very highly satisfied their expectations. The rest of the group indicated low (three people) or moderate (seven people) fulfilment. All the participants answered the expectations question. However, several people during interviews commented that they did not have any expectations. For example, Ingar mentioned that "it was totally like, let's see what happens". Maria, experienced in VR, said: "I expected something similar, but it wasn't." Regina noted, "I didn't know what to expect there. I just read the short description, that they were very new. Kind of, yeah, mixing virtual reality and theatre." James explained that: "I guess in the beginning there was certainly a moment when, you know, you get a bit nervous because you really do not know what to expect." Therefore, the answer to the fulfilment of the expectation question was also intuitive. Yet, there were a few more unenthusiastic responses to the expectations fulfilment question than to the anticipation one. Generally, those comments question the usefulness of (both) the expectations fulfilment and the anticipation question.

Answering the expectations fulfilment question, all participants rated an association between pre-experience expectations, the artistic experience and its perceived quality. In such a way, they numerically estimated and defined a

relationship between their personal disposition and the creators' vision. It is unclear if the participants' minds could quickly but (also) accurately quantify such a complex relationship. Especially if most of them did not know what to expect. The final mental appraisals might be immediate but could not always omit reflection. In cognitive terms, answers to most of the questions in both surveys involved a relatively slow process. To answer some of them, the participants had to proceed through a sequence of steps (Kahneman, 2011) through the event elements to (also) provide numerical responses. Other questions were more prone to cause mental shortcuts.

6.3.8 Cognitive bias

The role of mental shortcuts in the experience of engagement with arts and its assessments deserves the attention of engagement studies. The acquiescence bias (an inclination to select a positive response regardless of the content), often associated with self-reports, was not visible in the participants' responses. I also checked if mental shortcuts – already mentioned confirmation bias, priming effect and zero price effect – might cause the differences in the assessment of the experience. I mentioned earlier that high anticipation might be associated with confirmation bias. However, people attended (mostly) due to self-growth motivation, so there was no point to come if the event was not expected to be rewarding. In the presence of a priming effect (response influenced by a previous stimulus), the expectations fulfilment answers could be affected by responses to O'Brien's scale questions. Those preceding inquiries referred to focused attention, perceived usability, aesthetic appeal, and a reward factor. However, there was no visible correspondence between the scores to O'Brien and the expectations' fulfilment responses. Also, the operation of the zero-price effect is doubtful. Even if the benefits associated with free products are (automatically and unconsciously) perceived as higher (Shampanier, Mazar & Ariely 2007), the participants did not mention the lack of expenses influencing their satisfaction from attendance. Attending a free event was among some participants' motivations but did not visibly and solemnly influence their opinions about the event. Other factors, e.g. experiencing VR for the first time – looking at the answers – were more (or sufficiently highly) rewarding. The operation of the framing effect of, for example, the advertising of *the Banbury Dance* as presenting ground-breaking projects (*Whist*) could not be controlled, as I did not ask which of the participants received (and read) an email with such a message. The post-experience talks, or new information received (looking at the example of Sabine's change of mind) could result in a framing effect influencing post-event appraisals. The acquiescence and

confirmation bias, priming, and zero price effect, however, were not detected in my analysis.

The operation of another cognitive bias, the peak-end rule (Varey & Kahneman, 1992; Kahneman, 2011), was, on the other hand, visible in my study. As explained in chapter 2, most people judge an experience based on the peak (the most intense) and final feelings of the experience. The highlight of the *Bristol* programme was the third (and at the same time the last) film. Although intense, this film was highly positive. Thus, it should have positively influenced the participants' assessments. Yet, this emotional prison story did not stop people from assessing very highly this part and giving lower scores to the entire *Bristol* experience. This was possibly because the *Bristol* programme comprised three films and the overall assessment was the sum of three ratings. Past research (Do, Rupert & Wolford, 2008, pp.97–98) has suggested that such a structure might force participants to run a quick calculation and incorporate in the final rating: the lower scores of the first two films and the high score of the third one. Do et al.'s research, even if Mah & Bernstein (2019) failed to replicate this finding, also suggested that if the peak prison story was not the last but first or the second, the overall score could have been lower.

In *Whist*, the controversial "table II" scene was the most memorable and intense, and about half of the people who judged *Whist* lower indicated this fragment as the worst moment of the experience. The other half indicated problems with VR (e.g. feeling of sickness) or shaking images (an artistic choice taken as a technical problem) as the worst thing about the event. Therefore, some participants were not fully satisfied with *Whist* due to objective reasons (expecting more from VR image quality) and some, due to artistic choices (controversial scene that influenced their physiology). Those issues decreased some people's appraisals, while other participants, despite those challenges, were fully satisfied. The peak-end rule (with the peak being an aversive stimulus) operated differently than in *Bristol* as the peak experience was not the last one: "retrospective evaluations of aversive experiences […] are often dominated by the discomfort at the worst and at the final moments of episodes" (Kahneman et al., 1993, p.401). In *Whist*'s case, the "table II" scene did not negatively impact all participants' overall assessment as it was followed by positive episodes. Yet, it negatively influenced the appraisal of the youngest (18–24 years old) group, which further supports the lack of emotion regulation skills of younger audiences. Mental shortcuts of the peak-end rule might influence the assessment of the experiences of some participants. Of course, artists should not omit challenging subjects or scenes (which may impact audiences' reviews) to satisfy administrative (e.g. requested by funders)

evaluations. The controversial scene, like the other scenes in *Whist*, was justified by adherence to Freud's theories, e.g. those about repressing memories about personally highly traumatic events (Ormrod, 2012, p.2730). Yet, the context of the artworks and the age of participants should be taken into consideration when asking the audience to assess their experience. Facilitation of audience involvement and audience development also benefit from an understanding of the impacts of the peak-end rule. Unconscious biases deserve more attention from art engagement studies.

6.3.9 Memory

Each experience contributes to the creation and re-creation of memories. This study focused on short-term processes before, during, and after an artistic event but provided insights also into the general role of memory in arts engagement. In the case of participants of VR art projects included in this research, the memories of the experience built on bodily and mental responses to art during the event and post-event reflections, both private and with the researcher. As I noted earlier, the research context created different (from other arts engagements) conditions (also) for strengthening memories. Yet, some insights bypassed this specific context and were universal. As I noticed in the literature review, a memory-influenced appraisal is of the essence as, in line with Kahneman's and the predictive coding framework, decision-making power rests on the remembering self and not the experiencing self (Kahneman, 2011). Still, memories build on experiences.

Past research has indicated that emotional events are remembered more clearly, more accurately, and longer than neutral events. Emotional memory enhancement appears to involve the integration of cognitive and emotional neural networks (Tyng et al., 2017, p.16). That suggests that the VV (positively) and DV (negatively engaging) groups should remember their *Bristol* and *Whist* experiences better than other groups. It is unclear if the memory of general feelings or the peak moments during the event influence decision-making processes about future arts attendance and which aspect better sustains arts involvement. Recollections of details fade in time (not everything moves from short-term working memory to long-term memory). Effects of the peak-end rule potentially fade between three to seven weeks after the event (Geng et al., 2013, p.234), so temporary, specific, and peak emotions matter probably less in the long run. However, it might also be probable that an overall affective feeling during and about the experience contributes more to decision-making processes about future attendance. Before science answers this dilemma, arts

institutions could experiment with paths of involvement stimulating infrequent audiences' interests (during a habit-forming period) to attend artistic endeavours every one to two months. The subject of emotions helping audiences to remember and get involved in arts more often requires further exploration of audience studies.

There is a difference between processes of memory-making that could support sustained participation in arts activities and principles of experience economy that help design memorable experiences to sell products or services better. Experience economy propositions to theme the experience, harmonise impressions with positive cues, eliminate negative cues, mix in memorabilia and engage all five senses (Pine & Gilmore, 1998) might be applicable for designing experiences with and in cultural institutions. However, creating memories during the artistic experience is a complex (and individual) mental process. That process could be supported or scaffolded but not entirely steered. Even if the idea that people seek experiences rather than actions (products or services) is still popular, none of the research participants' reasons for attendance (nor usual participation in arts events, for that matter) was to have (just) a memorable experience. In my research, memories were by-products rather than the (conscious) reasons. Yet, if the decision-making power rests on the remembering self, then enhancing and maintaining memory about artistic experiences should facilitate involvement in arts.

