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Virtual Reality as a Promising Path to Closure after Bereavement: An Analysis of Immersion, Presence and Multisensory Engagement in the Case Study of I Met You

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Virtual Reality as a Promising Path to Closure after
Bereavement: An Analysis of Immersion, Presence and
Multisensory Engagement in the Case Study of *I Met You*

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Introduction

“ ‘Never’ has come to stay. ‘Never’ feels so unfairly punitive. For the rest of my life, I will live with my hands outstretched for things that are no longer there.” (51-2)

- Adichie, Chimamanda Ngozi. *Notes on Grief*

As most of us know, losing someone you hold dear is a painful experience. Coping with this loss is challenging and finding closure is difficult. In this digital age, there are plenty of resources that aid in the grieving process.¹ Virtual reality (VR) technology is one of those technological advancements that has the potential to provide individuals with a tool for facilitating closure.

In this thesis, I examine how immersion, presence, and multisensory engagement within a virtual environment (VE) of case study *I Met You* can potentially facilitate in the process of finding closure after bereavement. In a close analysis of the multisensory engagement of vision, sound, and touch within the VE, I examine the impact of these dimensions on the sense of presence. The concept of presence, or the feeling of “being there” in a virtual environment, is central to these experiences. The research question is, “In what ways do immersion, presence, and multisensory engagement in the virtual reality case study of *I Met You* have the potential to facilitate in the process of closure after bereavement?” By analysing the case study of *I Met You*, I aim to contribute to the growing body of literature on VR and grief,² and more generally grief in the digital age.³ With a specific focus on immersion, presence, and multisensory engagement, I aim to provide valuable insights into the potential of VR technology to support individuals in finding a path to closure after bereavement. The case study as well as similar VR applications are a relatively new field of study and thus it is crucial to examine them.

¹ Such resources include among others, online grieving communities like *Grief in Common* and *What’s Your Grief*, Facebook groups, group or individual grief workshops and training from various organisations such as *We Grieve* and *Our House Grief Support Center*, and even games such as *Gris* (2018) and *Apart of Me* (2018), which is targeted at young people dealing with grief.

² Since VR application in the context of grief are becoming more common, names of digital mental health experts Rosa M. Baños and Cristina Botella quickly come to mind whom themselves have designed such an application called *EMMA’s World*. More on the literature in chapter 1.

³ With the digitalisation of our lives, death and grief has undoubtedly become digital as well. “Digital immortality” (Hurtado) or “online afterlives” (Sisto) are some of the many ways to conceptualise this new phenomenon of the dead remaining alive in the digital and consequently leading to a new way of coping with grief.

In the first chapter, I offer a theoretical framework by conducting a literature review on texts related to the topic of this thesis. The concepts of immersion and presence spread across multiple academic fields including communication, computer science, psychology, and media studies (Lee 28). Therefore, the thesis is interdisciplinary in nature since I engage with texts from various academic fields such as communication, more specifically human-computer interaction, and psychology, as to comprise a more complete understanding of the concepts. Additionally, I will focus on texts about (multi)sensory engagement and personal content within the VE as well as VR therapy.

In the second chapter, I examine the various sensory stimuli produced by the VR system each in its subchapters, respectively the visual, auditory, and tactile senses. I use a combination of methods grounded in the field of media to examine the case study of *I Met You*. These methods are visual analysis for examining visual elements; content analysis for analysing aural aspects; and observational analysis for studying tactile elements. By using these different methods, I provide a more detailed understanding of how the multisensory engagement contributes to the understanding of immersion and presence within the VE.

The results of the analysis are discussed in the third chapter, where I link the multisensory engagement, immersion, and presence in more detail together and reflect on the literature discussed in the first chapter. I discuss the major findings of the analysis and what implications those have. Finally, in the concluding chapter, I offer an answer to the research question and give recommendations for future research.

Chapter 1: Literature Review

Grief after bereavement is a universal human, and some would even say more than human,⁴ experience that arises after the loss of a loved one (Botella et al. 675; Jordan and Litz 180; Marques et al. 1; Shear 119). Processing this grief is painful and coping with it can be challenging (Marques et al. 1). While one may never truly recover from the bereavement, one can learn to live with it. Therefore, individuals may seek various forms of support to help them navigate their grieving process (Shear 119). Recent technological advances have provided new tools that could possibly aid individuals in their grieving process (Knowles et al.; Botella et al.; Baños et al. “Virtual Reality System”, “Adaptive Display”). Virtual reality (VR) has the potential to become a promising medium for individuals coping with grief, in facilitating their grieving process by providing users with a sense of presence within a safe and controlled virtual environment where they can process their grieving emotions as a result of this sense of presence.

The South Korean virtual reality project *I Met You* (translated from 너를 만났다 or “Neoreul mannatda”) provides a unique opportunity to explore the potential of virtual reality to aid in the grieving process. This documentary series follows several individuals as they participate in a VR experience to be reunited with their long-lost loved ones. By closely analysing this project, I aim to answer the research question: “In what ways do immersion, presence, and multisensory engagement in the virtual reality case study of *I Met You* have the potential to facilitate in the process of closure after bereavement?” Specifically, in this thesis I aim to examine how immersion and presence through sensory experiences in a virtual environment (VE) can potentially facilitate in the process of finding closure after bereavement.

The concepts of immersion and presence spread across multiple academic fields, including communication, computer science, psychology, and media studies (Lee 28). With a background in media and film studies, I will primarily use a combination of methods grounded in that field to examine the case study of *I Met You* and its various sensory engagements, including the visual, aural, and tactile within the VE. I will also engage with texts across academic fields such as communication, more specifically human-computer interaction, and psychology, making the thesis interdisciplinary in nature. I argue that the interdisciplinary viewpoint is necessary in providing an answer to how VR as a medium could have the potential of providing a promising path to closure after bereavement.

⁴ I am aware that grieving is not limited to humans and extends to “more-than-humans”. See works of media and communication scholar Larissa Hjorth who writes about grief and caring media in relation to more-than-humans.

Since the role of the multisensory engagement in VR is central to this thesis, as it forms the angle with which immersion and presence within the experience of the VE can be understood, I will separately analyse each sensory engagement with a specific method. The methods consist of a visual analysis for examining visual elements such as graphics of the virtual surroundings; content analysis for analysing aural aspects such as the voice of the deceased person's avatar; and observational analysis for studying tactile elements such as haptic feedback provide to the VR user when interacting with elements within the VE. First, I examine the visual elements of the VE, more specifically the surroundings that constitute the VE and the avatar. Then, I focus the attention on the avatar and look at its voice and ability to converse with the VR user. Lastly, the tactile aspect of the VE is explored, respectively, the user's physical interaction with the avatar and interaction with the surroundings.⁵ By using different analysis methods, I analyse how the various engaged senses influence immersion and the sense of presence within the virtual environment.

The in-depth analysis of the case study of the South Korean VR project *I Met You* is particularly relevant since the project combines VR and grief in a novel manner, namely by virtually reuniting the user with their resurrected long-lost loved one in the form of a digital avatar in a world filled with personal content. The combination of a digital resurrection of an individual of personal importance to the user and the personalised content of the entire VE is a novelty. In recent years, VR therapy applications have gained more attention as it has been proven to be an effective tool in treating various mental health disorders, including anxiety (Boeldt et al.; Carl et al.; Freeman et al. 2395-396; Ioannou et al.; Glantz et al. 62;), depression (Freeman et al. 2396; Ioannou et al.), phobias (Krijn et al.; Glantz et al. 56-8), post-traumatic stress disorder (Carl et al.; Glantz et al. 58-9), and substance disorders (Freeman et al. 2396-7; Glantz et al. 61). In this thesis, I interpret the results of the case study analysis to discuss the potential implications of using VR as a possible way to facilitate in the process of finding closure for individuals coping with grief. The central idea of this thesis is that the multisensory engagement provides immersion and presence which is crucial to the effectiveness of such VR application when offering individuals coping with grief help in their process to closure.

In this literature review chapter, I will begin by discussing the promise of immersion by media technologies, focusing on early 3D cinema, before delving deeper into VR as a

⁵ By no means is the order of the subchapters and thus the engaged senses made to indicate the level of importance for the VR experience. Meaning, vision is not more important than sound, as sound is not more important than tactility, and so on. The order is simply to represent in which order the VR engages with a sense in the VE.

medium and how its relation with immersion differs for other forms of media technologies. In addition, I will explore the concepts of immersion and presence in greater detail and claim that there is a particular relation between the two within the context of VR. Following this, I will focus on sensory stimuli within the VE and the role of multisensory engagement in enhancing immersion and presence. Finally, I will address the concept of presence and multisensory engagement within the context of virtual reality therapy, and specifically for grief, which highlights their importance in supporting the bereaved to cope with their grief and possibly providing a path to closure.

1.1 Immersive Media Technologies: Early Cinema and Virtual Reality (VR)

In recent years, there have been significant developments in immersive media technologies, including augmented reality (AR), mixed reality (MR), and virtual reality (VR). These technologies claim and promise to be an immersive medium able to create immersive experiences for their users, blurring the lines between the physical and virtual world. While media technologies have changed over time, the promise of each new media technology to be an immersive medium has not changed, only the technologies which strive to do so. In the same vein, the promise of VR to be an immersive medium is nothing new either. The desire to create a sense of immersion in their audience has remained present since the early days of cinema.⁶

This is important to note because even though VR is a new media technology with the same promise of immersion, the relation between VR and immersion is different from that between other media technologies in the past. Because immersion is a promise made by media technologies throughout the years, it is necessary to understand their relation before arguing it is different for VR and before understanding that new relation. In this way, our understanding of VR as a medium compared to earlier media technologies is deepened, making clear how the medium differs from others and what new possibilities it could offer, such as facilitating in the process of closure after bereavement. By focusing on the aspect of immersion within the medium, I will have established a foundation on which the other concepts of presence and multisensory engagement build in answering the research question. In other words, understanding the difference between the promise of immersion by media technologies in early

⁶ For an elaborate discussion on the continuous search for immersive experiences, see Williams, Kevin, and Michael Mascioni. "The Drive for Immersion." *The Out-of-Home Immersive Entertainment Frontier*, edited by Kevin Williams and Michael Mascioni, Routledge, 2017, pp. 79-112.

cinema and its new relation to contemporary media form VR, forms the stepping stone to understanding VR as a medium and in relation to the concepts of presence and multisensory engagement. Therefore, in this subchapter, I provide historical context about the desire for immersive experiences in early media technology such as 3D cinema and contemporary state-of-the-art technology such as VR. Thereafter, with a better understanding of the promise of an immersive quality within media technologies, I further focus specifically on VR as a media form.

Since the early days of cinema, from silent films in the 1890s to synchronised sound films in the 1920s and 3D cinema in the 1950s, media technologies have continuously promised to be an immersive medium and thus provide immersion for their audiences (Holmberg 132).⁷ Each technological advancement brought with it new possibilities for creating more realistic and engaging experiences. The idea of this sort of cinema was to have a representation so close to the physical world, even perfectly representing it in audio and visuals, that the lines between the physical and fictional worlds became blurred for its spectators, completely immersing them in the films. With the arrival of 3D technology, the creation of such a cinema became even more attainable, as it allowed for a greater sense of depth and realism in the cinematic experience. 3D cinema had the potential to make the audiences forget they were watching a film projected on a screen in a movie theatre,⁸ creating a more engaging and immersive movie-watching experience.

These immersive experiences of early 3D cinema were mainly focused on the creation of a spectacle, which media researcher Carter Moulton writes in “The Future is a Fairground: Attraction and absorption in 3D Cinema”, links to film historian Tom Gunning’s “cinema of attractions” (6). 3D Cinema was capable of evoking strong emotional reactions in its audience, even if those emotions were mainly “outwards aesthetics” such as fear and shock (6), like when a train is seemingly only seconds away from “emerging outward from the two-dimensional screen” into the audience. 3D cinema demonstrated the potential of advancing technologies in blurring the lines between real and fiction for its audience, but with VR the goal of this immersive experience was no longer simply to shock and scare, for the attractions, it shifted.

⁷ Holmberg states that “all of film history ... [is] striving for this illusion of presence, or immersion” (132). While I do refer to Holmberg’s text, I intentionally choose not to quote his original text for he, like others, uses presence and immersion interchangeably which I explicitly do not do. The reason for this is explained in section 1.3.1.

⁸ For interesting insights on 3D cinema around the time of its emergence, see Hawkins, Richard C. “Perspective on “3-D”.” *The Quarterly of Film Radio and Television*, vol. 7, no. 4, 1953, pp. 325-34.

Likewise, the position of the audience shifted with 3D cinema and later VR. While 3D cinema created the illusion of extending into the physical world and thereby becoming part of it, the audience could not physically interact with the protruding elements, despite perceiving it as possible. It was 3D cinema that brought about a shift of the position of the cinema spectator. Although the movie theatre audience remained passive observers of events unfolding on a screen, mere spectators of the approaching train, they were no longer only observers. Their position began to shift towards that of an active interactor, though this was by no means realised by 3D cinema, nor could it. Nevertheless, 3D cinema presented a decisive point in the development of immersive media technologies and the spectators' role within it, laying the foundation for further advancements of immersive media technologies.

