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A Breathtaking Journey. On the Design of an Empathy-Arousing Mixed-Reality Game

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ABSTRACT

Persuasive games exist for a wide variety of objectives, from marketing, to healthcare and activism. Some of the more socially-aware ones cast players as members of disenfranchised minorities, such as migrants, prompting them to 'see what they see'. In parallel, a growing number of designers has recently started to leverage immersive technologies to enable the public to temporarily inhabit another person, to 'sense what they sense'. From these two converging perspectives, we hypothesize a still-uncharted space of opportunities at the crossroads of games, empathy, persuasion, and immersion. Following a Research through Design approach, we explored this space by designing A Breathtaking Journey, an embodied and multisensory mixed-reality game providing a first-person perspective of a refugee's journey. A qualitative study was conducted with a grounded theory/open coding methodology to tease out empathy-arousing characteristics, and to chart this novel game design space. As we elaborate on our analysis, we provide insights on empathic mixed-reality experiences, and conclude with offering three design opportunities: visceral engagement, reflective moments and affective appeals, to spur future research and design.

Author Keywords

Mixed Reality; Augmented Virtuality; Virtual Reality; Persuasive Games; Games; Empathy; Persuasion; Multisensory; Immersion; Visceral Engagement

ACM Classification Keywords

H.5.1 [Multimedia Information Systems] Artificial, Augmented and Virtual Realities. K.8.0 [Personal Computing] Games. H.1.2 [User/Machine Systems] Human Factors.

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Figure 1. ABTJ at the Dutch VR Days 2015 (Amsterdam, NL)

INTRODUCTION

According to a recent meta-analysis, American college students exhibit a relatively sharp decline in empathy since the early 2000s, especially in relation to the abilities of empathic concern and perspective taking [42]. While the possible causes for this decline are manifold, a part of it might be related to the media and technology we increasingly expose ourselves to (e.g. social networks, reality TV, or digital games [42]). Furthermore, there is a concern that, though contested (e.g. [67]), repeated engagement with the content of violent video games may lead to lower empathy [3]. At the same time however, evidence has emerged that games can influence real world attitudes, also towards more desirable outcomes (or at least desirable to the designers of such games) [86]. These games, more commonly known as persuasive games, could therefore potentially also be used to improve the empathic abilities of the players. The underlying mechanisms, especially in terms of how to design for empathy-arousing experiences in games, are still poorly understood however. With a Research through Design [88] approach and a Grounded Theory [2] methodology this paper aims to shed light on how multisensory immersive experiences, and the subsequent identification with the game's protagonist, could be used to arouse empathy. Finally, we propose a set of design opportunities to guide future design and research endeavors.

PERSUASIVE INTERACTIONS

The use of games for persuasion has gained widespread acceptance. A subset of these leverages persuasion not for

expressly commercial or promotional purposes, but to temporarily put players in the role of specific characters – for example the disadvantaged, marginalized or dispossessed – to communicate "how does it feel" to be in certain conditions. In parallel, many HCI solutions have been developed over the years exploring empathy as a desired outcome, for instance game-based training aids for people within the autistic spectrum. Here we aim to connect these two sets, namely: 1) games that foster empathic connections to promote attitude change, and 2) HCI artifacts designed to elicit empathy as a main objective, often through playful interactions. In the following paragraphs, we further unpack these two points of view on empathy and digital artifacts. The first one is slightly more functionalistic and foregrounds empathy as a desirable means to leverage in persuasion. The second brings aesthetic experiences to the forefront, and explores artifacts aiming at altering users' perceptions, thus producing empathic effects. The two perspectives are not mutually exclusive, as they situate the same phenomena (empathy-induction) in different contexts (applied games and aesthetic artifacts). We now outline these two views, before presenting a device situated in the middle ground.

Empathy-Oriented Persuasive Games

The use of empathy-arousal as persuasive appeal in legacy media is not uncommon, presenting struggles or happiness (e.g. people fleeing from a war torn-country or someone overcoming an illness), and has been effectively used to change or reinforce related attitudes and behaviors [26,40,73,74]. Although games might not have received the same amount of attention as other forms of media when it comes to empathy, they do present a unique array of opportunities to foster empathy [9,14,28,36]. Through their interactivity [81], goal driven nature [45] and various opportunities for role-taking [63], games already present a compelling toolkit for stimulating empathy. As Boltz et al. [15] argue, "well-designed empathy games can also encourage [players] to evaluate choices and consequences, and to question the system a game represents". Games that use empathy-arousing appeals to change or reinforce attitudes belong to the field of Persuasive Games. Bogost coined the term "persuasive games", to describe digital games "that mount procedural rhetoric effectively" [13]. However, this definition was quickly contested for being too narrow, ignoring other possible persuasive dimensions games can encompass [35]. Based on earlier work, unfolding the persuasive gameplay experience [44], we settle for a more general description and refer to persuasive game as 'interactive entertainment designed to shape how the player thinks and feels about reality'.