6.3.10 Attention, memory and interest development

This brings back the concept of attracting and sustaining attention. This concept has already been discussed by Dewey as early as 1913 in the context of theories of learning and interest development. It has also been used in museum studies (cf. Bitgood, 1988, p.162) and user experience design in HCI (cf. O'Brien, 2008; O'Brien & Toms, 2008). The strategies to catch and hold attention have usually been discussed within one project/event when "the same situation has the potential to stimulate Catch aspects and Hold aspects in different ways" (Knogler et al., 2015, p.47). In my study, both artistic projects grabbed and upheld participants' situational interests regardless of the individual's propensity for the arts or tech. Changes from pre-experience low and moderate artistic focus to, respectively, the medium and high arts assessment were positive. But they signal short-term satisfaction with the artwork rather than a permanent change in attitude towards arts. However, the catch and hold strategy could also operate in an extended timeframe when one event catches attention and creates situational interest, and a different

experience sustains it. Attitude change building on short-term situational interest to develop enduring individual interests requires more actions (e.g. Hidi & Renninger, 2006).

Interest development is a multi-stage process cultivated through experience (Krapp & Lewalter, 2001). Previous research has shown that the repeated arousal of situational interest had “a direct influence on the growth trajectory of individual interest” (Rotgans & Schmidt, 2017, p.181). In educational psychology, individual interest increased when situational interest was repeatedly reinforced by new events designed for this purpose (Rotgans & Schmidt, 2017, p.181). Repeated arousal of situational interests could also support the creation of memories related to involvement in arts.

Even if arts interest was not the main reason for my participants’ attendance and did not directly influence the quality of their engagement, the fact is that a lack of interest is designated the primary reason for non-attendance in the UK (DCMS, 2019) and Europe (Eurostat, 2021, p.20). Yet, many of my VR art projects’ participants attended out of curiosity. Each (interesting) interaction generating situational interest (Krapp, Hidi & Renninger, 1992; Renninger & Hidi, 2011; Ainley, 2017) brings a change in the strength of the more enduring individual interest (Ainley, 2017, p.5). If memory impacts decision-making and is strengthened by emotions and learning, then impressions from (past) artistic experiences could be refreshed and reinforced by successive affective arts experiences. Facilitation of not one-off involvement but paths of engagement with art might be paramount for audience development. Interest theory adopts a person-in-context perspective (Knogler et al., 2015). Audience studies and facilitation of audience involvement with arts could benefit from a similar outlook. An ethical approach to cultivating curiosity and interest seems promising for sustained participation in the arts, thus, also for studies of audience engagement.

6.4 Adaptive engagement

The literature review has suggested that the experience of engagement is adaptive. But the analysis of collected reflexive and reflective data has revealed how salient adaptivity is during the arts engagement. Our body and the brain are permanently active, affect always shapes our visual experience, emotions and cognition interrelate, and fast/automatic and slow/controlled mental mechanisms interact. “Staying alive […] requires that the states of a system behave in ways that counter the dissipative effects of random fluctuations” (Sims, 2020, p.71). Sims is referring here to internal resources/energy use

optimisation and the free-energy principle of Friston (Friston, 2009). Human (brain) ability of adaptivity has been recognised (e.g. by Davidson et al., 2000; Critchley, 2002). Robert and Hockey have reasoned that energetic resources are not only stimulus-driven and "may be allocated and controlled and subject to strategic resource-management decisions" (Robert & Hockey, 1997, p.75). The signs of adaptation have been seen in, for example, human synchrony (e.g. Koole & Tschacher, 2016). Some researchers have dealt with self-regulation and self-regulated learning, which are both adaptive (Winne, 2011). Others have considered memory and episodic memory (e.g. Dunsmoor et al., 2015) and "prioritized processing of emotional information" (Padmala, Sambuco & Pessoa, 2019) as adaptive. Gigerenzer and Brighton have argued that human nature is based on an adaptive toolbox of heuristics rather than on traits, attitudes and preferences (2009, pp.134–135). Yet, currently, there is more attention to machines adapting to user behaviour (e.g. in museums – Keil et al., 2013) than human adaptation. My research has covered both aspects of adaptability. The algorithm tracked each person's gaze during the VR experience of *Whist*, adapting the arts experience to this behaviour, while the participants' bodies and minds were permanently adapting to the artistic contents.

The adaptation relies on the artistic content directed by the artists. The law or principle of initial values (recognised in physiology studies), and framing and priming effects (studied in psychology), declare that the previous stimuli influence the reaction to and experience of the following content. Thus, pre-event educational activities change/frame the response during arts events as much as each moment of the artistic event frames the experience of the next moment. Therefore, physiological engagement (in this study visible in HR and EDA modifications) adapts to the functions and varying complexities of the artwork. Most bodies relax while experiencing tranquil scenes or display arousal where the artist builds suspense. Emotion regulation is also a sign of adaptability of reactions during the experience. Physiology often explains the decreased heart rate by an attention to the external environment. This attention cannot be inferior in the arts experience to internal processing visible in increased HR – "[a]rousal cannot, by itself, be an explanation of the pleasure derived from art stimuli" (Mastandrea, 2013, p.509). In the same or different artistic events, the scale of engagement state may vary from relaxed alertness fused with attention to external stimuli to high arousal that also involves some attention. The first may display lower and the latter higher physiological measures and changes. Thus, there may be a variety of combinations between relaxed and aroused states. Arousal and internal processing cannot occur

without some attention to stimuli. Like cognition and emotions, they are interrelated. It means that there may be (different) physiological manifestations of the fluid state of experience of engagement directed by the artists.

Personal perspectives are also permanently adapting. According to the neuroscience and predictive processing framework, our brains constantly build on past, present, and predictions of the future. Thus, as experiences evolve in the present, the memory of the past permanently changes and expands during the event. For example, when an audience steps into virtual reality for the first time, their arousal is (most of the time) high. But after a few minutes, virtual environments stop being novel (if there are no challenging usability issues). The audience learns, adapts, and habituates to this – formerly new – situation. The past conditions are now different, so the present and forecasts of the future are also modified (pre-event talks change experience in the same way). The memory and expectations of future developments are permanently updated while the story unfolds (Zwaan, Langston, & Graesser, 1995). This is the case also when the audience accepts the enigmatic artistic content (what *Whist* participants reported). Physiology documents those processes in real time. My participants' testimonies show that audience introspections can also mark significant transformations. The post-event perspectives (on the past, present, and future) have to differ from those before the event and those evolving during it. I argue that there is no contradiction between physiological reactions and post-experience recollections, as there is a difference between personal (mental) context before, during, and after the event. Consequently, every audience appraisal (and expectations of future experiences) may evolve in time and adapt to new information, a deeper reflection, or post-event discussions.

External circumstances of social interactions also cause adaptation during the experience of engagement. Social interactions may have different causes and timeframes. They may positively or negatively influence the initial state (*Bristol*), entire or parts of the experience (interaction of sisters during *The War of the Worlds*). People might also adapt their opinions due to the co-participant's views (for example, through consultation while completing questionnaires) or discover new aspects due to the researcher's questions (during the interview). Those situations are usually perceived as harmful to the study results. However, if adaptability is inherent to human experience, and also of art, then those aspects are not threats to validity but causes and reasons that should not be avoided but studied. Social interaction and adaptation to co-participants actions have already been studied in relation to, e.g. *kinesthetic empathy* across creative practices (Reynolds & Reason, 2012), dancers-audience synchrony (Vicary, Sperling, Von Zimmermann, Richardson, & Orgs, 2017),

changes in the social context influencing both gaze and memory processes (Richardson et al., 2012), interaction with museum exhibits (Clarke & Hornecker, 2013), serious games and virtual environments in museums (Apostolellis, Bowman, & Chmiel, 2018), and experiences of virtual reality (Bailenson et al., 2005; Schroeder, 2011). Audience studies already examine adaptation to, or influence of, the social context during the engagement.