Such technologies that resign the spectators from their passive positions and put them in an (inter)active one where they can interact with the content are technologies that belong under the name of extended reality (XR). Like 3D cinema, XR is “a medium premised precisely around appeals to the sensory” (Jackman 2), but in the case of XR, this entails appeals to the multisensory. XR is an umbrella term that encompasses various altered reality technologies, specifically augmented reality (AR),⁹ mixed reality (MR),¹⁰ and virtual reality (VR). Applications of XR technologies have been employed in a wide range of industries, including education, healthcare, entertainment, and marketing,¹¹ where they merge physical and digital worlds or, in the case of VR, create an alternative virtual world. While each of the technologies has unique features and applications, they share some commonalities, such as the requirement for some form of hardware, like a headset or display, and the use of computer-generated graphics and algorithms. Despite the similarities, the various media technology forms of XR operate and function differently, with VR being particularly distinct from AR and MR. In the following section, I will in greater detail explore virtual reality (VR) as a media technology. Ultimately, I want to dive deeper into VR as a media form and examine how its promise to be an immersive medium works specifically for that medium.

⁹ AR superimposes digital content onto the image of the physical world, allowing a composite view of the physical world and digital elements (Carmigniani and Furht). It offers another layer of information onto the physical environment.

¹⁰ MR enhances the physical world by adding digital content over it, similarly as AR, but it allows for interaction between the physical and digital elements. It creates a hybrid experience where physical and digital objects coexist and interact in real-time (Speicher et al.).

¹¹ For more on using immersive media in advertising, see Rose, Frank. “The Power of Immersive Media.” *Strategy+Business*, no. 78, 2015, pp. 1-10.

1.1.1 Virtual Reality – VR

By creating a digital environment, whether similar or different from the physical world, VR places its user amid a simulated environment. The most significant difference between VR and the other XR technologies is that AR and MR keep the user in touch with the physical world, while VR does not. Its user experiences the virtual world by putting on a headset, or head-mounted display (HMD) that covers the eyes and ears that block out the physical world and replace it with the virtual one. Within the HMD the user's movements are tracked by sensors, which adjust the display, making them feel as if they are present within the virtual environment. Thus, the digital environment replaces the user's physical surroundings.

In this form of immersive media technology, the borders of the screen are hardly noticeable, if at all, compared to AR, MR and even 3D cinema. However, as digital media and communication researcher Janet Murray writes in "Not a film and Not an Empathy Machine," we should refrain from thinking of "VR as "movies without a frame" since this is not true. "While the screen has not disappeared in an ontological sense, at the heart of VR is the production of the illusion that we have entered into and become a part of the world that we used to watch on the screen" (Nash 97). This virtual world is a computer-generated simulation of an interactive, immersive, 360-degree view of a 3D environment. This must not be confused with the assumption that VR is 3D cinema without a border since VR is "a virtual space to be visited and navigated through" (Murray). Nor must it be confused with another immersive media technology named 360 video.

VR and 360 video are often compared and conflated, if not used as if meaning the same when they are not. While these are similar and have similar characteristics, Devon Dolan and Michael Parets who are active in the film industry and interested in interactive storytelling within VR state in "Redefining the Axiom of Story: The VR and 360 Video Complex." The 360 video is comprised of a live-action scene filmed by multiple cameras at a 360-degree angle in a real-world environment, whereas VR's virtual environment is a computer-generated simulation 360-degree view of a 3D environment. Moreover, in a 360 video the user is confined to one spot, only able to look around by turning his head, while the VR user in a VE can move around freely and even interact with the environment. The user in 360 video and VR is, respectively, a passive observer and active interactor;¹² thus, the user of 360 video is not able

¹² By using the dichotomy between passive and active, I merely mean to point out that in VR the user is actively a participant able to interact with the VE while in 360-degree video the user is a passive observer. I therefore do not use 'active' in the manner Dolan and Parets do, where they describe it to mean that "the viewer is given a

to interact with the virtual environment as they would be able to do in any of the XR technologies. Therefore, VR could be seen as a medium going beyond the limits of 360 video. It is of importance to distinguish the difference between the media, since 360 video is well rooted in the physical world and not interactive, and, in contrast, VR is a virtual world where interaction occurs. Thus, the way the user engages with these media technologies and its contents differs significantly.

VR applications have been used in a wide range of fields, from engineering and medical applications in the late 90s (Zheng et al. 23), to more recently military training (Bowman and McMahan 37), and relaxation purposes (Heyse et al. 2). With the increased distribution and thus availability of VR headsets from 2015 onwards (Kaplan-Rakowski and Meseberg 146), VR has managed its way onto the film festival circuit, where it has the potential to significantly impact the field of film festivals (Fux 307). Rather than simply watching a film on a screen, the audience can enter a VR experience and become immersed in a digital environment. VR has the potential to revolutionize the way media is experienced and interacted with, opening up new possibilities for storytelling and audience engagements.

1.2 Immersion

A key aspect of the virtual reality experience is immersion (Bowman and McMahan). By replacing the physical world with the virtual, VR users are surrounded by and submerged in the new environment, possibly resulting in them temporarily forgetting about their physical surroundings. Immersion in the sense of losing oneself in something, and forgetting about their physical world, is not limited to VR. For example, one can also be immersed in a book they are reading (Hudson et al. 461). While immersion can be experienced in various forms of media¹³, it is particularly relevant in the context of media technologies such as virtual reality.

In the context of VR, I am using the term immersion as a way of describing the used technology, hence the phrase “immersive media *technology*” throughout the previous part of the chapter and my focus on the technological aspects of VR. Moreover, because the users of

share of the storyteller’s power to affect the outcome of the story’s events”. I do not mean to imply or assume here that the user of VR has an active role in the story’s narration or changing its outcome. That is not my point.
¹³ Another, may I add interesting, example of an immersive media is ‘immersive theatre’ in which the audience is placed amid the action thereby creating a fully immersive experience. Since I am limiting myself to discuss only immersive technologies, I won’t be elaborating more on immersive theatre and how it works. However, for an exploration of immersive theatre, see Machon, Josephine. *Immersive Theatres: Intimacy and Immediacy in Contemporary Performance*. Bloomsbury Publishing, 2017.

VR are by proxy submerged in another world when in a VR experience, VR technologies are inherently immersive, and which is why VR is often referred to as “immersive VR” (Bowman and McMahan; Hudson et al.). Thereby arguably, immersion could be seen as an inherent characteristic of VR due to the way it operates. Additionally, one might claim that because the user’s focus and attention in VR can only be directed towards the VE due to the technologies that immerse them into the VR world, since anything other is blocked out, immersion by the technologies is an inevitable outcome. In this sense, immersion is comprised of the technologies employed in VR to create an immersive experience for the user, making immersion a fundamental characteristic of VR.¹⁴

Out of all the XR technologies, VR holds the promise for the most immersive experience by submerging, if not completely “transporting”, its user to another world. Although supposed “total immersion” has not been realized according to some users of VR technologies who “are looking not to represent the user in a conventional virtual experience but to offer a total ‘out-of-body’ experience” (Williams and Mascioni 93), VR is highly immersive combining various technologies to create an experience of the virtual other world and sense of immersion in its user. The graphics, sounds and other stimuli of the VE surrounding the user make up the immersive technologies. Through “interaction between an individual and [their] environment,” the user is enabled to investigate the surroundings, increasing the “engagement or immersion in an experience” (Hudson et al. 462). VR is therefore an “exploration of the multi-sensory” (Nash 97). “Various output devices, such as computer or television screens, or more sophisticated head-mounted devices, such as helmets, goggles or glasses can be used, providing varied levels of immersion” (Hudson et al. 461). Through these sensory stimuli of the VE that engage simultaneously with multiple senses of the VR user, a sense of presence can be elicited.

¹⁴ Not all scholars writing about immersion in the context of VR may agree with this statement, as they could argue that not all VR experiences are immersive. However, I argue that this disagreement is the result of the confusion around the meaning of immersion and presence, and thus referring to immersion when they are writing about “being in” a virtual world (Hudson et al. 463), when feeling like one is in a place this is usually referred to as “presence” (Slater; Lombard and Ditton; Lee; Heeter; Steuer; Bowman and McMahan; Sheridan; Biocca). The separation of terms is made clearer in chapter 1.3.1.

1.3 Presence

The feeling of “being” in a certain place is called “presence”. In the context of VR, the place where one feels present is the VE. The essence of presence “is the *illusion* of being there” (original emphasis in Slater, “Immersion” 432), even though you are aware that in fact you are not. Virtual environment specialist Mel Slater writes in “Immersion and the illusion of presence in virtual reality” that “it is a perceptual but not a cognitive illusion”, which in turn is the true strength of VR that despite knowing it is an illusion, the user’s perception of it does not change (432). Media and communication scholars Matthew Lombard and Theresa Ditton in “At the Heart of It All: The Concept of Presence” describe presence as a “perceptual illusion of nonmeditation” while in a mediated experience, meaning that the illusion is on the level of the user’s perception of the VR world.¹⁵ “The concept of presence, or a sense of being there, is a frequently emphasized factor when discussing mediated environments” (Cummings and Bailenson 2). Presence is a concept at the heart of VR; thus it is crucial to explore this concept further.

Proceeding from the idea that immersive technologies employed in VR can create a sense of presence, an illusion of “being there” in a VE, in this subchapter I explore the concept of presence. I not only make clear the distinction between immersion and presence, two terms that are often unjustly used interchangeably, but also their relation to one another specifically in the context of VR. To conclude the subchapter, I discuss the role of multisensory engagement in enhancing the sense of presence in VE. By exploring the concept of presence in this way, I not only set apart immersion from presence, but also highlight a fundamental relation between the two.

1.3.1 Clearing up the Confusion Between Immersion and Presence

The terms “presence” and “immersion” are often confused by meaning the same and consequently used interchangeably (Cummings and Bailenson 2-3). As per the previous

¹⁵ In his article “Presence, explicated.” new media and communication researcher Kwan Min Lee displays how various academics have used various forms of the term ‘presence’ throughout the years which has made it difficult to have a “clear conceptual definition of it” (28). The debate on presence (its terminology, what it entails, etcetera) is vast and spreads over decades. For a detailed explanation and chronological timeline of the evolution of presence, see Lee, Kwan Min. “Presence, Explicated.” *Communication Theory*, vol. 14, no. 1, 2004, pp. 27-50.

subchapter section, I have argued that immersion concerns the technologies of VR, such as graphics, sound, and tactile elements, and not the subjective perception of those elements in a VE by the user. Herein is “*immersion*—defined as a technological quality of media—and *presence*—defined as the psychological experience of “being there,” (original emphasis 2) as media psychologists with a focus on virtual reality James Cummings and Jeremy Bailenson write in “How Immersive Is Enough? A Meta-Analysis of the Effect of Immersive Technology on User Presence”. Mel Slater whose research is focussed on the interface between computer science and neuroscience also argues in “A Note on Presence Terminology” for the separation of the two terms, writing that if the terminology is agreed upon, arguments among scholars over “non-issues” might be prevented (1). He poses to “reserve the term ‘immersion’ to stand simply for what the technology delivers from an objective point of view” (1). Additionally, if those technologies represent high fidelity to the physical world and our senses, they become more immersive (1). This nonetheless remains something to be objectively examined.¹⁶ The way in which the user perceives these immersive technologies and thus their subjective sense of being within that virtual world, are in reaction to those immersive technologies. As Slater states: “Presence is a human reaction to immersion” (2). While it is sensible to separate presence and immersion as terms, they are not separate but rather strongly related to one another (2). “By this account, the technological level of immersion afforded by the VE system facilitates the level of psychological presence” (Cummings and Bailenson 3). Consequently, one could even argue that their relation is one of cause-and-effect, with immersion being the cause that has presence as its effect.

According to this logic, presence within the VE could be obtained if immersion precedes it as a result of the immersive technologies used. Then presence is “the extent to which the unification of simulated sensory data and perceptual processing produces a coherent ‘place’ that you are ‘in’ and in which there may be the potential for you to act” (Slater 2). In other words, if the VR system produces an environment that is experienced through accurate sensory engagement and therefore can be sensed and interacted with, then presence is attained. Meaning that if the immersive technologies provide a sense of immersion, then a sense of presence follows. Additionally, the VE does not need to provide high quality sensory data for the user

¹⁶ On the other hand, media and information researcher Carrie Heeter writes in “Being There: The Subjective Experience of Presence” about the subjective experience of presence and what factors contribute to it. Her text offers a “subjective explanation of presence”, an analysis on “the kinds of evidence a virtual experience provides the user which help convince them they are there” (262). So, for a subjective angle towards presence, see Heeter, Carrie. “Being There: The Subjective Experience of Presence.” *Presence: Teleoperators and Virtual Environments*, vol. 1, no. 2, 1992, pp. 262-71.

to feel present (3), it simply needs to provide sensory data in an accurate manner. The corollary being that the most important aspect of creating a sense of presence are the stimulated senses or put more simply, the aspects of a VE that are perceived by the human senses, such as visuals, audio, and tactility, and the user's ability to act within the VE. Then, as argued before, it can be said that presence arises from immersion, "from the interplay between the human sensing and motor action systems and the immersive system" (2), "from an appropriate conjunction of the human perceptual and motor system and immersion" (4). Put differently then, the relation between immersion and presence can be described as causal, thus a relation of cause-and-effect.