Current research in game design and education [15,32,77] is exploring how game systems may stimulate the cognitive and affective aspects of empathy. This may empower players to explore alternate points of view and foster a sense of shared similarity and empathic concern for individuals and groups with whom they may not have direct contact (e.g. experiences of trauma, illness, migration, war…). Belman and Flanagan [9] point at PeaceMaker [37] as an exemplar artifact that is at the same time a game: "Cognitive empathy is involved in gameplay [...] To make progress [...] players have to consider the perspectives of a variety of stakeholders, rather than only that of their own side. [...] The game requires one to think carefully about the perspectives of a wide range of stakeholder groups [...] Policy decisions that agitate a stakeholder group too much can potentially derail the peace process." Games such as PeaceMaker [37], Darfur is Dying [68], Hush [4] and more recent games such as This War of Mine [1] and Spec Ops: The Line [87] do not only ask players to empathize with certain game characters, they also present the player with arguments that might cause one to think and feel differently about the people, events or situations represented in these games [44].

Several possible qualities have been named to increase the impact of such persuasive gameplay on a macro level [44], namely Engagement (and Immersion), Credibility and Relevance. For our current research on persuasive games it is in particular the design of engaging and immersive gameplay (i.e. degrees of involvement with a game [17,76]) that present an interesting quality [44], even more so as such experiences have already shown to be conducive for changing or reinforcing attitudes in other fields such as narrative persuasion [21,76], with indication for empathy as facilitating component [84] and as factor to help increase the likelihood such experiences lead to real world prosocial behavior [39]. While engagement and immersion can be strengthened through captivating narratives [48], we might also employ immersive technologies to stimulate similar experiences [21,33]. Through immersive technologies (e.g. head-mounted displays) we can experience a sense of 'presence' in an alternate reality, tricking our brain into thinking that we are somewhere other (a virtual world) than the physical world our bodies actually reside in [20,33,82]. With this feeling of being "somewhere" else, the feeling to stand in "someone" else's shoes becomes possible, which in turn presents ample opportunity to also think and feel like this other person (i.e. empathy). Although little is known about the effects of a mediated 'presence' on persuasion, the concept is captivating [21] and increasingly relevant for the field of persuasive games, in particular due to the recent rise and popularity of virtual reality (VR).

Empathy-Oriented Playful HCI

Similarly, to game design/game studies, empathy is not a new concept for researchers in some domains of HCI. In this part, we focus on artifacts that – while not being full-fledged games – still leverage a degree of playfulness in engaging their users [12,71]. Specifically, the interplay between immersive technology and phenomenology is opening new design spaces: the rapid and widespread diffusion of VR and wearables has made it feasible and relatively affordable to create a variety of artifacts making one experience someone else's phenomenological

perceptions. Design research has drawn upon pragmatist phenomenology to argue that interacting with technology in society "requires us to understand the experiences of [a] person in relation to ourselves and it is [there] that we identify empathy" [27]. To illustrate this, we propose here two approaches to empathy-oriented playful HCI: first immersive journalism, and then wearable devices that modify the perception of one's own body. As we present our selected examples, we categorize them as "playful" inasmuch they are not games, but they are not functionalistic tools either: as Lucero et al. argue, *"playfulness is a mindset whereby people approach everyday, even mundane, activities with an attitude similar to that of paidia"* [49].

De la Peña et al. [62] discuss the possibilities of "immersive journalism", a form of mediated first-person experience of a journalistic reportage, *"[allowing] the participant [...] to actually enter a virtually recreated scenario representing the news story [that] affords the participant unprecedented access to the sights and sounds, and possibly feelings and emotions" [62]*. In this vein, Arora and Pousman developed Clouds Over Sidra [6], a 360° film in partnership with the United Nations, following Sidra, a twelve year old girl, living in the Za'atari camp in Jordan. On the production company's website, co-director Arora describes: *"by leveraging breakthrough technologies, such as virtual reality, we can create solidarity with those who are normally excluded and overlooked, amplifying their voices and explaining their situations"* [6]. And, indeed, filmmaker and digital artist Chris Milk has recently argued for VR constituting an "empathy machine" [56]. When playing Clouds Over Sidra, *"[you're sitting there in [Sidra's] room, watching her, you're not watching it through a television screen, you're not watching it through a window, you're sitting there with her [...] when you look down, you're sitting on the same ground that she's sitting on [...] and because of that, you feel her humanity in a deeper way: you empathize with her in a deeper way"* [56].