The term *adaptive* is more appropriate to describe engagement with arts than, for example, *fluid* or *dynamic*, as it explicitly suggests that engagement processes are not random but have causes, reasons, and some boundaries. Adaptation is a form of learning, yet it may encompass all its forms. Audience engagement can build on formal education (professional training), informal facilitation (e.g. pre- or post-event talks), and non-formal learning – knowledge from experience and exposure (Visch, Tan, & Saakes, 2015). Adaptative engagement, as a concept, may also embrace multivariant co-relations between internal processes of, for example, emotions and cognition, understanding and pleasure, external attention and internal processing. None of these processes can be experienced in an either/or way. Previous studies of human adaptivity already offer some answers and suggest further research questions. What is important is the term *adaptive* is not ethically controversial. Adaptive engagement is a voluminous but suggestive and bounded concept.

The study supports earlier theories that artworks shape the audience's experience. The adaptation of internal processes is most visible in audience physiology during experiences with highly varying stories and those with external distractions limited by virtual reality headsets. The study also shows that engagement is susceptible to cognitive bias (consciously or unconsciously) placed in the experience design and adapts to circadian rhythms (part of the day an event takes place). In my study, adaptation was also visible in the personal reflections of the participants. On the other hand, adaptation to the social context may introduce irregularity in the adaptation to the artistic experience. The experience of engagement is, thus, a function of the audience adapting to the experience of specific arts content in specific social and presentational circumstances.

Chapter 7
Conclusion in context

This thesis has explored the theory and processes of audience engagement with arts to advance arts engagement studies within the field of audience studies and more effectively link them to audience engagement practice. I distinguish the audience's experience of engagement during the artistic event from the acts of facilitation of audience involvement by the arts sector. Such an approach offers conceptual clarity for academia and arts professionals. The study expands the understanding of audience engagement, suggests new research questions, and proposes novel ways of researching audience engagement with the arts. The research design, findings, and implications may appeal to interdisciplinary humanities and natural sciences researchers, for example, those using similar tools or looking at the complexity of bodily engagement processes.

The chapter recapitulates the key study findings and arguments and supplements the answers to research questions already provided in the previous chapter. It outlines contributions to arts audience studies and the practice of the arts. Moreover, I suggest future directions for research on the physiology of arts engagement. I reflect on the challenges of my exploratory and explanatory research design crossing academic disciplines' boundaries and will end the chapter with aspirations for my future studies. To avoid recurrences, I will address my – repeated below – research questions throughout this chapter.

1. What can bodily data collected through biometric devices tell us about the audience's physiological engagement with the arts?
   a/ What similarities and differences can be observed in bodily responses in different modes of engagement in the technology-augmented arts projects?
   b/ What similarities and differences can be observed in the engagement trajectories of audiences having different and similar profiles and motivations?
2. What can the relationship between the audience's personal context, dynamics of bodily engagement, and post hoc cognitive reflection reveal about the audience's experience of (VR) art?
3. In what ways might a deeper understanding of the audience experience of engagement with arts support evolving theories and practices related to audience development and audience engagement?

7.1 Main findings in relation to research questions

The response to my first two research questions can be summarised as follows:

- The level of participants' agency in different modes of engagement – the directed and semi-directed experiences – did not distinctively influence their bodily reactions or the assessment of the quality of the engagement.
- The personal context of the participants in this study influenced their experience, but differently than was expected. Trends in bodily engagement and the assessment of the quality of the engagement did not depend on participants' propensity for the arts. It does not mean that audience knowledge and past experiences do not influence the internal processes; they do. Yet, neuroscience argues that human minds automatically close the (e.g. knowledge or attention) gaps (Feinberg & Mallatt, 2016, p.123) by, for example, perceptual filling (Koenderink, van Doorn & Wagemans, 2012), and that different regions of the brain are activated by expertise and pleasure (Kirk et al., 2009; Chatterjee, 2014, pp.141–142). Audiences can always derive (some) meaning, and the quality of, and pleasure from, their experience does not (only) depend on their expertise.
- The VR artworks constantly shaped participants' cognitive, affective and bodily responses. They harmonised the experiences of different people, as this study demonstrated that people with varying liabilities could have similar experiences of engagement. Commonalities, however, were caused not only by artistic visions but also by the fact that some human reactions are universal (e.g. use of cognitive bias), while others are uniquely individual. An artistic experience's time-bound dynamics and structures guided temporal transformations in engagements, while individual differences and contexts generated most variations in reactions.

If the experience of engagement depends on the participants' liabilities, so their broad predispositions to engage, then this research on VR art revealed that openness to experience might be a more dominant liability than the high propensity for the arts. People visiting museums have also been found more open to experience (Mastandrea, Bartoli & Bove, 2009) and other cultures, lifestyles, or races compared to non-visitors (DiMaggio, 1996). Yet, the liabilities are not fixed states as they may or may not be activated. This aspect is somewhat less acknowledged by marketing psychographic segmentations.

Before the experience, my participants' liabilities were triggered by more than one causal mechanism (for example, receiving information about the opportunity to experience VR and having time and energy to come). The experience itself depended on a different set of contingent conditions and their configuration. During the event, the openness to experience might support enduring situational interest ignited and sustained by, e.g. the VR artwork. However, other artistic events may (also) require or stimulate other or different liabilities of the participants. In my study, the arts and VR stimuli, no matter the audience's propensity for the arts, guided their dynamics of meaning-making, curiosity, and situational interest during the experience.

Thus, the study does not support the theories that a higher level of agency and arts affinity impact the experience of arts engagement. Increased agency positively impacts learning (e.g. Ormrod, 2012 p. 2729), while agency in the arts (especially in the artworks not involving interaction) is a more complicated subject. Also, the outcomes of my analysis contradict theories of psychologists working on processing fluency and most audience scholars who agree that the lack of capacity of perceivers negatively influences the quality of their aesthetic response. My study did not support the statements (Reber, Schwarz & Winkielman, 2004; Boorsma, Conner, Heim, Hodgson, O'Toole et al., in Walmsley, 2019) that the more educated or prepared individuals, the more positive aesthetic response they have. Connecting the quality of the artistic experience to audience knowledge and "preparation" justifies institutional missions to educate the audience. A recent study in the UK clearly showed that audiences feel capable to engage with arts and do not want to be "developed" (Pitts & Price, 2019, p.19), while concentration on educating audiences might also have a role in the still dominant conviction that lack of audiences' competences restrains participation in the arts. However, my study showed (in line with previous research mentioned already) that intellectual meaning-making is not (always) necessary for, or the cause of, the high quality of engagement with arts. My study, like Tröndle and Tschacher's (2016) research of the spatial behaviour in the museum, strongly indicates that arts affinity does not predict participant engagement and (in my research) only moderately forecasted their physiological reactions. That is a significant alignment, as those studies have used different methods for data analysis: mine uses humanities-driven narrative and Tröndle and Tschacher's uses statistics. The functions of arts affinity (or propensity) and audience agency (in diverse contexts) deserve closer attention from empirical audience studies.

On the other hand, my findings are in tune with psychological research dedicated to the development of interests. Those studies confirmed that

situational interest has been “truly generated by situational factors as they were virtually unrelated to [past and enduring] individual interest in the topic” (Knogler et al., 2015, p.46). My study involving virtual reality had a high potential to raise situational interest before attendance and not depend on participants’ pre-experience specific interests. Moreover, both VR art projects continued arousing situational interest, even when virtual reality lost its novelty appeal. Physiological reactions during and positive appraisals after the events confirmed that. Actions invoking and sustaining situational interest might be the clue to increased audience engagement with the arts. The psychology of interest (e.g. Silvia, 2008), but also film and museum studies, offer relevant insights into different sub-fields of audience studies and audience development practice.

7.2 Contribution to arts audience studies

This thesis makes an ample original contribution to existing knowledge and methodologies in studies of audience engagement. A new understanding of audience engagement with arts can stimulate progress in audience studies in multiple ways. For arts audience scholars, this research provides a more nuanced way of looking at the interconnected processes of human psychological and physiological engagement with arts, positioning them firmly in further studies of arts engagement. The significance of this research to the study of audience arts engagement lies in several issues.

7.2.1 Building a foundation for arts engagement studies

The research’s multi-dimensional and human-centred understanding of arts engagement contributes to the crystallisation of empirical arts engagement studies and their development of interest approach path. The PhD clarifies engagement-related concepts and indicates those requiring re-definition. The main amendment proposed is the differentiation between audience development (broadening and diversifying audience groups) and audience engagement (developing interests in the arts) and, subsequently, recognition that audience engagement combines audience experience of engagement and facilitation of audience involvement with arts. This builds a foundation for a more purposeful cumulation of knowledge in audience studies and their clearer subdivision according to aims rather than actions or methods.