To further expand on the concept of presence and its relation to other concepts often used in reference to VR, some distinctions need to be made. For eliciting a sense of presence, it is often confused that aspects like interest of the user in the experience is needed, however this is not necessary, nor indicative of it (Slater 2). In the same vein, involvement and engagement need to be discussed. While involvement and engagement are often associated with the effect of presence, they are not the cause of presence since "one can be present but not involved" and vice versa (2). Circling back to the idea of being immersed when reading a book, the reader may be involved in the book but not present within the world of the book. Even if the book is emotionally engaging, presence is separate from it (3). Therefore, while I argued immersion and presence have a cause-and-effect relation, immersion in a book does not necessarily result in presence. So, then the cause-and-effect relation proposed earlier does not hold up in this media form. Hence, I will reformulate my previous statement more poignantly by emphasising that immersion and presence have a cause-and-effect relation only within the media form of VR. In other words, there is a direct correlation between immersion and presence only within the context of VR and so this relation does not apply to all media and immersive technologies.

In contrast, digital media researcher Pepita Hesselberth in "From subject-effect to presence-effect – A deictic approach to the cinematic" problematises the traditional understanding of presence as simply "being there" as a result of immersive technologies that enable "narrative, physical, or social involvement with a mediated world", because it is based on the "dualisms between mind and body, between subjective and objective space, despite its emphasis on the relation between them" (242). Hesselberth writes that it is "the bodily-spatial or affective aspects of our engagement with the technologies of sound and vision that valorise our being in the world" (242). Meaning that, presence comes about through the interaction the user can have with the VE. So instead, Hesselberth proposes an understanding of presence as

“being-in-touch-with-the-world” (243), where presence is tangible for the body. Adopting Hesselberth’s approach, presence would then become presence-effect as similarly tangibility is viewed as an effect (244). It might be valuable to refer to presence as presence-effect, since I already proposed a cause-and-effect relation, appointing presence as the effect. While I still wish to maintain the cause-and-effect relation between immersion and presence within the context of VR, since Hesselberth offers a valuable perspective on presence I will add this perception to the earlier proposed relation, because incorporating Hesselberth’s ideas allows for the development of a more nuanced understanding of presence as both an effect of immersion and a tangible experience.

1.3.2 The Role of Multisensory Engagement in Enhancing Presence

When considering presence in VR as a tangible embodied experience for the body, the role of the senses becomes particularly important. Compared to other media, VR is multisensory and so it is important that multiple senses are engaged for the user to feel present within the VE. “In immersion VR, (...) presence is based on part on simulating real world perceptions” (Heeter 265). Subsequently, one could state that sensory engagement results in presence, because the VR user perceives themselves to be present within the VE because “sounds and images in the virtual world respond like the real world to your head movements” (266) Additionally, “seeing your virtual hand move when your real hand moves adds to the illusion” (266). For immersive VR to create the presence effect, it must not only effectively engage with the senses of its user, meaning it must offer some sort of similar sensorial experience as in the physical world, but those perceptions must then also be correctly processed by the brain since “based on what our sensory organs are currently reporting” that is where the feeling of presence is created (Butler). In other words, for a user to feel present in a VE, the VR system must meet certain requirements that allow for an immersive and realistic experience. These requirements highlight the importance of engaging with and accurately processing sensory information in order to create a sense of presence in VR.

With a background in media and technology studies, Sydney Butler writes in “What Is “Presence” in VR, and Why Is it So Important?” that there are certain things that have shown to be the most important aspects for a VE to make its user feel presence, the so called “minimum presence requirement”. Firstly, he mentions good quality tracking in the head

mounted device (HMD), explaining that it “is how the VR software tracks the physical position of your body in virtual space.” It is essential for this tracking to be precise and within a spacious area while offering a stable image. Secondly, he emphasises the crucial role of low latency in creating presence, meaning that the VE should respond to the user’s actions almost instantaneously, or at least “that it feels like real-time.” The quicker the system responds to the user’s actions, the more control the user feels within the VE, which enhances their sense of presence. Thirdly and lastly, he writes about the quality of the image, not on how accurate the image is rendered, but on “the physical resolution of the screen” that must be good enough so that the pixels are not noticeable to the user’s eyes. On top of that, the user must be able to have a horizontal viewing field of at least 90-degrees. By matching at least these minimum requirements, according to Butler a VR system can elicit a feeling of presence in its user.

When it comes to measuring presence, it is a difficult task due to its subjective nature. However, there are signs indicative of presence like the behaviour of a VR user in a VE or them stating that they feel like they are present in the VE (Slater 4). Focusing on physiological signals such as heart rate and EEG could be ways of monitoring the user’s sense of immersion while in a VE and offer an indication of the feeling of presence.¹⁷ One way to induce the feeling of presence through the VE “is to increase realism; another way is to match the displays and interactive capabilities to the requirements of the human perceptual and motor systems” (4). While measuring presence can be challenging, quantifying immersion is an equally as complex process, however, it is easier to measure due to immersion having an objective nature, seeing it as refers to the objective immersive technologies employed in VR. Immersion can be quantified by looking at aspects such as:

- “Visual, auditory, haptic, olfactory fidelity - including fields of view, resolution, stereo, panorama, etc.;
- Behavioural fidelity of what is being simulated (e.g., does the virtual human behave, talk, move like a real human?);
- Display lag and system latency;
- Tracking coverage;
- (...) sensory isolation from the surrounding real world;
- Many others.” (4)

¹⁷ Similarly, did Livia Petrescu and colleagues in the context of anxiety detection where they used biosignals measurements to estimate user’s anxiety levels during phobia therapy (“Integrating Biosignals Measurement in Virtual Reality Environments for Anxiety Detection.”)

Each of these aspects would then have a “corresponding ‘presence response curve’ that showed for an ‘average participant’ how presence was ideally thought to vary as these system parameters varied” (4). In other words, seeing as immersion and presence have a causal relation with one another, quantifying immersion could potentially provide a way to quantify the range of presence that a regular user might experience, or at least serve as an indication of it.¹⁸

Following the idea that by measuring immersion one could indirectly and to some extent measure presence based on the fact that they have a cause-and-effect relation, then if the sense of presence is related to the tangibility of the VE,¹⁹ or put differently, the way in which the user’s bodily aspects engage with the VE, focusing on multisensory stimuli and engagement could be a promising approach in measuring presence. In turn, this could result in enhancing the multisensory engagement to enhance the sense of presence within the VE. It is then not illogical to suggest that the relation between multisensory engagement and presence could be causal too. Thomas B. Sheridan suggests that for telepresence and virtual presence can be determined by three quantifiable physical factors: “extent of sensory information, the control of relation of sensors to environment, and the ability to modify physical environment” (122). New media scholar and instigator Jonathan Steuer in “Defining Virtual Reality: Dimensions Determining Telepresence” divides the determining factors for presence into two: “*vividness*, [which] refers to the ability of a technology to produce a sensorially rich mediated environment” and “*interactivity*, [which] refers to the degree to which users of a medium can influence the form or content of the mediated environment”, (125). Steuer’s determinant “interactivity” entails both of Sheridan’s last-mentioned factors, “control of relation of sensors to environment” and “the ability to modify physical environment”. Sheridan adds that the sense of presence can be measured by these objective measures and subjective ratings of the users

¹⁸ While there is not yet a standardised way of measuring presence, but the need for it is. In “Musings on Telepresence and Virtual Presence” mechanical engineer Thomas B. Sheridan with particular interest in human-automation interaction, expresses the “need for an objective measure” for presence (2). Sheridan uses “virtual presence” to refer to presence within a VE. He coined the term in 1992 to distinguish from “telepresence,” which he refers to as a sense of presence in case of involving remote teleoperations (Steuer 7). However, the addition of ‘virtual’ is unnecessary since both telepresence and virtual presence entail “a sense of transportation to a space created by technology” (Lee 29). The technology that made the feeling of presence possible is not of interest since “presence is a general term that does not specify any technological domain” (29). Moreover, “a technology-specific differentiation of presence (telepresence vs. virtual presence) is meaningless, because presence, by definition, is a psychological construct dealing with the perceptual process of technology-generated stimuli” (30). However, since this issue is concerning a rather philosophical debate and it is unnecessary in answering my research question, I will not further engage with it since it would cloud my analysis.

¹⁹ As mentioned in the previous chapter.

(123). These objective measures proposed by Sheridan highlight the importance of sensory engagement in creating a sense of presence in VR and their close relation.

The role of multisensory engagement seems crucial in creating a sense of presence in VR, since the senses are perceiving the immersive technologies employed by the VR system and giving the signals to the brain that then creates the feeling of presence. Or as human computer interaction specialist Frank Biocca writes in “The Cyborg's Dilemma: Progressive Embodiment in Virtual Environments,” “the senses are the portals to the mind” (ch. 1.1). These immersive technologies are made up of vision, sound, and touch in a VE, thus, respectively, engaging the user’s senses of seeing, hearing, and touching. Then similarly to the relation between immersion and presence, multisensory engagement seems to have a cause-and-effect relation with immersion and presence. More specifically, multisensory engagement seems to result in immersion that then results in presence. So, therefore by effectively engaging with the user’s senses in VE through visuals, audio, tactility, and even olfactory stimuli, the VR system provides accurate multisensory stimuli that can enhance the feeling of presence.²⁰ For example, high-quality visuals with a wide viewing field and high resolution can provide a more realistic visual experience, while spatial audio can create a sense of depth. Moreover, haptic feedback provides the user with a sense of touch and physical interaction with the VE. Olfactory stimuli can add another layer of realism by providing scents that match the VE, though this kind of stimulus is not yet that common. By effectively engaging with multiple of the user’s senses and providing accurate sensory stimuli, a VR system can create an immersive experience that can enhance the feeling of presence.

However, not all senses within VR form “channels for information,” since seeing, hearing, and touching are the only senses ever indeed engaged by the VR system, with “nasal and oral senses underutilized” (ch. 2.1.1.). In “At the Heart of It All: The Concept of Presence”, Lombard and Ditton whose focus lies on psychological processing of mediated experience, state that “it is generally believed that the greater the number of human senses for which a medium provides stimulation (i.e., media sensory outputs), the greater the capability of the medium to produce a sense of presence.” Like Steuer states that “more senses must be stimulated for a feeling of presence to arise (85). So, the more senses the virtual environment engages with, the more immersed the user is and thus the more the sense of presence can be enhanced, once again highlighting the causal relation between the concepts. However,

²⁰ Emphasis on “accurate” since inaccurate sensory engagement with a VE does not result in immersion and consequently presence.

Lombard and Ditton argue that “in general, our visual and aural senses dominate our perception and have been most often identified with presence.” (ch. “Causes and Effects of Presence”). Besides the importance of the number of sensory output channels, they also argue that the consistency of this information via the various channels is crucial, explaining that all the sensory channels should be perceived as describing the same VE. In other words, “the mediated environment will more likely be perceived as a plausible space if these cues are both rich in quality and have a logical consistency” (Cummings and Bailenson 4). If this is not the case, the user is confronted with the artificiality of the VE. Therefore, not only the “sensory *breadth*, which refers to the number of sensory dimensions simultaneously presented” but also the “sensory *depth*, which refers to the resolution within each of the perceptual channels” is crucial (Steuer 84-85). Conclusively, accurate multisensory engagement within a VE is crucial for achieving immersion and presence, as there is a cause-and-effect relationship between them.

The immersion of both body and mind in the VE is further emphasized by the idea that the body can act as an interface for interacting with the VE. Both body and mind are immersed when entering a virtual reality world because, through the bodily senses, the VR user receives impulses which they make sense of by their mind. While the user is in the physical world, the sensory stimulation manipulates the user into developing a feeling of presence in the VE. According to Frank Biocca who focuses on technology and communication, the body can be used as an interface for interacting with the virtual environment, and the virtual environment can be designed to be responsive to the body’s movements. “Thinking of the body as an information channel, a display device, or a communication device, we emerge with the metaphor of the body as a kind of simulator for the mind” (ch. 1.3). It is the body that stands front and centre in VR, since the body receives information from the VE through its senses and processes them accordingly, resulting in a sense of presence.

1.4 Virtual Reality Therapy

The immersion of both body and mind by the multisensory engagement resulting in a sense of presence, could possibly be used for therapeutic purposes. A form of therapy that has received increasingly more attention in recent years is virtual reality therapy (or VR therapy) (Corno et al. 2). This type of therapy uses VR technology to create simulations of real-life situations and environments in a safe and controlled way (2). Each patient wears an HMD (head-mounted

display) with which they can perceive the VE (Garcia-Palacios et al. 342). According to the patient's need, the therapist can personalise the VE, providing tailored content aimed at helping them with their specific mental disorder (Corno et al. 2). Throughout the therapy session, the therapist is able to provide ongoing support and feedback, offering the patient a sense of secureness (Garcia-Palacios et al. 342). Research has shown that VR therapy applications are an effective tool in treating various mental health conditions, including anxiety disorders (Boeldt et al.; Carl et al.; Freeman et al. 2395-6; Ioannou et al.; Glantz et al. 62; Pan and Hamilton), depression (Freeman et al. 2396; Ioannou et al.), phobias (Krijn et al.; Glantz et al. 56-8), post-traumatic stress disorder (Carl et al.; Glantz et al. 58-9; Baños et al. "Virtual Reality System", "Adaptive Display"), and substance disorders (Freeman et al. 2396-7; Glantz et al. 61).

In this subchapter, I will explore the concept of VR therapy in more detail, with the specific focus on its use in grief therapy after bereavement as it forms a possibility of using VR as a way to facilitate in the process of finding closure. First, I will elaborate on the significant role of the senses within VR therapy and take as my prime example virtual reality exposure therapy (VRET). I will then move on to discuss grief, more specifically prolonged grief disorder (PGD), and the role that VR therapy can play in helping to cope with PGD. Finally, I will discuss the potential of VR therapy for treating PGD and provide some exemplary projects of VR applications that have been used in the context of grief.