In addition to using technology to alter the viewpoint of the viewer, technological devices can also be used to stimulate the other senses and thereby alter one's own bodily perception, with the objective of literally feeling what someone else might perceive. Marshall et al. [51] and Benford and colleagues [11] have experimented with devices built around military-style gas masks, fitted with wireless breath sensors and cameras. They report [51] on a horror-themed maze visited by volunteers wearing sensors-equipped gas masks, who were remotely observed by other participants through their video feeds and breathing sounds. Semi-structured interviews showed the remote participants experiencing heightened fear, arguably because of their empathic bond with the volunteers inside the horror labyrinth. In a later study [11], they present Breathless, a physical installation for three participants wearing breath sensors. Breathless prompts one participant to sit on a swing, another to control its rhythm and the last one to observe them from afar - and they all had to synchronize (in different ways according to their role) their breathing and their movements. Qualitative analyses of the collected data points at an empathic relationship created between the participants by means of their shared perceptions.

An Opportunity Space: Presence, Empathy, Persuasion

The examples and literature discussed so far suggest that 'presence' may be an effective vehicle to support persuasion, to change or reinforce attitudes, and to think or feel differently about objects or issues [60,64]. As such, it is surprising that immersive technologies, particularly in combination with empathy-arousal as persuasive appeal, are still largely absent from the repertoire of games designed to persuade [89]. On one hand, we see a variety of applied games following the footsteps of PeaceMaker [37], fostering empathy by presenting carefully simulated sequences of strategic actions and reactions. At the same time, Marshall et al. [51], Benford et al. [11] and De la Peña et al. [62] exemplify an approach to empathy that is more grounded in playful immersion and in the sense of presence it produces. There are both the technical opportunity and the urgent need for merging these approaches and examine the design of immersive applied games for empathy. For these reasons, an exploratory Research through Design (RtD) [88] process was launched to examine the problem space, produce relevant concepts and test them on an experimental artifact, on which we report in the following section.

A BREATHTAKING JOURNEY

A Breathtaking Journey (ABTJ) is a mixed-reality game, meant to arouse empathy for refugees. ABTJ was born out of a project with Amnesty International the Netherlands [90] in 2014 and 2015, in which we set the objective to explore how interactive media could help motivate people to change or reinforce attitudes towards human rights related issues [43]. The design of ABTJ draws inspiration from empathy-supporting games for change such as Hush [4] or Madrid [29] from art-games such as The Graveyard [83], as well as from unusual immersive experiences such as Taphobos [18]. ABTJ places the player in the shoes of a refugee who is fleeing from a war-torn country, hiding in the back of a truck, to reach a safe haven (fig. 1 and 2). The virtual experience of ABTJ, delivered through a head-mounted display and over-the-ear headphones, is augmented with a range of physical elements including a mask (housing a breathing sensor and a scent diffuser), a tangible contraption mimicking the inside of a truck, an unbalance motor to simulate movement and a controlled shutter to drop objects on the player during the game. The combination of both virtual and real elements effectively positions ABTJ as a Mixed-Reality [10] game. It is particularly close to the concept of Augmented-Virtuality, which is situated towards the Virtual-Reality end of Milgram and Kishino's Reality-Virtuality continuum [55]. Augmented-Virtuality refers to the integration of real world objects into a predominantly virtual world, as opposite to Augmented-Reality where virtual elements are integrated

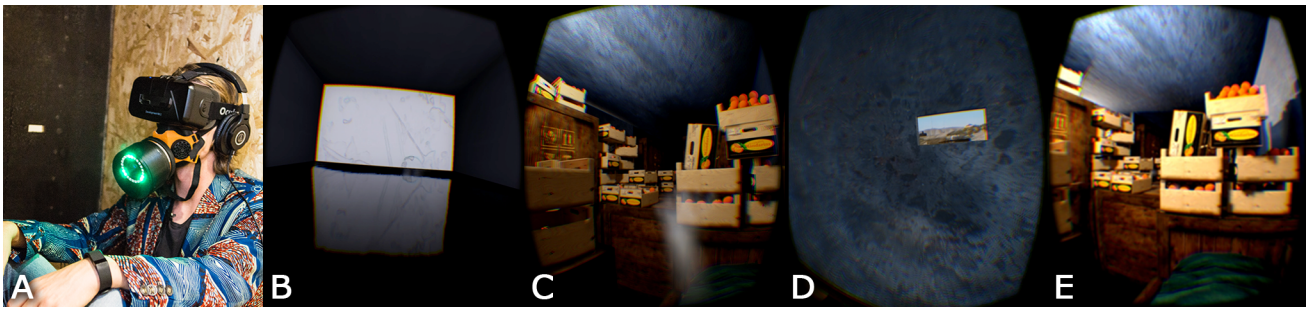

Figure 2A-2E. A: Participant wearing a head-mounted display, a mask to diffuse scent and measure breathing, and over-the-ear headphones. B: Dream scene. C: Driving scene. D: Window on the side of the truck. E: Door of the truck is being opened.