The research demonstrates the advantages of the transdisciplinary approach in audience engagement studies. It supports the statement by Bruce McConachie that science knows enough to rule out some issues, introduce others, and

provide “some scientific confirmation for common sense” in audience studies (McConachie, 2008, p.8). The research outcomes endorse some but question many previous audience studies’ findings and existing theories. That is not surprising. Audience studies over-rely on theoretical interpretations, while my empirical analysis links together aspects previously explored independently and in different contexts. Also, as demonstrated in the previous chapter, my exploration supports some but questions other cognitive neuroscience experiments’ results. I can explain this by the difference in the contexts and research methodologies. I studied longer experiences in a real-life situation and compared individual and specific rather than averaged data. The audience studies benefit from the knowledge of neuroscientific explorations. Yet, the neuroscientific studies of audience engagement with arts also benefit from the apprehension of findings and theories in humanities audience studies. The study confirms the value of research that does not compartmentalise science but combines insights from various academic domains, recognising their different contexts.

The study demonstrates that studying audiences’ artistic experiences in the context of the causal mechanisms and conditions in which they operate, the impact of audience agency, positive and negative consequences of heuristics, and circumstances restricting engagement are worthy themes for further research. The analysis suggests attention to the short- or long-term spans of arts engagement, its interrelations, and its contexts. Such empirical arts engagement studies can contribute to arts professionals’ missions to develop public interest in the arts.

7.2.2 Offering a new methodological framework

The proposed research design demonstrates that audience experience of engagement and analysis of its dynamic processes are not intractable problems. I created a new methodological approach building on critical realism and combining qualitative and quantitative methods into one qualitative analysis. The study integrates biometric and digital tools – for data collection and analysis – into humanities audience studies. It also demonstrates that integrated quantitative and qualitative data related to the experience of the same artwork offer the opportunity to identify the actual processes in action in specific artistic cases and the contextual influences on these. Thus, the thesis addresses, evidenced by the Centre for Cultural Value (Dowlen, 2020), a gap in rigorous mixed methods research that can offer convincing evidence of the impact of culture on, for example, well-being.

My research design incorporates within-person and between-person comparisons rarely used jointly in the same study. My own and a small group of people's pilot experiences heralded the same aspects as my primary study. Thus, not just the sample size but also methods integrating quantitative and qualitative data offer pertinent insights. In a qualitative study, within-person comparison (of the participant's before-after state or attitude) has been considered more credible as assessment criteria vary widely across people (Cutting, 2021, p.318). Yet, between-person exploration in purposefully assembled clusters of participants builds an understanding of general engagement processes. The study demonstrates that joint analysis of the individual and collective experience of the same artwork is advantageous.

My research design fits very well with the seven principles voiced in a recent call for integrative and interdisciplinary aesthetics research (Tröndle et al., 2022). The principles of ecological validity (study in real-life context), use of unobtrusive and inclusive measurements, treating cognition as embodied, integrating qualitative and quantitative data, merging art and science, and considering all relevant scientific perspectives have already been implemented in my research. Moreover, the study confirms that the use of virtual reality (diminishing external distractions during the experience) for studies of audience engagement with arts (especially the ones including bodily data) increases the validity/credibility of the research. The analyses of specific audience experiences of arts engagement in real-life contexts through available scientific knowledge authorise credible generalisations about the engagement phenomenon. The timely research design enables the transferability of the methods to other arts engagement studies. The research demonstrates that a holistic, multidisciplinary, humanities-driven empirical research design is feasible, effective, and replicable.

7.2.3 Advancing analysis of physiology during arts experiences

The research demonstrates that exploration of audience physiological reactions in a real-life context and individualised (and qualitised) analysis bring valuable insights not only to audience studies but also studies of psychophysiology and neuroscience. Importantly for future studies, my data analysis, like in the Rouselle, Blascovich & Kelsey study in 1995 (Andreassi, 2000) and recent “eMotion - mapping museum experience” research (Tröndle, 2014), shows that (in this study – light) movement did not block or overpower other reactions of the body. Thus, research on physiological responses during real-life arts experiences involving movement can bring satisfactory results. Moreover, the

law of initial values, priming and framing effects indicate that studies of isolated reactions to stimuli have limited value for arts engagement studies. Examinations of longer experiences are more valuable.

The research suggests a few topics for further research that may stimulate physiological studies of arts engagement. First, the research analyses emphasise the operations of different modes of EDA and HR coappearance and variants of parasympathetic and sympathetic activations during arts experiences. Only a few studies have discussed the dissociation between response systems. Yet,

> if a stimulus can produce an increase in electrodermal responding and a simultaneous decline in HR, it makes little sense to ask whether the stimulus produced an increase or a decrease in autonomic responding. (Winton, Putnam & Krauss, 1984, p.213).

My study echoes those conclusions. Second, the analysis shows that experience of engagement with (not only VR) arts might offer satisfactory conditions to study variants of physiological arousal. Third, the outliers may effectively expose (like in my study) particularities of engagement that uncover more general aspects of the phenomenon. Fourth, the study suggests looking at physiological indications of disengagement. Fifth, our minds sometimes need to take a rest and at other times benefit from stimulation. Knowing if and to what extent general tendencies of human physiology (unconsciously) impact the selection of artistic experiences to help balance, maintain or invest in satisfactory levels of the body energy budget may be beneficial for health and well-being research. Studies of these topics may advance the knowledge of human physiology during arts experiences and support the studies and facilitation of audience engagement and development.

7.2.4 Endorsing an audience-friendly approach in audience studies

My research suggests that audiences are the best source of information about their artistic experiences. But the extensive literature review revealed a general lack of confidence in audience reflections among researchers. The statements about a biased audience are often quoted but rarely reviewed. Yet, heuristics is not necessarily negative – a “biased mind can handle uncertainty more efficiently and robustly than an unbiased mind relying on more resource-intensive and general-purpose processing strategies” (Gigerenzer & Brighton, 2009, p.107). My study indicated that the empirical understanding of individual and audience (a temporary group of people unified by the same art event) experience, which incorporates audience reflections, supports general comprehension of experiences with arts. The PhD outcomes suggest

reopening the debate (e.g. Reason, 2010) about whether and in which circumstances audience opinions can be valuable.

The neuroscience theories mentioned in the literature review have already implied that analysis of data collected in real time and introspective time cannot lead to identical conclusions. As Heraclitus declared and neuroscience agreed, people cannot step twice in the same river, as this is not the same river, and people do not remain the same. Physiological data collected in real time display engagement in progress, while (the majority of) artists direct the processes, totality, or conclusions of the artistic experience. Although the experience of arts unfolds in real time, it can be appraised, as a whole, only in introspective time. The interpretation of physiological measures without the audience's introspection is limited. Post-experience reflection deals with the total, which is not the simple aggregation of individual moments visible in bodily data collected in real time. During the interviews, participants reflected on entire assimilated experiences. Physiological data cannot offer that. The audience introspections include salient – for a specific person – features of an experience. Those, unprobed by the researchers, can be interpreted as data errors. Insights integrating real-time and introspection-time measures offer a more comprehensive understanding of the engagement phenomenon.

My study indicates that an audience-friendly research design shall acknowledge the context and adaptability of engagement processes. Thus, the time of the study defines and differentiates its results. Audience-friendly research should not over-rely on averaged data and include insights from participants' reflections. Those aspects suggest that in explorations of audience experience of engagement, both the objective data and the audiences' post-event reflections require not just caution but also attention.

7.3 Reflections on methodology and methods

Methodologically, the development of the multilevel exploratory-explanatory approach integrating qualitative and quantitative data into one analytic narrative framework is unique (not only) in audience studies. Therefore, I encountered both resistance and support from qualitative and quantitative academic communities and the arts sector. I have heard many "yes, you can do it" and "no, you cannot do that" from those communities, and both reactions contributed to the unique path I took. I have understood that none of those methodological perspectives alone could solve the problems I considered paramount. I learned basic statistics and programming to better understand relevant studies from natural sciences. I have learned a lot about

methodologies and methods, which enabled me to decide that most of them could not help me achieve my aims. For example, statistics, acceptable for colleagues from neuroscience, would make my study inaccessible to most humanities researchers and the arts sector. Those target groups were, however, principal for the impact of my work. But then again, accurate (but accessibly presented) interpretation of the natural science knowledge was essential. Finding the right balance between the expectations of both scientific communities was the most demanding task. The study builds bridges but may be an easy target for an attack from both sides of academia. Yet, it may appeal to a growing number of interdisciplinary scholars who can also judge the contexts and connections between different fields of knowledge.