1.4.1 Presence and the Senses in VR Therapy

A specific form of therapy is called VR therapy where VR technologies are employed for the treatment of patients. During VR therapy, the patient's senses are engaged due to the immersive technology used for the VE, designed specifically for their needs (Corno et al. 2; Ioannou et al. 2). The VE engages with multiple senses such as vision, sound, and touch, allowing the patient to experience the VE through their senses, and feel immersed within the virtual world (2; Garcia-Palacios et al. 342). Through sensory immersion, the patient is able to engage with the VR world and feel present in the therapeutic scenarios created within it.

VR creates another world that stimulates the senses and presents stimuli that in some cases could not have been reproduced in real-world settings or would have been costly, as

psychology academic Azucena Garcia-Palacios states (342).²¹ The VE is a controlled space that the therapist can adjust to what they deem appropriate for the patient (Powers and Emmelkamp 567). The patient is meant to feel safe when entering this world. However, there might still be certain negative effects associated with using VR such as simulation sickness (Williams and Mascioni 93-4), which is difficult to prevent and therefore might still occur. Despite these challenges, VR therapy offers a powerful tool for helping patients overcome their mental health conditions in a safe and controlled manner (Corno et al. 6; Garcia-Palacios et al. 342). The multisensory engagement plays a crucial role in creating a sense of presence, providing sensory stimuli that help individuals feel connected to their virtual surroundings (Powers and Emmelkamp 562).

In addition to the multisensory engagement that elicits a sense of presence in the patient within the VE, the patient also needs to perform some sort of task, which in turn enhances the feeling of presence. So writes professor of mechanical engineering and of applied psychology, Thomas B. Sheridan that besides the three principal determinants for presence,²² there are the “major task variables” (6) that together contribute to inducing a feeling of presence. The principal determinants then “are technological and the task variables are task-, or context-based” (Steuer 83). Sheridan suggests that the principal determinants of presence are task-dependent and play a role in inducing a sense of presence (122). Within these task variables, he differentiates between two main properties, “task difficulty” and “degree of automation”, the latter meaning “the extent to which the control of the task (the ability to modify the environment) is automatic as contrasted to being manual” (122). These five factors create an engaging virtual experience that enhances the patient’s sense of presence within the VE. According to the research of psychology scholars Mark Powers and Paul Emmelkamp, it is likely that “some level of presence is necessary for VRET to be effective” though studies assessing “presence” in the context of VRET are few (568). Nevertheless, a sense of presence remains crucial in experiencing the virtual world as something tangible, which arguably seems especially important in a therapeutic setting.

²¹ Similarly, psychology scholars Powers and Emmelkamp write in context of treating fear of flying, that VRET offers enormous advantages over standard exposure therapy (568). “It is highly cost effective, components of the flight can be repeated endlessly in the therapist office, and different flight destinations, different crews, and different weather conditions can be created in seconds.” Additionally, VRET offers the possibility of treatments for “patients who are too anxious to undergo real-life exposure in vivo” (568).

²² Which I mentioned in chapter 1.3.2, but to refresh the memory, the mentioned factors were: “extent of sensory information, the control of relation of sensors to environment, and the ability to modify physical environment” (4).

1.4.2 Virtual Reality Exposure Therapy (VRET)

Exposure therapy is an approach within the field of psychology that seems particularly interesting for my research due to its strong connection to presence and involvement of the senses. During exposure therapy, the patient's senses are central to the therapy process since the body forms the surface against which the exposure takes place, and the senses perceive this encounter. An alternative form of exposure therapy is virtual reality exposure therapy (VRET). Exposure therapy treatment uses exposure as a tool to help patients confront and ultimately overcome their fears and anxieties in a safe environment (Garcia-Palacios et al. 341). It gradually exposes the patient to the thing they fear and avoid in order to “break the pattern of fear and avoidance” (341; American Psychological Association (APA)). This type of therapy has been found to be effective for a range of conditions, like phobias (Garcia-Palacios et al. 342), obsessive-compulsive disorder (OCD), anxiety disorders and post-traumatic stress disorder (PTSD) (APA).²³

In cases where in vivo or imaginary exposure is not practical or desired,²⁴ one can opt for VRET (Garcia-Palacios et al. 347). According to virtual reality psychology scholar Corey Bohil and colleagues, “VR offers some distinct advantages over standard therapies, including precise control over the degree of exposure to therapeutic scenarios” (758). The control over the exposure, results in a smoother exposure for each patient personalised in different stages of the therapy (Powers and Emmelkamp 567). Research has showed that VRET may at times even be the preferred to in-vivo exposure therapy (Garcia-Palacios et al. 347; Powers and Emmelkamp 565).²⁵ Interested in the interaction between virtual reality and mental health disorders, psychology scholars Mark Powers and Paul Emmelkamp even found that “VRET was highly effective in treating phobias (...) and was slightly but significantly more effective than in vivo exposure.” Although other psychology scholars have found that VRET does not offering better result than in vivo exposure (Carl et al. 35). The learnings the patient obtains within the VR world, can be transferred to the physical one (Freeman et al. 2394), thus VR therapy can be considered as a viable alternative to standard therapy.

²³ For an insightful article on VRET for PTSD, see Gerardi, Maryrose et al. “Virtual Reality Exposure Therapy Using a Virtual Iraq: Case Report.” *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, vol. 21, no. 2, 2008, pp. 209-213.

²⁴ Let us not forget that VRET has a level of comfortability that comes with it; “It may become the method of choice for psychological treatment: out with the couch, on with the headset” (Freeman et al. 2394).

²⁵ If there are enough funds to obtain such equipment in the practice since the cost is still rather high. Although with the spreading popularity of VR, this could eventually result in less-expensive systems (Bohil et al. 759-60).

When using VRET instead of traditional exposure therapy (ET), it is crucial for the patient to experience the VE as similar as possible to the real-life equivalent. They must feel present within the environment in order to experience the emotional response associated with the feared object, activity, or situation. Digital mental health experts Rosa M. Baños and colleagues write that “emotions may play a role both as determinants and consequences of presence” (“Immersion and Emotion” 735). So, a VE made with affective content could enhance the sense of presence and in turn affect the emotional response and therapeutic process of the patient.²⁶ Then not only must the patient feel transported into the VE but also emotionally engaged, which in this context is related to their mental condition they have come to treat. Then the creation of the feeling of presence by multisensory engagement is considered an important aspect of the VRET, since it allows the patient to engage with the virtual world and the therapeutic scenarios created within it. If the patient does not feel present within the VE, they cannot engage in the therapy process, because they cannot be exposed to something when they are not “there”. Therefore, multisensory engagement of the VE plays a crucial role for facilitating a sense of presence, providing not only sensory but also emotional stimuli that help the patient feel connected to their virtual surroundings and immersed in the therapy experience.

1.4.3 Prolonged Grief Disorder (PGD)

Grief is a complex response to losing someone you hold dear (Jordan and Litz 180; Marques et al. 1; Shear 120; Botella et al. 675). After the bereavement, individuals enter a period of mourning over the loss they experienced (675; Shear 119). Everyone deals with bereavement in their own unique ways and there is no one-size-fits-all process. However, as time passes, so do the symptoms of grief (119; Jordan and Litz 180). While one may never truly get over the loss, they learn to live with it and find ways to cope (180).

In some cases, a person may continue to have intense feelings of grief for an extended period of time (for adults over one year and for children and adolescents over six months) and

²⁶ Similarly do psychologist Giuseppe Riva and colleagues write about the connection between presence and emotions in virtual reality, stating that VE can induce emotional states when the sense of presence is present (50). Their research suggests “the importance of the sense of presence as mediating variable between the media experience and the emotions induced by it” (55).

if the symptoms are interfering with their everyday life tasks,²⁷ they might suffer from a mental health conditional known as “Prolonged Grief Disorder” or PGD, according to the American Psychiatric Association.²⁸ This debilitating form of grief often co-occurs with other mental health disorders such as PTSD and major depression (Jordan and Litz 181), which is why treatment is crucial. While various kinds of therapy treatments offer people suffering from PGD a way of improving their mental health, they must first initiate the healing process by seeking help, for which VR therapy might offer an attractive option (Garcia-Palacios et al. 343; Powers and Emmelkamp 562).

1.4.4 Virtual Reality Therapy for Grief

According to psychology researchers like Cristina Botella who have a particular interest in the relation between VR and psychology, VR therapy has the potential to offer an alternative to the traditional grief therapy or other therapy methods used to help bereaved persons cope with mourning (Botella et al.; Pizzoli et al.). VR therapy can potentially regulate the patient’s emotions by placing them within an environment that elicits certain specific emotions (Baños et al. “Virtual Reality System”, “Immersion and Emotion”, and “Adaptive Display”), which teaches the patient coping strategies and emotional regulation techniques that they can continue to use outside of the VR therapy treatment. VEs can be designed to foster expression and processing of emotions in a safe and controlled environment (Botella et al. 676). The bodily senses and the concept of presence are central to the potential of VR for coping with grief (676), and the more immersive a VR experience is, the more likely it is to evoke a sense of presence in the user. While VR therapy offers potential in treating PGD, it is relatively new field without a lot of research so more research is needed to understand the relationship between presence, immersion, and the sensory experiences in VR for grief therapy.

There have been several projects that explore the use of VR for coping with grief. For example, *5Days* is an immersive VR game where the levels of the game are made “on the basis of the five stages of grief described by Elisabeth Kübler-Ross: Denial, anger, bargaining,

²⁷ Various symptoms include, but are not limited to, identity disruption, marked sense of disbelief about the death, avoidance of reminders of the deceased one, difficulty with reintegration (such as planning for the future), emotional numbness, etcetera (Appelbaum and Yousif).

²⁸ PGD is also known as Complicated Grief, or CG, however, I will solely use the term PGD since that is the term admitted by the APA (Appelbaum and Yousif).

depression and acceptance” (Roth et al.).²⁹ In each level of the game, the atmosphere (meaning graphical and auditive assets) of the VE corresponds to one of the five grieving stages though the environment itself remains the same. In addition, in each level the user must solve a riddle which in some way connects to the lesson related to each stage. The user can go from one level to another without a specific, predetermined order.³⁰ The result of their test run was that although not scientifically verified, “the targeted emotions (...) are experienced and understood”, and that it ultimately “support[s] progression through the named phases of grief” (5).

Another project is *EMMA's World* designed by a group of psychology scholars or digital mental health experts, including Cristina Botella and Rosa M. Baños. This project has been developed with the specific goal of being applicable for the treatment of multiple mental health disorders of PTSD, Adjustment Disorder (AD), and Pathological Grief (PG) (Quero et al., Botella et al. 676; Baños et al. “Virtual Reality System” 602 and “Adaptive Display” 348). The project has been described as a versatile VR system that can be adapted to different problems for each user. *EMMA's World* “can be described as an adaptive display that reacts to affect” (348), meaning the contents and aspects change with the user’s elicited emotion, by reflecting, provoking, or invoking the user’s emotions. The goal of the project is to address the negative emotions of the patients that are causing them psychological problems and promote emotional processing and acceptance of what happened. The VE can be personalised to make it more meaningful to the user, and the therapist can also choose specific tools within the VE that they deem appropriate or needed for the patient. The project contains five different scenario landscapes, each representing a different emotion and throughout the therapy session, the therapist can adjust the VE to match the context of the session. Specific details within that environment can also be altered to best reflect the emotional state the patient is in. The result of their research suggests that *EMMA's World* effectively transformed negative emotions (353).³¹

Belonging to this short list of projects,³² is the South Korean project *I Met You* (translated from 너를 만났다 or “Neoreul mannatda”). This project is specifically aimed at

²⁹ Elisabeth Kübler-Ross is a psychiatrist and pioneer in near-death studies. She wrote multiple books among which *On Death and Dying* (1969).

³⁰ However, they do mention that “the first and fifth stage are always the start and end stages of the game” (2), respectively, denial and acceptance.

³¹ Due to its overall flexibility of being adjusted according to the situation, makes that this project has already been used for providing psychological support to women after perinatal loss (Corno et al.).

³² This list is by no means an extensive list of all the examples that exist of projects that are similar to the one I have mentioned. They are mere examples of the best-known VR applications for dealing with grief (and PGD).

dealing with grief but is not situated in a therapeutic setting. It is the first of its kind to combine grief and VR in a specific manner (Pizzoli et al.). While the other two projects focus on the VE, more specifically the landscape that can provoke emotions and aid in emotional processing, and personalisation (in the case of *EMMA's World*), *I Met You* takes personalisation of the VR experience to a new level by offering the user the revival of their loved deceased one in the form of a digital avatar and the opportunity for them to meet. This novel approach to combining grief and VR in this way is analysed in greater detail in a following chapter.

1.5 Conclusion

In this chapter, I set up the framework and theory upon which the rest of the thesis will build. I focused on VR as a medium and placed it in historical context of media technologies that hold the promise of being an immersive medium, such as 3D cinema. Moreover, I distinguished VR from a similar medium, 360 video. I then discussed various debates revolving around key concepts in the context of VR such as immersion, presence, and sensory engagement. After separately elaborating on the debates around the concepts of immersion and presence, I also explored their relation, stating that they have a cause-and-effect relation in the context of VR. Moreover, I have demonstrated that through multisensory engagement, immersion and presence can be understood. Therefore, accurate multisensory engagement results in immersion which consequently results in a sense of presence. I explicitly shed light on the importance of accurate multisensory engagement in creating and enhancing a sense of presence. Lastly, I discussed the notion of grief and the various ways in which VR in the context of therapy is used. Once more the importance of the sensory engagement in creating a sense of immersion and presence was highlighted. The chapter ended with various examples of VR applications for therapeutic purpose for facilitating the grieving process of the bereaved.

It seems the discussion surrounding VR, immersion, presence, and multisensory engagement is located within fields including computer and (new) media studies. While in fact the case study of the thesis *I Met You* adds psychology to the mix, thus engaging with psychology field. Then the case study is what bridges the gap between the discussions of various field, by combining technological and psychological aspects in one project. Since there is a need for more research on the relationship between presence, immersion, and sensory experiences in virtual reality for grief therapy, I analysed the South Korean project *I Met You* in the next chapter. This project offers a unique approach to combining grief and virtual reality by allowing users to meet a digital avatar of their deceased loved one. Through the analysis of this project, I hope to gain a deeper understanding of the relations between immersion, presence, and multisensory engagement in the context of VR being used to aid in the grieving process.

Chapter 2: Case Study Analysis of *I Met You*: The Engaged Senses (All There Is to See, Hear, and Feel in the Virtual Environment)

In early 2020, the first season of *I Met You* aired on one of the largest broadcasters in South Korea, MBC. The documentary follows the story of the mother Jang Ji-sung who years before the project lost her seven-year-old daughter Nayeon to a rare blood cancer and how through this project she was able to reunite with her deceased daughter in a virtual reality world. By putting on a virtual reality headset comprising of goggles and headphones, and matching haptic gloves, she was transported in an alternative world where her daughter is alive and happily playing in the park. Upon seeing, hearing, and touching her, the mother is brought to tears and the two spend some precious moments together before they say goodbye one final time. Almost a year later, the second season of the project was aired named subsequently *I Met You 2*. This time it is a husband who reunites with his wife, who passed away due to a serious illness some years prior. In similar fashion as the mother from the first season, the husband is transported into a virtual world custom made for him and he too is overwhelmed by his emotions and brought to tears by the experience of reseeing his deceased beloved one. A third project of the kind was aired a little over a year later in which a woman reunites with her deceased mother in similar circumstances.³³ All the seasons of this project demonstrate the capability of virtual reality in evoking strong emotions in its users, specifically in persons who are grieving the loss of a loved one.³⁴ What makes the *I Met You* project even more exceptional, besides the immersive technologies used and the added personalisation, and except the fact that the project engages with grief and VR in a new way, is the fact that it is the first project to engage in such a relation between human and technology by resurrecting the deceased in a new world in which the bereaved can see their loved ones one last time.

There are three seasons of the project with the similar premise of offering a bereaved person a reunion with a lost loved one through the use of VR. The various seasons of the *I Met*

³³ Around the same time as *I Met You 3* and from the same makers, the project *First In, Last Out* was aired, which in many ways is comparable yet quite different from the ones so far. This season, the story of the firefighters fighting the fire at a large warehouse on the Gunpo street in Anyang, a city south from Seoul, is followed. On the morning on April 21, 2020, a fire broke out at a large warehouse in Anyang, caused by a cigarette lighter from a resting construction worker, igniting an immense fire and causing a large-scale operation by the local fire department. After an exhaustive effort in an extreme environment, the firefighter doused the fire. The VR scene was created based on testimonies from firefighters who were present at the scene. This project aims to provide the general public access to experience a fire scene and have them have more profound sympathy for social issues. Since the nature of this specific project is divergent from the other three seasons, the focus remains on those, and I will thus not pay further attention to this project in the context of this thesis.

³⁴ The manner in which these people experience the virtual reunion, and the different forms of grieving depends also on their cultural background (Stein 9).

You project are comparable to one another in the way they employ the sensory stimuli in the VE. While the details per season differ considering that each VR experience is tailored to each of the users, the mechanisms within the project remains the same, making the projects extremely similar, if not identical when excluding the personalised contents in it. Thus, the analysis is performed on only one of the seasons, since what is true for one of the projects, holds truth for the others as well. Seeing that the first season of the project made a significant impact on the internet worldwide,³⁵ with a video montage of it being posted on the MBCLife channel reaching almost 35 million views of which 12 million in the first week, it is the object of analysis, acting as exemplary of the others.

³⁵ The documentary series is only available to the South Korean public, but multiple video montages of these seasons are posted on the MBCLife YouTube channel as the VIVE Studios and other channels for the worldwide audience to watch. See “Mother Meets Her Deceased Daughter Through VR Technology.” *YouTube*, uploaded by MBCLife, 6 February 2020, www.youtube.com/watch?v=ufITK8c4w0c.

2.1 Analysis of the Visual – The Sense of Sight

The first of the mother's senses to be engaged by the VR, is vision. After putting on the Vive head-mounted display (HMD), the mother immediately comes to face the VE and is able to see and perceive this new world she is in. While the environment forms the background against which the VR experience takes place, it is not peripheral in terms of importance. VE is a pillar for the coming together of the VR world. In other words, surroundings form the foundation against which the experience takes place. In this subchapter, I first look at the general surrounding environment, after which I turn my attention to the use of the avatar, or lack thereof, and link these aspects to the mother's sense of presence.

2.1.1 Surroundings

Upon entering the virtual world, the mother finds herself on a circular platform surrounded by white fog-like scenery, at the border growing grass and in the middle a square of concrete pavement tiles. In front of her, a purple ball is floating (Fig. 1).³⁶ This environment functions as a start screen, a neutral, static environment prior to the upcoming experience. She must make contact with the purple globe in order for the experience to commence. This gives the mother time to get familiar with the digital environment and how she visually perceives it. She is in control of deciding when the experience can begin, which offers her the opportunity to decide at her own pace when she feels ready to start the experience.

³⁶ Which is reminiscent of the crystal globe used by fortune tellers.



Fig. 1: VR start screen



Fig. 2: Mother standing in Nayeon's favourite park with white butterfly flying around her

After touching the globe, the mother is transported to another world. The environment changed to a levelled grassy green field with multiple, green-leafed trees on the rim which cover the grass in some place with their shadows and a dark wooden pavilion under which some round wooden tables and chairs are visible besides the mother (Fig. 2). This site is a digital reproduction of a physical park that according to conversations between the producers of this project and the mother, Nayeon loved to visit. The sun sets and embraces the surroundings in a warm glow. The natural elements, like the flora and sunlight, of this park provide a calming, quiet but moreover natural ambience which is only highlighted by the sound of chirping birds.

A white butterfly flies around the mother before landing on some materials in front of the mother. After the mother hears a girly giggle coming from behind a pile of logs, the digital avatar of her daughter appears and greets the mother. Overcome with emotions, the mother bursts into tears. They greet each other, say they miss each other, and talk a little. It does not take long before Nayeon reaches out her hand as if initiating a high-five and instructs her mother to do the same so that the palms of their hands meet, and they start soaring increasingly higher. A white flash transports them to yet another site.

It is night-time, and a dark purple sky is the home of many sparkling stars and light purple clouds that wrap around the base of the green grass field. On this field there is a big old tree with a swing hanging from it. There are various white furniture pieces, a desk, a dining table with a bench and chair, and a bed with a bedside table. There is a small playground with a tent, slide, and rocking horse toy to entertain herself. This environment represents Nayeon's new home, her resting place.³⁷

On this playground are stacks of presents and a bunch of stringed balloons. The bed is also festively decorated with colourful balloons on each side of the bed and a balloon garland (Fig. 3). On the dining table there is a white frosted birthday cake with colourful candles on it surrounded by other sweet treats. The joyfully decorated environment is depicting a celebratory event, Nayeon's birthday, for which her mother has come to celebrate with her.

³⁷ Which is taken quite literally with the depiction of her bed in which she rests.



Fig. 3: *Mother is transported to Nayeon's "final resting" place*

All the visual elements that comprise the VE, from the surroundings to the items within, are recreated from and inspired by Nayeon's real life and her possessions. These elements were created based on the information given by Nayeon's family members including her siblings and items shown by Nayeon's mother during interviews with the production team. For example, the use of various shades of purple in various aspects of the VE is motivated by Nayeon's fondness of the colour.³⁸ Then with the personal touches to the VE, like the sites, toys, and presence of the colour purple, combined with the use of natural elements, like trees, grass, sunlight, and shadow add to the realism of the environment and thus, for the mother, to the realism of the experience.

The documentary short film *My Own Landscapes* by filmmaker Antoine Chapon (2020) demonstrates the significance of the VE within VR, with specific focus on the realism of the surrounding nature. The documentary explores how VR games are employed to recruit soldiers, prepare them for battle and treat their PTSD upon their return home, and how accordingly, the relation between the soldiers and the video games changes when the purpose of the game changes. Whereas nature functioned as the mere background of re-enacted war situation simulations, when the purpose of the game was to prepare soldiers for war, when the purpose of the game is to treat PTSD, it becomes central in creating a realistic and relaxing environment simulation of nature. The calming natural environment aids the soldiers in processing their emotions related to PTSD. The users can transport the feeling they experienced from this naturalistic imagery paired with sounds of nature like the ruffling of the tree leaves, outside of the VE into real life. Thus, the nature of the game, both figuratively and literally, changed from violent to peaceful and possibly healing. This projects displays the potential that lies within the design of the background and foregrounds its importance in a VR experience, particularly in the context of mental health.

In the case of *I Met You*, while the visual realism of the VE, similar to that in *My Own Landscapes*, immerses its user within the VE, the natural elements and personal content of the VE influence the mother and her perception of the VE differently. While both the natural and personal content represent real-world elements, meaning that elements within the VE are virtual recreations of elements from the real-world, the personal content adds an extra layer of meaning to it. By having the environment consist of personal meaning, the more connected the mother feels to the environment and consequently to the experience because she is emotionally engaged. Baños and colleagues state that emotional engagement is both an effect as a cause of

³⁸ Hence the mother's reason for wearing purple, as a way of commemorating her daughter.

presence (“Immersion and Emotion” 735). Following this statement then, the inclusion of personal content into the VE influences, in addition to the mother’s emotional engagement with the VE, her sense of presence within it. In other words, the affective personal content of the VE enhances emotional engagement, and consequently her overall sense of presence during the VR experience.

Additionally, emotional engagement can only impact the sense of presence if through immersion a sense of presence is already created. Therefore, immersion and effectively presence must precede emotional engagement for it to have any influence on presence. Immersion is further emphasized by the immersive technology of the head mounted display (HMD) providing accurate sensory feedback in response to the mother’s head movements resulting in a sense of presence. While blocking out the physical world, the HMD device responds rapidly and accurately to the mother’s head movements, which allows her to visually explore the VE like she would in the physical world, providing her with a natural visual experience. Precisely because the HMD responds accurately in adjusting the vision according to the mother’s head movements, the sense of immersion is maintained, and a sense of presence is evoked. In conclusion, through immersive technologies that provide accurate sensory stimuli, the mother feels immersed and present within the VE; and through the personal content which engages her emotionally, because presence is already obtained, her sense of presence is enhanced.

However, the sense of presence can be negatively impacted due to limitations within the VE by making the user feel restricted in their ability to explore the VE. For example, if there are boundaries within the VE that prevent the mother from visually exploring certain areas of the environment she wishes to explore, the sense of immersion breaks and accordingly so does her sense of presence within the VE. Although the developers of this project can anticipate and address possible limitations, restraints remain, such as the physical space within which the mother can move. These limitations interrupt the sense of immersion and thereby that of presence and remind the user that they are experiencing a VR simulation because their engagement with the VE is not sensorial accurate.

Naturally, if the VR user is unaware of these limitations, the sense of presence is not negatively impacted. In the case of the mother in *I Met You*, she remains well within the boundaries of physical space throughout the experience. However, there is one particular instance when she almost walks into a wall, and the producers watching on the side line must

intervene and guide her towards open space (Fig. 4).³⁹ This discrepancy between what the mother sees and what she can explore diminishes her sense of presence, since by perceiving sensory cues from outside of the VE, the sense of presence within the VE can be interrupted (Biocca, ch. 6.1).

³⁹ Multiple instances similar to this one have continued to take place even in the later seasons of this project. To show that this limitation remains present in the later seasons of the project I offer an example from *I Met You 3*, in which the daughter that reunites with her deceased mother and walks along with her mother when she has said her goodbye and the staff is necessitated to stop the daughter from walking into the green screen. In this case also, the sense of presence is disrupted.



Fig. 4: *The mother is stopped by production team from walking into a physical wall*

What could more disrupt the sense of presence within a VE that seems to strive for realism in its visuals and sensory feedback, is the addition of a fantastical element,⁴⁰ such as Nayeon favourite purple plush pony that has become a living flying animal. This fantastical element breaks with the visual realism thus far created within the VE.⁴¹ While realism is certainly not the sole determinant of presence,⁴² it could diminish the realism of the experience because it reminds the mother that the world she seems to be in is merely a fantasy world and so her experience of reuniting with her daughter is simply part of that fantasy world.⁴³ In other words, the issue with the addition of such an element is that it might emphasise the artificiality of the environment and therefore the experience of it. However, a breach in visual realism does not necessarily result in a breach of presence since she could still feel present in this fantasy world. In fact, this fantastical addition could enhance her emotional engagement with the VE since it represents a personal connection to her daughter.⁴⁴ Then by triggering emotional response and memories, the fantastical element could potentially strengthen the sense of presence all the more.