The methodology, although successful, was not without its limitations. It had an ambitious scope for a study done by a single researcher, and there were limits to what I could do alone. In some of my programming challenges, i.e., the development of a graphic user interface and the physiological data cleaning, I got the support of specialists. The fact that I had multiple functions to carry out during data collection in a fast-paced real-life setting created a challenge. That is why I could not timestamp the start of *Whist* for my participants. I also did not think of video recording the sessions, which could have supported my (for example, movement) analysis later. But this might have distorted the general experience of the audience, who could have felt watched. Therefore, I do not consider it a limitation. Some problems, for example, with unavailable Empatica equipment, were solved during the process. But new equipment caused new challenges. For instance, it revealed a need to develop a bespoke analysis tool which required additional time. I experimented with the methodological framework, solving problems along the way. I, therefore, consider the results satisfactory and sufficiently credible. My methodical rigour diminished the elusive guesswork, even if I discussed causes and effects, which are often multivariant. My extensive professional experience in several fields, including artistic and organisational practice, allowed me to avoid potential pitfalls. The additional pilot studies of my arts experiences have enabled me to draw on my reflexive and reflective processes and understand better what to expect from the analysis of other people's experiences. The research design is replicable but obtaining costly equipment and not straightforward data processing might require considerable resources, programming support, and careful (time) planning. Thus, the research design is more suitable for scholarly than applied research.

Critical realism supports the comparisons and transferability of my study. It sustains my multi-dimensional critical outlook on procedures and research

outcomes. The analysis of internal processes of engagement revealed difficulties with constructs such as anticipation, expectations, immersion, and flow. Equivocation (an informal fallacy resulting from using a particular word/expression in multiple senses within an argument) still prevails in audience studies. Thus, I always avoid conceptual ambiguity and explain how I understand the concepts. This supports the transferability of my research. The protocol of my multilevel exploratory-explanatory study integrating qualitative and quantitative data will be freely available through the Octopus portal. This makes my research open, transparent, and ready to be endorsed or declined – the practice that current audience studies lack. My research will become, thus, a benchmark study.

After the data analysis, I understood that my questionnaires needed some modifications. There were problems with some questions rather than the answers. For example, inquiries with pre-defined answers about what grabbed the participant's attention the most (the structure or the story; the technology or arts) were too broad to generate practical insights. Moreover, I collected demographic information about the participants to build detailed audience profiles and enable a more accurate comparison with the results of other studies and existing segmentation models. But, except for age and gender, demographic information may have no function in the study of the experience of (VR) art. The participants' age influenced the assessment of the event due to variants in emotion regulation – negatively for the younger and positively for older audiences. Both arts projects with technological aspects attracted more women than men (in *Whist* the proportion was twenty-two females to eight males, and in *Bristol* twelve to seven). That is inconsistent with the UK's *Taking Part* survey results, which report a smaller gap in attendance between women and men (the third option there, "another", generates too few records to be considered). The high proportion of female participants in my VR art projects indicates a demand for less gender-specific content in VR (still male dominated). Bodily data analysis (of a balanced representation of both genders) did not reveal gender-specific differences in physiological reactions. That suggests that the inclusion of questions about gender is only relevant for some kinds of research questions. Artistic content is rarely gender specific, so gender neutrality can be kept in audience engagement studies. Also, the level of education has little value in understanding the experience of arts engagement. Therefore, I will modify my questionnaires to avoid in replication studies the inquiries that lead to heuristics (of the researcher or the participants).

7.3.1 Usefulness of physiological methods for engagement studies

The research confirmed that biometric tools provide valuable insights into the engagement processes even in real-life circumstances. The heart rates collected through the Garmin smartwatch displayed variation but mostly during very diverse actions in *The War of the Worlds* pilot experience. Otherwise, it did not differentiate between arousals in different parts of my principal artworks except for the controversial scene in *Whist*. Generally, the heart rates indicate if arousal moves above the average rest state level. Yet, the previous stimuli and circadian rhythms (time of the day) influence heart behaviours. Thus, the interpretation or comparison of different HR data sets is problematic in most contexts.

Regardless of some problems, the study with two professional Research Grade Wearables collecting heart rates, the electrodermal activity of the skin, and movement brought the most valuable results. Empatica is the easiest to use, and the company offers its clients access to the bespoke platform for data visualisation. The Ring, designed for lab use, is more accurate in seated experiences. As the sensors lay on the fingers, the movement more often causes disconnection and breaks in the recording. Moreover, data visualisation was not provided, which made this device more challenging to use in a non-specialist context. Even if EDA alone provides some insights for studies of audiences' bodily reactions, joint research of HR and EDA during the experience of art engagement has the most potential. However, this direction requires further investigation, in the first place, in the field of physiology.

The neuroscience's stance that our brains and bodies are always active questions the notion of universal disengagement. Thus, the interpretation of the EDA trends depends on the context and the definitions of engagement and disengagement. My study suggests that three directions of tonic EDA measures may logically indicate if valence – the affective characteristic of arousal – is positive, neutral, or negative. Increasing tonic EDA can signal positive emotional engagement; flatter, close to the baseline EDA – a more neutral/cold attitude; and the decreasing skin conductance level – potentially affective engagement with a negative valence or a lack of participant concentration. In some circumstances, disengagement may be understood as a more neutral (reserved or removed) state displayed in flat EDA; in others, decreasing EDA may suggest more negative reactions. The latter can be (also) seen as an engagement but with a negative appraisal. In physiology, words of *increase* and *decrease* would describe EDA trends in different directions. In audience studies, this terminology may suggest increasing or decreasing

engagement, which – through heuristics – can easily be interpreted as better and worse, higher, or lower engagement. But most artists do not aim for audience hyperstimulation and design varying psychological and physiological reactions. Thus, a high level of arousal, EDA, or mental processing alone, without context, should not be considered the equivalent of better engagement.

The interpretation of the physiological reactions needs to build on two contexts: the artwork and the insights from the participants. Bodily arousal may not change if the cognitive-emotional load of the adjacent scenes does not significantly vary. But the arousal appraisal (called valence) may change, which cannot be deducted just from physiological reactions. Also, it is hard to imagine the evaluation of physiological engagement during an artistic event guided by purely quantitative measures. The heart rate and EDA baseline levels are hard to obtain in a real-life context. Without baseline data and statistical analysis, the engagement levels of different participants cannot be compared. Establishing credible and universal quantitative benchmarks for better and worse audience engagement seems unattainable. Thus, diagrams visualising trends of physiological engagement may be more suitable for audience studies and arts practice than discrete values of the thresholds 2, 10, or 50% higher. The shapes and data trends aligned with the artwork's affective rhythm (which is not just arousing) and audiences' reflections are appropriate for studies of real-life artistic experiences. My study demonstrates that the lack of statistical analysis is not a limitation. The qualitative approach to physiology analysis also brings satisfactory results and suggests new research topics.

The exploration through the mixed-method design that integrates quantitative and qualitative methods offers the most comprehensive insights into the engagement. The trends of HR and EDA activations suggest that if we have bodily data and an understanding of the artwork, we can infer some aspects of internal engagement of people even if they do not provide full cognitive feedback. But this data does not provide insights into the causes and meaning of the experience for an individual. Without the knowledge of the contexts – artistic and personal – neuroscience cannot fully interpret the bodily experience and distinguish better from worse engagement. Participants’ reflection supports an interpretation of the physiological data indicating positive or negative reactions and the causes of specific changes. Post-event questionnaires, but most-of-all, semi-structured interviews a few days later, support a deeper understanding of individual engagement processes. The occasional incompatibility of audience physiological reactions and their post-event reflections may be caused by different issues related to the interpretation of quantitative and qualitative data and the time of data collection. As far as

qualitative data is concerned, differences may relate to a varying understanding of the concepts by the researchers and the audience, or imprecise questions rather than inaccurate answers. The study confirms the usefulness of the simultaneous gathering of several physiological measures and the value of mixed-method research for arts engagement studies.