2.1.2 Avatar

Besides the flying pony, the VE also features another lively presence, namely Nayeon, or more precisely, a digital recreation that represents her. She is the main attraction of the VR experience. When the mother first lays eyes on the avatar, she is immediately brought to tears. Nayeon appears with a big smile on her face from behind some wood and greets her mother. She is wearing a gold hairband with studded diamonds, a pink leaning towards purple ruffled summer dress, a pink cross-body bag from the *Frozen* film franchise, and green flipflops. The mother recognises all these items as they are digitally recreated versions of Nayeon's most worn and loved item, which the mother showed with the production team during various interviews (Fig. 5). The colour purple is yet again very present and matches the overall colour

⁴⁰ With 'fantastical element', I mean an element which is common in fantasy stories, such as fairies or unicorns.

⁴¹ Sensorial realism is explicitly left out of this observation since it is not impacted by the addition of this fantastical element.

⁴² As was elaborately discussed in 1.3.2.

⁴³ While this is true, for she does not actually reunite with her daughter, but with an avatar representing her, the experience should be perceived as actually taking place.

⁴⁴ Even when she was in the hospital, Nayeon would hold on to her plush friend, and after her passing, her mother placed the pony next to the urn that holds Nayeon's ashes, as if they are still together.

tones of the multiple surroundings. The avatar's facial and bodily features closely resemble Nayeon's when she was still alive.

The production team used various techniques to create the digital Nayeon, including her accessories, body, and bodily and facial movements. For creating the clothing items and accessories, they gathered information during the interviews with the family. They focused on the items that held the most sentimental value and made sure to include those in the VE design. They used 3D modelling to create the digital items and paid close attention to details. To create the body, the team scanned the body of a girl of about the same age as Nayeon (Fig. 6), making up data that they inserted into a software to create a shell of a human (Fig. 7). The next step was to create an anthropomorphic avatar out of this inanimate shell. The team created the shapes of the hairstyle, eyes, mouth, and more, and eventually coloured them in similar colours as Nayeon's, paying close attention to even the smallest of details like her skin texture (Fig. 8). The team used digital photographs of Nayeon as a reference to make the avatar as life-like as possible.

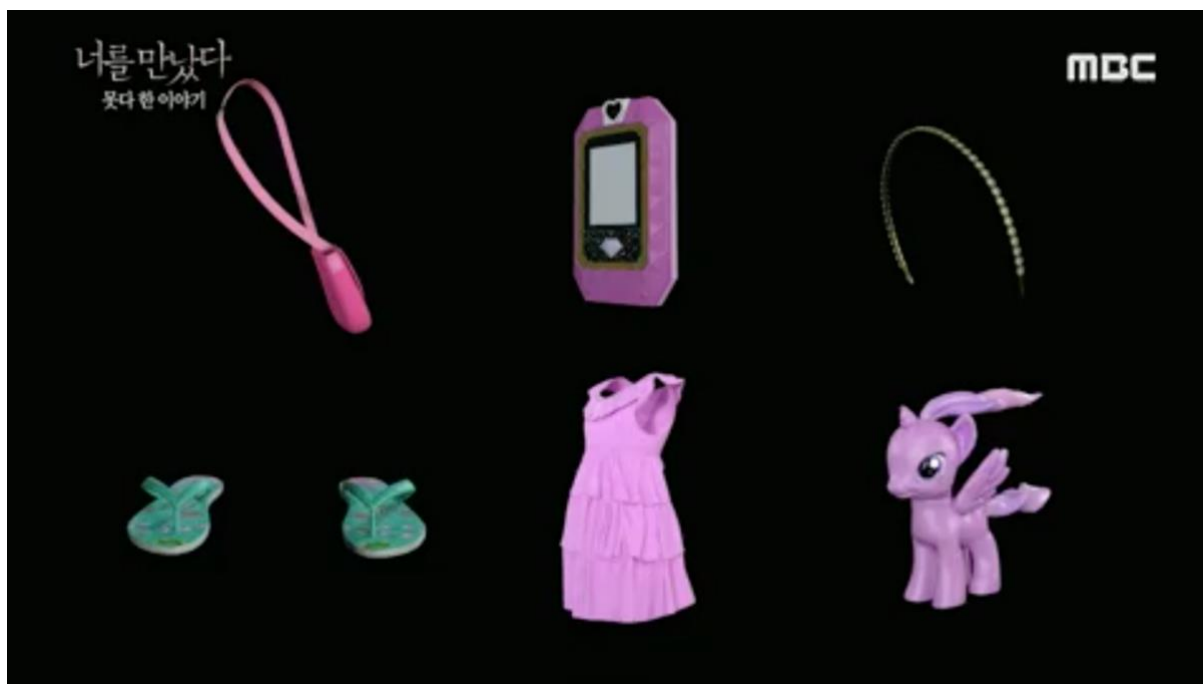


Fig. 5: Recreations of Nayeon's items

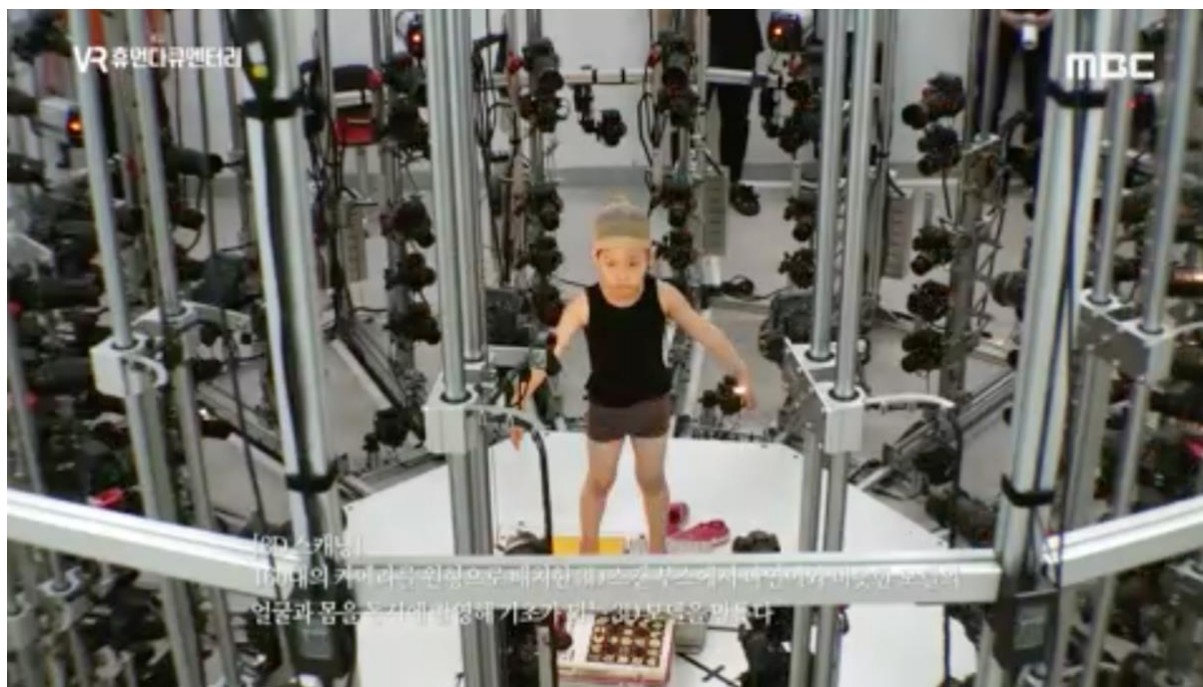


Fig. 6: Scanning of a child to design the shell of Nayeon's avatar



Fig. 7: Digital scan of the girl's body



Fig. 8: Filling in of the human shell by adding details according to Nayeon's appearance

Through this process, the shell has obtained an anthropomorphic appearance, yet it is emotion- and motionless. To make the avatar able to have expressions and to move around, the team used motion capture technology to make the avatar have movements. The woman who operated as the body double for Nayeon's avatar, wore a special headset that placed a small camera in front of her face to capture her facial expressions and was dressed in a full bodysuit with various sensors attached to it. The software detected movements of these sensors and translated them into movement for Nayeon's avatar (Fig. 9). The actress had to run around, play, and walk, among other things, to create the data needed to bring the shell to life.⁴⁵ To as closely as possible resemble Nayeon's expressions and movements, the team used video footage of her as a reference. The body double played out a predetermined script and once the data was collected and transferred onto the empty shell, Nayeon's avatar was brought to life.

⁴⁵ Although the woman who served as a body double was not Nayeon's age, she needed to move her body in such a way that appropriately mimicked the body movements of a 7-year-old girl. Since she was able to do so, the age difference was not important. What mattered were the movements that were picked up by the sensors and translated onto Nayeon's shell.



Fig. 9: The process of adding movements to Nayeon's avatar

While the attention to details of these elements highlights the aim for realism in the VE,⁴⁶ the mere presence of other creatures within the VE, like Nayeon, influences the mother's sense of presence in a particular way. It started with the white butterfly in the first environment flying in circular motions around the mother, rather than passing through her, thus being aware of her presence in the space. Then Nayeon greets her mother, looks at her, and interacts with her, once more acknowledging the mother's presence within the VE. The sense of presence created due to other entities being present within the VE and reacting to the user, is called "social presence" (Heeter 267). Social presence seems to enhance the feeling of "being there" by adding the acknowledgement of others that one is in fact an entity in the space, thus present in the VR world. It can be said that this confirmation of one's existence as an entity in the virtual space by others present within that space solidifies the user's sense of presence. In other words, the social presence resulting from the use of avatars enhances the mother's overall sense of presence within the VE.

Remarkably, despite the significant role of the avatar, the mother herself does not have one. The absence of the mother's avatar and hereby the representation of herself within the virtual space has implications for her sense of presence. She cannot perceive herself as an existing entity within the VE, which impacts her "personal presence" (264). She cannot visually confirm her presence within the virtual world like Nayeon's avatar validates her. However, while the mother's avatar is absent, she is not entirely a ghost presence because she has transparent robotic hands.⁴⁷ Usually when in a virtual world, some part of the body is present as "a dynamic, artificial representation" which is often "a computer generated hand" (264). It seems that accurate hand movements are more important than appearance.⁴⁸ While the social presence brought on by the other avatars enhanced the mother's sense of presence, the lack of a complete avatar might diminish that effect although the sensory feedback that is given is accurate. Consequently, and to maintain her sense of presence, the mother becomes more reliant on other avatars to confirm her presence because she can only partially do so herself. The dependence on the avatar's confirmation of her presence within the VE even more underlines the importance of the avatars, especially in the context of social presence constructing her overall sense of presence.

⁴⁶ One can certainly argue over the importance of the avatar's skin texture since it is a minor detail which the mother might not even notice, which then begs the question whether it is valuable, if at all.

⁴⁷ Although she might as well be perceived as a ghost considering that she does not even have a shadow on the ground when everything around her, including Nayeon, does. The robotic hands are all the mother is within the VE.

⁴⁸ Although one could argue that making the hands look more human-like might enhance immersion and the personal presence effect as well as visually fit more into the VE.

2.2 Analysis of the Aural – The Sense of Hearing

If Nayeon's avatar is meant to represent the digital, living version of her, then, in addition to the visual attributes, she must have all the hallmarks of living Nayeon. So avatars or “animate virtual personas,” must resemble people in their appearance, behaviour, and sound (Glantz et al. 56). In this following subchapter I examine the use of sound within the VE, focusing on Nayeon's voice and her conversation with her mother.⁴⁹ The second sense the mother is introduced to within the VE is hearing, including sounds from both the surroundings and the daughter's avatar. Through the headphones that are attached to the HMD, the mother hears her daughter's voice while the surrounding sounds outside the VE are cancelled out by noise cancelling. In the following subchapter, I examine the avatar's voice and the interaction it offers with the mother, and their possible impact on the mother's sense of presence.

2.2.1 Voice

To create Nayeon's voice, the team recorded the voices of various children of similar age to Nayeon reading the script for the scenario that forms the VR experience. Their goal was to find a voice that closely resembled Nayeon's. They used home video recordings of her to understand her voice, speech patterns, nuances, and intonations. Ultimately the sound mixer adjusted the recorded voices to match Nayeon's pitch and create a soundtrack that would function as Nayeon's recreated voice. By using home video footage, the team could accurately recreate Nayeon's voice. The soundtrack was added to the avatar making it as human-like as possible by giving it speech. The aural aspect of the avatar allows the mother to hear her daughter's voice again and connect with her in a way that is no longer possible in the physical world.

The team used the created voice soundtrack for the avatar throughout the entire VR experience, except for a moment at the beginning of the experience when the mother was searching for Nayeon in the green grassy field, and she hears Nayeon singing. For this fragment,

⁴⁹ I leave outside my focus the natural sounds of the environment for example where Nayeon and her mother first reunite such as the sound of chirping birds in the landscape or the rustling noise of tree leaves. They add to the realism of the VR experience and add depth to the world, however, while not dismissing its importance in making the VE dimensional, I want to turn the attention to the audio aspects of Nayeon's avatar since her avatar is crucial in creating a sense of presence within the mother.

the production team used an actual recording of Nayeon in which she sings a song that she used to sing regularly, which adds personal content to the VE in quite a literal form. This event sets the emotional tone for the rest of the experience. It is a way of introducing the mother to hearing Nayeon's voice within the VE prior to seeing her. However, by using Nayeon's real voice first, followed by the recreated voice, the succession of them might make the mother realise the differences between them. The voices might seem too different from one another. By using the original voice first, the mother is immediately emotionally engaged, however, by then using the recreated voice immediately after, it might just as quickly expose the difference between them, consequently negatively impacting the mother's engagement.⁵⁰

Even if the voice used is not exactly Nayeon's, it allows for the avatar to become livelier and allow a verbal connection between her and her mother. An example of this connection is when Nayeon and her mother sit at the dining table and Nayeon takes a picture of her mother with her favourite pink phone (Fig. 10), saying "Mom, you are pretty," right before the flash goes off. In this case then, the emotional connection the voice offers overshadows the realism of it and so even if the voices differ, together with the visual image of the avatar they construct the digital Nayeon with which the mother can form a relationship and against which her sense of presence is enhanced. In other words, the verbal relationship enhances the sense of social presence the mother feels within the VE, because not only does the avatar react and validate her presence visually, but it also confirms her presence on the level of sound.

⁵⁰ Her sense of presence is not influenced by this.



Fig. 10: Nayeon takes a photograph of her mother

2.2.2 Conversation

The verbal relationship between Nayeon and her mother is crucial for the VR experience. By Nayeon engaging in a dialogue rather than a monologue and asking her mother questions, she sustains the conversation between the two. When they first see each other, she asks her mother, “Where have you been mom?”, “Did you think of me mom?”.⁵¹ The mother, besides simply hearing Nayeon, participates in the conversation and reacts to Nayeon by answering her questions and asking some herself, such as “How have you been Nayeon?”, “Have you been doing well?”. The exchange of questions and answers offers the mother verbal interaction with Nayeon which enhances her engagement.

“Did you think of me mom?”

“Every day.”

“I missed you.”

“I missed you too.”

This back-and-forth dialogue, where Nayeon and her mother ask and answer each other’s questions seemingly reacting to one another, as if the conversation runs naturally, creates the illusion of an interactive conversation. This illusion allows the mother to feel part of the virtual world and enhances her sense of presence and emotional engagement.

Although the conversation appears to be interactive, it is not truly, it is but an illusion. Not only are there are multiple instances where the conversation between the two falters, but there are times when the mother asks questions and Nayeon is unresponsive to them. For example:

“How have you been Nayeon? Your mother missed you a lot. Have you been doing well? You are so pretty. Your mother wants to hug you Nayeon. Your mom missed you so much.”

“Am I pretty mom?”

“You are so pretty our Nayeon.”

⁵¹ This and all the following conversational fragments are originally in Korean and have been translated into English using Google Translate.

The lack of interactive conversation is due to the limitations of using a script. Nayeon's recreated voice is a pre-recorded soundtrack following a script that was written and recorded before the encounter with her mother, making it a fixed scenario. By using a pre-written script, Nayeon's half of the conversation is predetermined and not susceptible to change by the mother within the conversation. In other words, the mother is not able to steer the conversation into the direction she wants, which in turn could efface her perception of her conversation with Nayeon.

To prevent the mother from noticing this incapability of her to change the direction of the conversation, and thus to compensate for this limitation, the team made sure to present an engaging and seemingly interactive conversation, by having Nayeon ask several questions to which her mother can respond:

“Mom, are you afraid?”

“I am not scared.”

And,

“I wrote a letter to you, mom. Shall I read it?”

“Yes.”

Nayeon does not engage with her mother's response, but it also does not hinder the flow of the conversation.⁵² These short conversations pieces, or more specifically question-and-answer fragments, make the mother feel like she is having a conversation with Nayeon, thus enhancing her sense of presence. While the mother responds to Nayeon and what she says, Nayeon, on the other hand, does not since she is not able to respond to her mother's questions:

“Mom, I am cold.”

“Why? Why are you cold?”

“Mom, put your hands like this.”

“Like this?”

“Mom, isn't it nice to touch hands?”

⁵² Neither do they interrupt each other. There is no sign of overlapping speech or them talking simultaneously, as well as be no awkward silences which maintains a nice and natural pace of the conversation.

“Yes.”

The conversation then has become somewhat one-sided. However, once more, by having Nayeon ask her mother multiple things, this one-sidedness of the conversation might not be as noticeable by the mother, if at all. Even so, this limitation runs the risk of negatively influencing the sense of presence.

Moreover, the team also made sure to add personal content to the audio. Much of what Nayeon is saying holds a certain personal meaning to the mother, such as when Nayeon makes her wish before blowing out her birthday candles with her mother, “Please don’t let dad smoke. My siblings should stop fighting. Can our mom stop crying?”. This personal content within the audio keeps the mother emotionally engaged and thus eager to keep conversing with Nayeon. While not so interactive at closer examination, the conversation nonetheless provides the mother with a sense of connection to Nayeon and by having a conversation, her sense of social presence is enhanced.

If despite the efforts of the team trying to make the script feel as interactive as possible, the mother notices that she cannot truly have a human-like conversation with her daughter within the VE, it could negatively impact her sense of presence. Interaction is one of the determinants for presence (Steuer 11), and if the mother feels like she cannot interact with the VE then her sense of presence diminishes. In other words, the technological limitations that make the mother unable to have an interactive conversation with her daughter, causes cracks in the foundation of the sense of presence constructed by the VE so far.

2.3 Analysis of the Tactile – The Sense of Touch

The first thing the mother wants to do upon reuniting with her deceased daughter is to hug her and to touch her once again. By using the Noitom's Hi5 virtual reality gloves, providing haptic feedback to the hands of its wearer, the mother is offered a tactile experience of Nayeon’s avatar. The mother can also physically interact with the surroundings. The third and final sense engaged by the VR system is touch. By engaging this sense in addition to vision and hearing, the mother can construct a cohesive sensory perception of the VE. In this subchapter, I examine the tangibility of the VE, including the avatar and the surroundings, and I relate these elements to the mother’s sense of presence.

2.3.1 Physical Interaction

The mother's first tactile experience within the VE is with Nayeon's avatar. "I want to touch you, just once," are the words the mother utters after reuniting with her daughter. Shy and unsure at first, the mother approaches the avatar and begins to initiate touch. She holds Nayeon's shoulders and strokes her face and hair (Fig. 11).⁵³ The mother is brought to tears by the physical encounter with her daughter. Her desire to feel her daughter again is finally fulfilled. She is able to feel her through the virtual reality gloves she is wearing, which offers accurate sensory feedback for the mother to engage in physical interaction and on an emotional level.

⁵³ On top of accurate sensory feedback through the gloves, this interaction also provides accurate sensory feedback on the visual level, since for example Nayeon's hair moves accordingly to the mother's strokes of her hair.



Fig. 11: *First physical interaction between Nayeon and her mother*

To make the VE tangible to the mother, the team used haptic gloves as part of the equipment that the mother had to wear prior to entering the VE. These gloves can create a sense of touch in the hands of the wearer through force feedback technology, which allows the mother to feel and sense pressure within the virtual world. This process provides the mother with a sense of physical interaction between her and Nayeon when she touches her. The gloves are designed to be highly responsive and provide a sense of touch that is synchronized with the VE, thus offering accurate sensory feedback. Moreover, the sensors attached to the HMD ensure that the mother's hand movements are detected moving in front of the infrared sensors and are then reflected within the VE (Kim et al. 6). These aspects add to the tactile experience of the VE and enhance the mother's sense of presence within this world.

What is more, the mother seems to have autonomy over the physical interaction between her and Nayeon. She can touch Nayeon for as long as she desires. There were no time limits on how long the mother was allowed to touch Nayeon. This aspect of autonomy was integrated by the team so that when the mother would touch Nayeon the scenario would pause for as long as she was in contact with Nayeon. This was meant to give her the time to engage with the avatar for however long she wanted. It allows her to adjust the pace of the experience according to her needs. Additionally, Nayeon would remain quiet but not static. To maintain being perceived as a realistic human being, she would take on a relaxing pose and only make slight movements as to keep in line with the realism of the VE and experience. The freedom the mother has in the timing and duration of touch and the flexibility of the VE to allow her to do so, enhance her sense of presence.

Besides the mother, Nayeon is also able to initiate physical contact. Even though the moments are planned by the predetermined script, they are naturally integrated into the script so that the mother experiences them as Nayeon's natural behaviour. The first time Nayeon initiated contact was when they both were in the green field landscape and she reached her hand towards her mother, waiting for her mother to do the same so that the palms of their hands would meet. Not only does the element of touch make the VE more interactive for the mother, but the fact also that Nayeon initiated it once more confirms the mother's existence in the VR world and thus her presence within it.

As demonstrated in the previous subchapters on sight and audio, visual and auditory elements can be personalized, however, tactile elements cannot that easily. They are limited to the sensory, which in this case is tactile feedback. In previous cases, personal contents could be added to what the mother sees or hears; however, one cannot add personal content to the element of touch within the VE. Through the gloves, tactile feedback is provided when in

contact with a virtual object. While the object can vary in textures, since the gloves are only able to offer sensory experience of that object through force feedback, the user cannot distinguish between touching a plush or a table in the VE for example.⁵⁴ Even if one could alter the strength of the force feedback according to the hardness of objects, the feedback would relate to objective characteristics of that object in the physical world and not the personal content of it. Thus, the tactile experience of the VE seems predicated on the physical objective characteristics with which the mother interacts and not personalisation.

Despite seemingly not being able to add personal content to the tactile experience of the VR, the physical interactions taking place within the played-out scenario add personal meaning to the experience. For example, when the mother and Nayeon arrive at the final VE, Nayeon's resting place, Nayeon surprises her mother by giving her a flower. She reaches out her hand, holding the flower and the mother happily receives it. This instance, the mother is holding a virtual object in her hands and the provided sensory feedback makes it feel as if she is holding an actual flower (Fig. 12). The gift of the virtual flower holds emotional meaning for the mother since Nayeon used to gift her mother with plucked flowers and the fact that the mother can hold it in the VR world, reaffirms her presence within the VE. Similarly, since it is Nayeon's seventh birthday, the mother and Nayeon sit at the dining table and decorate the cake with seven candles. Nayeon hands her mother some candles to place on top of the cake and one by one the mother picks them up and sticks them onto the cake (Fig. 13). When the candles are placed on the cake, they sing happy birthday together, make wishes, and blow out the candles. This interaction is emotionally meaningful to the mother, and further reiterates the mother's ability to touch and interact with virtual objects and thus enhances her sense of presence.

⁵⁴ The incorporation of vibration and heat feedback in the haptic gloves would offer the mother a more nuanced experience (Kim et al. 13). It would make the distinction between touching her daughter and an item in the VE clearer since the gloves could give off warmth when the mother touches her daughter, which in turn also enhances the realism of the experience and her sense of presence.

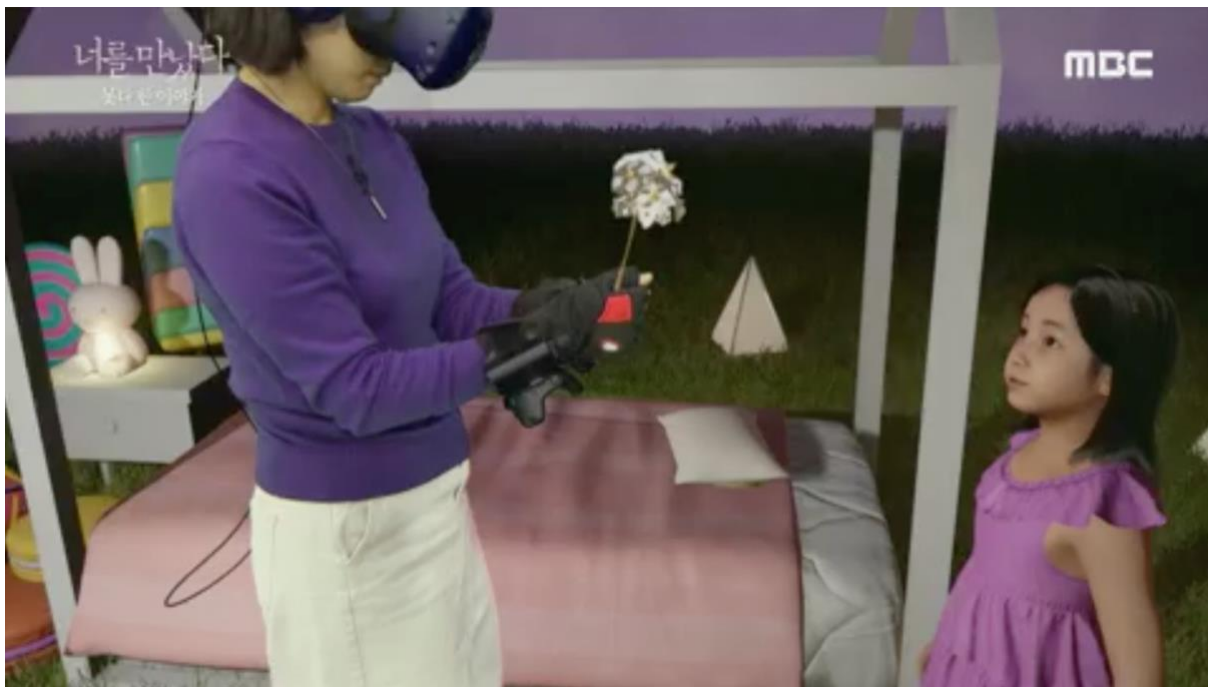


Fig. 12: The mother holds the flower gifted by her daughter



Fig. 13: The mother places candles on Nayeon's birthday cake

However, there are some instances where the two tactile interactions, grabbing the gifted flower and putting the birthday candles on the cake, do not run as smoothly as they should. For example, when the mother tries to grab the flower, it jumps up out of Nayeon's hand and lands in the mother's hand before she had even reached it (Fig. 14). Similarly, when the mother has grabbed the birthday candles and places them on the cake, the candles disappear from between her fingers and quickly reappear correctly placed on the cake (Fig. 15 and Fig. 16). While each of the events takes place in less than a second, and are therefore almost unnoticeable, they are nonetheless noticeable. Moreover, these events could have a negative effect on the mother's sense of presence within the VE, since the sensory engagement does not seem to be accurate. The negative effect is even more reinforced when Nayeon and her mother try to blow out the candles and half of them suddenly go out and, right before the mother takes another breath to blow out the remaining ones, they suddenly go out as well.⁵⁵ The mother reacts surprised by the flower jumping up like it did, the candles disappearing and reappearing on the cake, and the candles going out when she did not blow them out. Even if the delay of the result of the interaction is visual, these occurrences influence the mother's tactile experience since her sense of the objects is suddenly present or disappears, and thus influences her sense of presence within the VE.