7.4 Implications of the findings for the practice of the arts

The ambition of this research has been to highlight the audience experience of engagement for the arts sector and the cultural policy. The previous chapter offered most of the implications of my research findings, extensively responding to my third research question: In what ways might a deeper understanding of the audience experience of engagement with arts support evolving theories and practices related to audience development and audience engagement? Here, I add a bird's-eye view perspective and reflect on the challenges for the impact of my findings outside of academia.

The engagement definitions cited in the literature review are valid. Yet, I can now slightly specify the definition I conceptualised in the introduction. The audience experience of engagement is a mix of affect-guided bodily and reflective processes during the event. Those processes are adaptable to a particular artwork in the context of the audience's motivation for attendance and the social context of the specific event. Such a definition underlines aspects of the (momentary) engagement with the artwork that my research considered most influential. This description highlights aspects of the experience of arts engagement that institutions can (or cannot) influence. It also guides their searches for specific insights in academic audience studies.

My research suggests that general trends in physiological engagement trajectories and focus on causal mechanisms may provide valuable insights into experiences of engagement studied in an applied research context. Such a perspective is advantageous not only for arts audience studies. If an arts organisation wants to produce the desired outcome, it needs to understand its generative mechanisms and create conditions that help cause those effects. That is not a novelty for most the artists and audience development practitioners. My research indicates that, to facilitate engagement, we do not need to know much about the personal context of the audience members. It is equally important to acknowledge their causal powers and liabilities and link them with an experience's causative circumstances. In my research, the capacity of the audience members, also in their view, did not negatively influence the quality of their engagement with arts. Therefore, my research

supports Tröndle and Tschacher's suggestion to treat arts institutions "less as an apparatus of distinction and a place of exclusivity, but more as a site of equal aesthetic experience" (2016, p.99). One could argue that the novelty factor of VR art in my study could cancel out the affinity factor. Yet, Tröndle and Tschacher's conclusion came from museum studies, which suggests that this may be a universal principle. That finding may help bypass the ethically problematic discussions about human quality and agency and support more audience-friendly approaches to studying and facilitating arts experiences. The challenge remains to find how to connect an audience-friendly attitude and a mixed-method approach to dominant numbers-oriented audience development or engagement practices.

My approach and the findings are incompatible with the UK's current mainstream policies and actions to support them due to their understanding of audience engagement as a combination of attendance and participation (e.g. DCMS, 2019). *Taking Part*, a household survey in England conducted by the Department for Digital, Culture, Media & Sport (DCMS, 2019), focuses on socio-demographic factors and frequency of attendance, aspects that arts organisations have little influence over. Arts Council England's (ACE) recent strategic document *Let's Create* prioritises support for high-quality cultural experiences and creativity, understood as the process of making, producing, or participating in "culture". "Culture" means here ACE-supported institutions (Arts Council England, 2020, p.12). Also, information collected in my surveys would not allow me to match my participants with audience profiles in existing segmentation tools, e.g. the Audience Spectrum by the Audience Agency, presenting "patterns of engagement", but mainly patterns of attendance (The Audience Agency, 2022). Changing just (or mostly) the label from attendance to engagement, marketing to audience development, and now to audience engagement has not safeguarded a positive transformation of arts attendance. It might be beneficial to acknowledge that:

> more sophisticated marketing is not the key to bringing […] more spectators. […] [If arts institutions] care about the audience's appreciation of the work shown and about the cultural diversity of the audience, they need multiple simultaneous strategies that will reinforce each other. There are no ready-made solutions since contextual circumstances tend to be quite specific. (Klaic, 2012, p.122).

The arts practice challenge is to match long-term planning with volatile and transient factors that influence decisions about attendance. My research supports the creation of audience development and engagement strategies

based on understanding the audiences' engagements and not just institutional or cultural policy needs.

Adherence to cultural policy guidelines and how publicly available data is used depends on the leadership and organisational culture of individual organisations. But support for a coherent and strategic approach to the whole-organisational cooperation in audience development and engagement is noticeably below the assistance to arts marketing actions. That leaves an impression that the aim is to justify public funding by selling more tickets. If this is the purpose, then audience development as a separate domain may be unnecessary. Without it, the arts sector could (potentially) focus on the strategic implementation of diverse and (more) sophisticated marketing tactics and discussions about how to facilitate more and more frequent involvement in the arts (to sell more tickets). Yet, I have already mentioned (in the introduction) doubts about the efficiency of the domination of a marketing-sales approach.

My research suggests that applied audience research and practices of arts evaluation benefit from a deep and critical reflection on what is worth studying and why. There is a need for more efficient reciprocal connections between audience studies and the practice of the arts. James Doeser's recent declaration is not uncommon:

> [a] complex set of forces determine whether people are likely to engage in the first place, and what that engagement might achieve. The forces in question are familiar: someone's knowledge, attitude and demographic characteristics. This is irrespective of whether the art is any good or not. (Doeser, 2022)

Cultural projects I evaluated for the European Commission indicate that it is a prevailing direction of thinking of the cultural professionals. Yet, understanding of audience knowledge, attitude and demographic characteristics has not led to positive change in arts attendance. My research demonstrates that those factors have some, but not crucial, influence on the audience experience. The separation of audience experience from the artistic content while talking about audience engagement is untenable.

7.4.1 Building arts-audience relationships

My study can inform the creative practices of artists, curators, and designers interested in directing or facilitating richer and audience-friendly experiences of artworks. The conceptual separation of audience engagement from audience development, and the audience experience of engagement from acts of involving the audience by arts institutions, solves some of the challenges related to audiences, organisations, and artists' relationships with each other.

The separation clarifies the roles of different organisational departments in audience development strategies and the facilitation of audience involvement processes in arts-related (not just marketing- or sales-related) parts of the total experience. The focus on the impact of the experience of engagement to support the development of interests in arts may encourage artists to co-facilitate engagement processes related to, but outside of, their artistic creation without compromising their artistic ambitions and quality. This new methodology for studying audience experiences of engagement with arts may support scenario planning and effective forecasting of audience arts experiences. Yet, it should not be treated as an instrument for judgement of artistic quality, as the audience experience of artwork depends not only on the arts itself. An approach that is both arts and audience friendly may support the arts sector's objective to attract and engage new and infrequent audiences in cultural experiences.

Arts institutions can benefit from a deeper human-oriented approach as the audience experience of engagement also depends on personal context. Herbert A. Simon has suggested a few decades ago:

> we should be sure, first, that our social institutions are framed to bring out our better selves, and second, that they do not require major sacrifices of self-interest by many people much of the time […] Success depends on our ability to broaden human horizons so that people will take into account, in deciding what is to their interest, a wider range of consequences. (Simon, 1983, pp.105–107).

My research supports this recommendation and sees it as beneficial to both audiences and arts institutions. People's liabilities (also those included in audience segmentation models) may be activated (or stopped from being triggered) by diverse factors, some caused by arts institutions' actions (or lack thereof). The audience experience during a specific artistic event may be considered a short-term process of engagement closely linked to the concept of situational interest (Krapp, Hidi & Renninger, 1992; Renninger & Hidi, 2011; Ainley, 2017). The analysis of short-term engagements with arts (and their causes) may support the comprehension of their cumulative role, so the development of interest (or interests) to trigger and sustain more frequent involvement with the arts, which is beneficial for the audience and the arts sector.

The research results underline the importance of understanding by artists and the cultural policymakers of the audience experience of engagement within their specific contexts. The second film in the *Bristol* programme was the least appealing for almost all viewers. The controversial scene in *Whist* caused lower

– by (mostly) younger – and higher – by older audiences – appraisals of the general experience. External assessment of both projects could easily lead to heuristic judgements and mislead programming and funding distribution decisions. *Bristol* audiences preferred VR featuring real people, but the animation told the story of extinct birds, so the theme and aim of the film justified its form. The reactions to *Whist* were caused by age-specific features of human emotion regulation. Yet, the controversial scene is in line with the Freudian theme of the experience. *Whist* authors forecasted strong physiological reactions to seductive dancing and blurred that image. If they tested the experience with the biometric sensors (even by Garmin), they might have decided to blur another controversial moment. Two, instead of one, blurred fragments could better suggest to the audience that blurred images are an artistic expression rather than a technological failure. It seems that, in not all but some circumstances, tests with physiological devices can help artists to make decisions that impact audience experience of engagement. The audience experience of engagement is a feature of the audience in a specific artistic and social context.