⁵⁵ While the first two mentioned are tactile elements that negatively influence the mother's sense of presence, the latter reinforces the visually sudden and unnatural movements of the former two. This delay in visual feedback causes diminishing of the sense of presence (Welch et al. 271).



Fig. 14: *The flower is up in the air after popping out of Nayeon's hand*



Fig. 15: *Candle fades away after the mother lets it go*



Fig. 16: *The disappeared candle suddenly reappears on the cake*



Fig. 17: *The mother cannot seem to grab a hold of something*

There are even bigger issues concerning the physical interaction between the mother and Nayeon when it does not seem to work properly. At the beginning of the experience when the two have met, the mother keeps reaching out her arms to feel her daughter, and while the team made room for the mother to physically interact with Nayeon whenever she desires, she seems to be trying to grasp something that is not there (Fig. 17). She keeps expressing desires of physical interaction with her daughter, “You mother wants to hug you Nayeon,” and “I want to touch you, once more” while desperately grasping in the air. Her efforts are in vain. Not only can she not hug Nayeon due to technological limitations and the fact that the haptic devices only offer tactile feedback to the hands and therefore do not extend to the rest of the body to provide her with accurate sensory feedback,⁵⁶ but she cannot always feel Nayeon through her hands. On top of that, the haptic gloves are fingerless and so when the mother placed the candles on the cake, she held them with her index finger and thumb, which are out of reach for the gloves to give sensory feedback to. Interactions with objects in the VE must result in tactile feedback through a haptic system that is crucial in accurately expressing the interaction, because it is an essential part of immersion that enhances the sense of presence (Kim et al. 2).

While I am only able to observe the mother’s behaviour and therefore cannot state when or whether the haptic gloves do or do not work properly, I can, however, deduce from the mother’s reaction, that at times the tactile feedback does not seem to work as desired. Which in turn, could influence her sense of presence in those moments, since there is a disconnect between what she sees and what she feels through touch. “Missing tactile feedback” can make the person within the VE feel like the interaction is not really happening (Cui et al. 11), which is detrimental to the tactile experience. When the haptic gloves fail to provide accurate sensory feedback, the mother’s sense of presence is diminished, and when the gloves do provide accurate sensorial feedback the mother’s sense of presence is enhanced.

2.3.2 Tactile Interaction with the Surroundings

The physical interaction between the mother and the VE is not solely made possible by the use of haptic gloves. Outside of the haptic gloves, the mother is also able to physically touch the surroundings with her body. When Nayeon and her mother are in the VE which represents

⁵⁶ For an insightful investigation about the tactical experience of hugging a virtual avatar, see Cui, Dixuan, Dominic Kao, and Christos Mousas. “Toward understanding embodied human-virtual character interaction through virtual and tactile hugging.” *Computer Animation and Virtual Worlds*, vol. 32, no. 3-4, 2021, pp. 1-15.

Nayeon's resting place, Nayeon indicates her mother to take a seat on the bench next to the dining table. The mother seems uncertain of the existence of the bench and feels it out with her fingers first before taking a seat. Because of the fingerless gloves, or "glovelettes", the mother is able to feel the bench with her own fingers without mediation of the gloves (Fig. 18). She perceives a surface and so proceeds to take a seat.



Fig. 18: *The mother checks with her fingers if there is a physical surface*

In the physical world, a big block with the same size and shape as the bench in the VE was placed on the location that corresponds with the location of the bench within the VE. In this way, the mother would be able to sit on the bench in the physical and virtual world. The interaction with the bench feels natural since it is not mediated by any kind of technology. Her encounter with the bench may lead the mother to believe that other items of the surroundings within the VE are tangible as well. As a result, when she gets up from the dining table, she walks around the table, despite the fact that there is no table in the physical world and thus she would have been able to walk through it. Her behaviour clearly demonstrates her perception that she is present within the VE and that the objects are tangible to her.

While the haptic gloves are crucial for facilitating physical interaction between the mother and Nayeon, the bench in the VE is also physically tangible by the mother's body when she sits on it. This non-mediated interaction provides realistic and reliable tactile feedback, in the sense that the mother always feels the bench in the same way, and it won't oscillate between disappearing and reappearing, in comparison to the haptic glovelettes which not always provide accurate sensory feedback. As mentioned, this non-mediated interaction might present the illusion that similar items are also tangible without mediation when they are not. This puts limits on the mother's physical interaction to the surroundings. However, she remains unaware of this since she treats all items similarly in that they are there and since she is "there" too, she must go around these objects. Nonetheless, the addition of the bench enhances the mother's sense of presence in making the VE tangible to more parts of her body, which enhances both realism and presence. The mother's sense of presence then does not solely depend on the use of haptic gloves but also on her bodily contact with the surroundings. This offers a more stable sense of presence, since it cannot be disrupted due to delay in the visual feedback as was the case with physical interaction made possible by the haptic gloves.

2.4 Conclusion

Throughout this chapter, I analysed the multisensory engagement of the case study *I Met You* by examining the visual, aural, and tactile dimensions within the VE that accordingly engaged with the mother's senses of sight, hearing, and touch. The VE in all the dimensions seems to strive for realism in the way that the senses are stimulated. However, in the analysis it has become clear that immersion and therefore presence are not always obtained and maintained, which has implications on the way the mother experiences the VR reunion. While the immersive technologies, such as the HMD, functioned properly throughout the mother's VR experience, the limitations of the multisensory engagement within the VE had a diminishing effect on the mother's sense of immersion and presence because during those instances the mother's engaged senses were not coherent with the VE and did not represent the VE accurately in terms of sensory feedback, consequently not offering genuine interaction (Conte 223). As long as the immersive technologies provided accurate sensory feedback within the VE, it resulted in immersion and followed in presence, but when it did not, immersion was not obtained and thereby neither presence. Therefore, it can be said that multisensory engagement and immersion, and immersion and presence have cause-and-effect relations. According to the analysis of the multisensory engagement within the VE, the sense of presence is continuously enhanced and diminished, in other words, it is unstable and oscillates.⁵⁷

While the focus of the analysis was mainly on the multisensory engagement of the VE, I also concluded that within the visual and aural dimensions personal content is added, evoking strong emotional engagement with the VE. When personal content is paired with accurate sensory feedback, it resulted in the mother feeling more connected to the VE and amplifying her sense of presence. The personal content while intended for heightening emotional engagement with the VE, offers another oscillating movement, namely that of the sense of proximity and distance within the VR experience, meaning that the reunion between mother and daughter seems palpable yet distant. Moreover, in the personal content, a distance seems to be sustained between the physical and virtual worlds, and thus the experience herein, namely by the fantastical elements added to the realistic VE, and the use of a recorded fragment of Nayeon immediately followed by the recreated one. Additionally, the mother is only able to touch her daughter through the haptic gloves and thus is limiting the surface for physical

⁵⁷ Which is the same as what Biocca claims about presence, that it is unstable and “fleeting at best” (ch. 6.1).

interaction within the VE.⁵⁸ These elements preserve the distance between her and her daughter as well as between the physical and virtual worlds.⁵⁹

⁵⁸ Philosophy scientist Pietro Conte even proposes that the limitations of the VE show that the producers were mainly focused on visual and sonic realism, leaving interaction on the side lines (Conte 224). “Chatting was not really chatting, touching was not really touching, and even seeing was not really seeing” (224).

⁵⁹ This oscillation between proximity and distance is “a feature essential to the medium of virtual reality” (Conte 225).

Chapter 3: Discussion

The goal of this thesis is to understand the role of immersion and presence through the lens of multisensory engagement within the VE of *I Met You* in facilitating a possible path to closure after bereavement. The main research question is, “In what ways do immersion, presence, and multisensory engagement in the virtual reality case study of *I Met You* have the potential to facilitate in the process of closure after bereavement?” The key findings of this study suggest that the multisensory engagement within the VE influences the way in which immersion and presence play a role in possibly facilitating in the process of closure after bereavement. More specifically, I found that the multisensory engagement appears to reveal an oscillating movement throughout the VR experience between the sense of immersion and presence, thereby creating an interplay between the closeness and distance of the VR experience and impacting its potential for facilitating in the process of closure after bereavement.

The findings of the research imply that accurate multisensory engagement offered a sense of immersion within the virtual world and by cause-and-effect relation resulted in a sense of presence, which is consistent with the claim that a sense of presence is attained when an VE can be experienced through accurate sensory engagement, as suggested by a previous study (Slater 2). Furthermore, the findings showed that in the case of technological limitations when the user experienced inaccurate sensory engagement immersion was disrupted, and along with it the sense of presence, which further underlines their cause-and-effect relations which is in line with what I have argued in previous chapters (respectively, 1.3.2. and 1.3.1).

In contrast, the findings surprisingly indicated an oscillating movement in the senses of immersion and presence, which is inconsistent with the potential of multisensory engagement to provide accurate feedback and thereby a continuous sense of presence throughout the experience. It means that in this case the multisensory engagement was not accurate and could not result in immersion and consequently presence, making this result match with a study discussing the fleeting character of presence (Biocca, ch. 6.1). The multisensory engagement and the sense of presence are central to the potential of VR for aiding in coping with grief (Botella et al. 676), and the level of the immersion achieved through accurate multisensory engagement is indicative of the potential in evoking a sense of presence, which is a finding I expected to make but that the VE did not meet. An obtained sense of presence makes the user more connected to the VE which could elicit certain emotions (Baños et al. “Virtual Reality System”, “Immersion and Emotion”, and “Adaptive Display”), enforcing the process of closure.

Therefore, not having a constant sense of presence is not in line with the expectation and could negatively impact the potential of VR in facilitating in the process of closure.

Another unexpected finding of the study was the significant role personal content of the VE played in relation to presence and in furthermore underlining a similar oscillating movement between proximity and distance or put differently, a distance between the virtual and physical worlds and experiences herein. The findings corroborate with another study that found that the distance within VR is maintained while seemingly bridged (Conte 226). The recreated distance between worlds seems to be in conflict with the VE's seeming aim to be as much of a recreation of the physical world as possible, so that the mother would perceive the virtual world and experience therein as if in the physical world. However, studies state that personalised VEs can be designed to foster expression and processing of emotions in a safe and controlled environment (Botella et al. 676), disregarding the distance between environments. In the same vein, Baños and colleagues argue that emotional engagement due to personal content is both an effect as a cause of presence ("Immersion and Emotion" 735), which means that emotional engagement could allow for fully experiencing the events within the virtual world without regard for the sort of world. Tailored content could help the user in evoking and thereby processing their specific feelings (Corno et al. 2), helping them to find a path towards closure.

The findings of my research contribute to a clearer understanding of the relation between the concepts of immersion, presence, and multisensory engagement within a VR experience that deals specifically with grief. It illustrates the importance of accurate multisensory engagement for achieving a sense of immersion and presence which in combination with personal content of the VE, has practical implications for the design of VE and VR experience in the context of grief, as well as their role in possibly facilitating in the process of closure after bereavement.

Chapter 4: Conclusion

By analysing multisensory engagement within the VR project of *I Met You*, this thesis showed how immersion and presence within the VE could have potential in facilitating in the process of closure after bereavement. The research demonstrates the multisensory engagement within the VE as an important factor in understanding immersion and presence within a VR experience, working as an inducer to both. Moreover, an oscillation between immersion and presence as a result of the accuracy of the multisensory engagement is made clear. Personal content also played an important role in underlining this movement that maintained the distance between the physical and virtual world and the experiences herein. Within the personalised VE, it is possible to process emotions evoked by the environment, making it possible to aid in the process of closure after bereavement.

In this thesis I have focused the research on one case study, however this poses two limitations. First, the generalisability of the findings is limited since I performed the analysis on only one season of the project. While it still is broadly representative for the other two seasons of the project,⁶⁰ it is not necessarily valid for other similar projects. Therefore, more similar research on other similar projects is needed. Lastly, the case study I examined in this thesis has a certain cultural background to it and because I performed a close reading of it, and not a comparative one, I was not able to pay much attention to it. However, it would be interesting to explore that direction further since grief is so culturally dependant. Therefore, I would like to see a follow-up research to be performed using mixed methods, including interviewing people and conducting comparative research. This study serves as a starting point for the future research on this topic.

⁶⁰ Where a husband reunites with his wife, and a daughter with her mother.

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