Quantitative generalisations that do not acknowledge those contexts may lead to distorted decisions. Thus, the study conclusions offer salient clues also for (careful) arts projects' assessment. The approach suggested by my research does not oppose mainstream cultural policies, which primarily support artistic creation. It offers them complementary measures. Moreover, organisations can (also) research and facilitate their audiences' experiences of engagement without a connection to cultural policies or when they are ambiguous or missing. Understanding the audience's experience of engagement can inform both the creative processes and the methodology of evaluation of artistic programmes. In this regard, mixed and qualitative research methods are advantageous for creative practice and audience studies made for cultural policy.

My study provides arguments supporting proponents of an audience-friendly approach in the cultural sector. It advocates for attitudes based on empathy and acknowledgement of personal contexts, bodily reactions, and physiological needs of the audience. It argues that the experience of engagement is adaptable rather than chaotic and that people engage with arts on their terms and changing – both temporary and more enduring – contexts of their lives. Facilitation of audience engagement by developing arts' curiosity and interests, rather than people, is easier to operationalise and ethically credible. In my research, curiosity brought people to experience VR art, but securing future attendance requires strategies providing opportunities that sustain and feed the

interest. Cultural institutions can simultaneously care about the art, artists, and the audience. Through its focus on the audience and the art, my research supports the development of strategies that build arts-audience and audience-arts relations.

7.5 Further research

There remains plenty of data from my PhD study to be fully explored and analysed (also in different ways) and a wealth of scope for further publications. Adaptive engagement – with its two sides, personal and organisational – is a complex problem. Yet, rationality is bounded, and heuristics helps to make decisions based on limited facts (which my audiences also demonstrated). My analysis suggests that, for studies of audience engagement, not only should cognition and emotions not be considered separately, but also heart rate and EDA should be analysed together and in context. The mixed design studies of the dynamics of reflexive and reflective aspects of audience arts experiences in a real-life context through trends and some details may be more feasible and satisfactory credible for qualitative generalisations. These topics, as much as the cumulative potential of short-term engagements, are fascinating subjects for my future research. I intend to continue audience-friendly studies integrating quantitative and qualitative data – trends of physiological reactions and insights from participants' reflections. Empathetic and systematic experimentation with aspects of the experience of engagement in different (yet partly controlled) contexts can advance audience studies and the practice of the arts.

My research identifies many (already discussed) topics for supplementary investigations for humanities and natural sciences. Some of my findings call for advanced studies as they touch on aspects rarely investigated by, or that go against, cognitive neuroscience knowledge. Yet, my research contributes to establishing common ground and common questions for scientists of different disciplines and the arts sector. I draw – in my view, successfully – connections between various fields of science. In this way, I contribute to the re-emerging framework of interdisciplinary arts engagement studies.

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Appendix A: Participant Information Sheet

UNIVERSITY OF LEEDS

Research project: Facilitating audience engagement in technology-augmented live art: a critical analysis.

Researcher: Agnieszka Wlazel pcaw@leeds.ac.uk

Participant Information Sheet (audience)

Facilitating audience engagement in technology-augmented art: a critical analysis

The aim of the study is to provide new understanding of engagement in innovative art projects. The research will be independent and managed by the University of Leeds.

By participating in this study, you agree to engage in related research activities including (please tick as appropriate):

1/ ☐ filling in two short questionnaires: pre- and post-experience (app. 10 min each.);

and

2a/ ☐ taking part in an art experience monitored by a wearable device that offers real-time physiological data collection. The recordings of heart rate (and skin conductance) are made in an entirely non-invasive, non-intrusive manner by the wrist, and fingers

and (possibly)

2b/ ☐ taking part in a 30-minutes interview a few days after the experience.

The participants that agree to collect their physiology data will be able to withdraw this data up to the point of post-experience interview proposal. Any data I have obtained from you up until this point will be removed from the research and deleted or destroyed (where possible).

Please also rest assured that all data, questionnaires, transcripts of individual interviews will be anonymised. The data will be stored on secure password protected server by anonymous code.

I intend to publish the findings of this study in the PhD thesis, academic journals and disseminate them through industry and academic conferences, but I will always preserve your anonymity in these dissemination activities.

There are no immediate financial benefits for participants taking part in this research, though it is hoped that the outcomes from this research will contribute toward a more comprehensive understanding of audience engagement in art and will contribute to current debates around the shape of arts support.

If you have any further questions about this activity, please talk to Agnieszka Wlazel or email at pcaw@leeds.ac.uk

Thank you for agreeing to take part in this research!

Agnieszka Wlazel

Appendix B: Informed consent form

Research project: Facilitating audience engagement in technology-augmented live art: a critical analysis.

Researcher: Agnieszka Wlazel pcaw@leeds.ac.uk

Informed Consent Form

Facilitating audience engagement in technology-augmented art: a critical analysis

I, the undersigned, confirm that:

1. I have read and understood the information about the project, as provided in the Information Sheet.
2. I have been given the opportunity to ask questions about the project and my participation.
3. I understand I can withdraw from the interview at any time without giving reasons and I will not be questioned on why I have withdrawn.
4. The procedures regarding confidentiality have been clearly explained to me.
5. The use of the data in research, publications, sharing and archiving has been explained to me.
6. All intellectual property that shall arise from this process shall remain in perpetuity the copyright of the University of Leeds.

Please sign and date this informed consent form below (where appropriate).

Participant name date

Researcher name date

Appendix C: Pre-experience questionnaire

UNIVERSITY OF LEEDS

Research project: Facilitating audience engagement in technology-augmented live art: a critical analysis.

Researcher: Agnieszka Wlazel pcaw@leeds.ac.uk

_____Participant code

Pre-Experience Questionnaire

For each statement, please indicate what is most true for you.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
1	I am ready to get absorbed in this experience					
2	I am excited about this experience					
3	I am curious about this experience					
4	I am confident that I will enjoy the experience					
5	I sought information about this VR art and/ or artists prior the experience					
6	Engaging with (any kind of) digital technology is a regular part of my life					
7	I am very much interested in technology					
8	In general, my level of competence in using technology is high					
9	I am, in general, very familiar with VR					
10	I am a frequent VR user					
11	Engaging with art (any at all) is a regular part of my life					
12	I am very much interested in art					
13	My level of knowledge of (any kind of) art is high					
14	I like to be actively engaged whilst experiencing art					
15	I consider myself well acquainted with VR because of my previous experience					
16	The event I am about to take part in lies within my 'comfort zone'					
17	The people I normally socialize with attend art events like this					

18. If you have experienced VR before, what kind of experience was it? Mark all relevant options.

❒	❒	❒	❒	❒
VR games	VR art	Training in VR	Other	I haven't experienced VR before

19. Do you own a VR headset?

❒	❒	❒
NO	No, but I have access to a VR headset	YES

20. Which of the following actions describe your most frequent participation in art?

Choose the three (3) most frequent actions:

1 – the most frequent 2 – secondary 3 – the third most frequent

ACTION:	YOUR CHOICE:
going to the cinema	
visiting the museum	
visiting a gallery	
going to the theatre	
going to the concert	
going to the opera	
seeing dance performance	
experiencing art in the open air	
I prefer experiencing art at home	

21. In general, would you describe yourself <u>more</u> as a fan/enthusiast of?

❒	❒	❒	❒
emergent, contemporary art	established cultural forms	neither	both

22. How often do you attend art events or visit art institutions?

❒	❒	❒	❒	❒
less than once a year	once or twice a year	three to four times a year	almost once a month	more than once a month

23. How often have you attended art events organised by this venue?

❒	❒	❒	❒	❒
it is my first time	once or twice a year	three to four times a year	almost once a month	more than once a month

24. Why are you here today? Choose the three (3) most important reasons why you are here.

Write your own reasons or choose from the list
1 – the main reason, 2 – secondary, 3 – the third most important

to experience VR	
to experience art	
to boost my mood	
to broaden myself culturally	
to be stimulated intellectually	
to discover something new	
to be emotionally moved	
to feel spiritually moved	
to spend quality time with the person(s) you came with	
to expose others to the artistic experience being offered	
to expose others to the technological experience being offered	
because I am familiar with the venue/organisers	
because the tickets were free	
your own reason/s:	

25. Generally, how do you feel at the moment?

Distracted 1 ---------- 2 ---------- 3 ---------- 4 ---------- 5 Focused

26. What is your gender?
❒ M ❒ F ❒ Other

27. What is your age?
Between: ❒ 18-24 ❒ 25-34 ❒ 35-44 ❒ 45-54 ❒ 55-64 ❒ 65-74 ❒ 75+

28. What is the highest level of education that you have completed?_____

29. Cultural background (or primary nationality) _____

Appendix D: Post-experience questionnaire

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Research project: Facilitating audience engagement in technology-augmented live art: a critical analysis.

Researcher Agnieszka Wlazel pcaw@leeds.ac.uk

_____ Participant code

Whist: what was the number you received at the end of your experience?_____

The following statements ask you to reflect on your experience of engaging with this VR experience. For each statement, please use the following scale to indicate what is most true for you.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
		1	2	3	4	5
1	I lost myself in this experience					
2	The time I spent during this VR project just slipped away					
3	I was absorbed in this experience					
4	I felt frustrated with technical (VR) aspects of the experience					
5	I found this technology confusing to use					
6	Using VR equipment was taxing					
7	This VR art was attractive					
8	This VR art was aesthetically appealing					
9	This VR art appealed to my senses					
10	Experience with this VR art was worthwhile					
11	My experience was rewarding					
12	I felt interested in this experience					
13	This VR art fully fulfilled my expectations					
14	My overall emotional response to the experience was strong (no matter positive or negative)					
15	My own experience with and knowledge of art was adequate to appreciate this VR art					
16	I will search for other VR art experiences					
17	I am, in general, a relaxed person					
18	The physiology device negatively affected my experience					

What, for you, was more dominating in this experience?
Please, tick the most relevant answer.

19. Did you concentrate more on technology or art?

❒	❒	❒	❒
more on technology	more on art	both	neither

20. What, for you, was more attention-grabbing in this experience?

❒	❒	❒	❒
structure	story	both equally	neither, other things

21. Would you describe this VR experience as more intellectual or emotional?

❒	❒	❒	❒
more intellectual	more emotional	both equally	neither

What was the best/worst thing about this VR experience?

22. The best:

……
……
……

23. The worst:

……
……
……

24. Would you have liked to attend a discussion with the artists, if one had been offered?

❒	❒	❒	❒
No	I don't know	Yes, before the experience	Yes, after the experience

25. Did this experience change your attitudes towards VR art in anyway?

1 I like it less	←	2	←	3 No change	→	4	→	5 I like it more

26. Would you consider yourself more as a person

❒	❒	❒
having specific, fixed interests	being open to new experiences	both

27. Why do you usually engage with art? What are the most important reasons for you to attend an art event or visit an art institution?

.....

.....

.....

.....

.....

28. Why do you usually <u>not</u> engage with art? What are the most important reasons for you NOT to attend an art event or visit an art institution?

.....

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.....

.....

29. In what <u>art activity</u> will you most probably engage with in the near future?

.....

.....

.....

30. If you wish, add further reflection or feedback on this VR art experience

.....

.....

.....

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.....

Appendix E: Semi-structured interview questions – *Whist*

Can I call you in my research by your first name or do you prefer a pseudonym?

I structured the interview according to three timeframes – before, during, and after the experience.

Pre-defined questions

Before

How did you learn about this project?

Did you read about the project before you came?

During

Did you find the technology or the use of headsets difficult or disturbing?

Did you lift the headset to move? How did you find transitions between the episodes?

Did you ask for help at any time during the experience?

Were you conscious of other people around you during the experience?

How did you feel during the whole experience?

Did you feel equally engaged through the whole process? Emotionally? Intellectually?

What do you think about the structure of the project? Did you consider all episodes as one artwork? Were you looking for a narrative in it?

Which scenes do you remember the most? Do you remember the last scene?

Did you feel immersed?

Did you think about your personal experiences, life moments, and people in your life during the experience?

Who were you in this experience?

After

After the experience, did you read more about the project? Have you checked the number you received after the experience?

Did you speak with anyone about the project afterward? What did you talk about?

Appendix F: All participants – main findings from questionnaires

Codes

“ARTS!” and “TECH!” (capital letters with exclamation marks) indicated “very high” propensity toward arts or technology;

“ARTS” and “TECH” (in capital letters) – propensity in “high” range scores;

“arts” or “tech” – a “moderate” score for propensity in the specific area; and

“?” – a question mark in the title presented a lack of focus as both areas were calculated in the “low” or “very low” range (below 2.6 points).

Calculation of pre- and post-experience change of attitude is defined on p.126.

Bristol

Participant number	Gender	Age	Pre-focus	Post-experience	Change re. tech	Change re. art	General quality of engagement
16	F	25-34	TECH!/ART!	TECH!/ART!	0	0	4.50
15	M	25-34	tech/ART!	ART	-1	-1	3.25
4	F	25-34	tech/ART	TECH/art	+1	-1	3.67
1	F	45-54	tech/ART	tech/ART	0	0	4.25
8	F	25-34	ART	TECH/ART!	+2	+1	4.33
10	F	25-34	ART	TECH/ART!	+2	+1	4.67
12	M	25-34	TECH/art	tech/ART!	-1	+2	4.00
11	F	25-34	tech/art	TECH/art	+1	0	4.50
5	F	25-34	tech/art	tech/ART	0	+1	3.83
3	F	35-44	tech/art	TECH/ART!	+1	+2	4.25
18	F	35-44	tech/art	TECH!/ART!	+2	+2	4.75
17	M	25-34	tech/art	tech/ART	0	+1	3.75
13	F	18-24	art	TECH!/ART	+3	+1	3.83
6	F	25-34	art	tech/art	+1	0	3.75
14	F	25-34	art	TECH/ART	+2	+1	3.83
9	M	25-34	art	TECH!/ART!	+3	+2	4.58
7	M	25-34	tech	TECH/ART	+1	+2	4.08
2	M	55-64	tech	TECH!/ART	+2	+2	4.58
19	M	35-44	?	TECH!/ART!	+3	+3	4.42

Whist

Participant nunmber	Gender	Age	Pre-focus	Post-experience	Change re. tech	Change re. art	General quality of engagement
7	F	55-64	TECH/ART!	TECH!/art	+1	-2	4.50
14	F	45-54	ART!	TECH!/ART!	+3	0	5.00
18	F	25-34	ART!	TECH/ART!	+2	0	4.67
19	F	25-34	ART!	TECH!/ART	+3	-1	3.50
30	F	25-34	tech/ART!	TECH!/ART	+2	-1	4.33
3	F	35-44	ART	TECH!/ART!	+3	+1	4.83
6	F	45-54	ART	TECH/art	+2	-1	3.75
15	M	45-54	tech/ART	TECH!/ART!	+2	+1	4.92
17	F	45-54	ART	TECH!/ART	+3	0	4.17
20	F	35-44	ART	tech/art	+1	-1	3.17
21	F	35-44	tech/ART	TECH!/ART	+2	0	4.50
22	M	45-54	ART	TECH!/ART	+3	0	4.00
23	F	25-34	TECH/ART	TECH!/ART!	+1	+1	4.42
1	F	18-24	art	tech	1	-1	2.33
4	F	55-64	art	tech/ART!	+1	+2	4.42
9	F	65-74	art	tech/art	+1	0	3.67
10	F	35-44	tech/art	TECH!/ART	+2	+1	4.42
11	F	75+	art	TECH!/art	+3	0	4.00
12	F	18-24	tech/art	TECH!/ART!	+2	+2	4.67
16	F	18-24	tech/art	TECH!/ART!	+2	+2	4.83
24	M	35-44	tech/art	TECH/ART!	+1	+2	4.33
26	M	45-54	TECH!/art	TECH/ART	-1	+1	4.42
29	F	45-54	art	TECH/ART	+2	+1	3.75
27	M	45-54	TECH!	TECH/art	-1	+1	3.75
2	F	18-24	tech	TECH!/art	+2	+1	3.25
13	M	18-24	tech	tech/art	0	+1	3.33
25	F	18-24	tech	tech	0	0	2.42
5	M	55-64	?	TECH!/ART!	+3	+3	5.00
8	M	25-34	?	TECH!/ART	+3	+2	4.17
28	F	45-54	?	tech	+1	0	3.08