into a predominantly real world. Although the term Augmented-Virtuality is seldom used (and, when it appears, it often refers to the integration of live visuals from reality into a virtual world) we could also consider the inclusion of live physical elements, such as the use of real world gravity, acceleration, wind, mass, materials, scent and temperature, as possible augmentations of the virtual world. This particular format affords the creation of an alternate (virtual) world, completely authored by the designer (through computer generated visuals and audio), all the while supplemented with real, physical, elements (that are still difficult to fabricate digitally) to address additional senses, enhance the experience, and most importantly increase the player's sense of 'presence' [23].

As a RtD [88] project, ABTJ addresses the aforementioned gap between applied games and "empathy machines" by designing a game that (a) generates a sense of presence through embodied and multisensory elements, (b) suggests complex emotions and visceral reactions, and (c) stimulates users to interpret the embedded told-narrative.

Technology

In what follows, we describe how ABTJ provides players with outputs that are 1) audio-visual, 2) tactile, vestibular, and proprioceptive, 3) olfactory. For that last point, we also address the use of an anemometer as a novel input device.

For audio-visual stimuli, we used an Oculus Rift Development Kit 2 head-mounted display [59], providing the player with low latency head/positional tracking and a stereoscopic visual of the virtual environment. It was combined with isolating over-the-ear Audio Technica ATH-M40x [7] headphones, providing simulated spatial audio. Tactile, vestibular, and proprioceptive elements required a more complex setup. By placing users in a wooden crate (roughly 120x100x140cm), we were able to map the virtual world represented in ABTJ with a player's physical surroundings (fig. 1). By precisely superimposing the virtual environment onto the physical contours of the contraption, players are able to actually touch and feel what their avatars might perceive in the virtual world. To create a sense of movement we positioned the the contraption on a suspension system, which simulates a realistic sense of driving via a heavy unbalanced motor situated in a protected compartment underneath the player. Furthermore, to add an extra physical component to the installation, a pair of mandarins is automatically dropped on the player's leg, triggered by a specific in-game event. For olfactory stimuli, and to use the player's breathing as an input, we created a wireless device that closely resembling a gasmask (fig. 2A). The device houses two independently controllable ultrasonic scent diffusers. These diffusers use electronic frequencies to create fast vibrations that vaporize essential oils (mandarin in this case) into the user's airstream. The device also houses an anemometer (wind sensor based on a hot-wire technique) to measure the player's breathing. All sensors and actuators are interfaced to the computer over a (wireless) serial connection using an Arduino microprocessor [5]. We used the Unreal (Game) Engine 4 [25] to drive the narrative, process interactions, facilitate in the communication between sensors, actuators and the game code, and real-time render the virtual environment.

Gameplay

We created an embedded narrative to frame the experience, but, at the same time, we decided to keep it at a minimum to better foreground and explore the multisensory and immersive aspects of ABTJ. The game is divided in two scenes, spanning five minutes overall. We refer to them as the "dream scene" (an auto-diegetic narrative introducing part of the protagonist's background) and the "driving scene" (representing the protagonist hidden in a truck). During the entire game, the player is free to move and look around within the physical boundaries of the contraption, while subtle visual elements are rendered in sync with the input of the anemometer (fig. 2C). Although the game has a single script for the embedded narrative, the player's gender determines the gender of the protagonist and corresponding narration (the auto-diegetic voice).

In the "dream scene" (fig. 2B) the player has no virtual body and floats mid-air in a dark room. A movie (with an outline filter applied) is projected on a white virtual wall, and an auto-diegetic voice tells about a raid kidnapping the protagonist's brother. Then, the movie shows a boat drifting off at sea, with the protagonist's voice telling how he/she escaped the country, how the boat he/she was on sank not far from shore, leaving the protagonist as one of the few survivors. The player sees water rising from below to above his or her head (fig. 2B), as if being submerged and

drowning, after which the environment turns black, and the protagonist explains that continuing the journey through an overland route is the only option left.

The "driving scene" (fig. 2C) begins with the player waking up, hidden in a truck that is transporting mandarins. The diffusers in the mask are activated and disperse the soothing scent of mandarins. A small window on the right side of the crate exists both in the physical and in the virtual worlds, and players can touch it and peek outside over a Middle Eastern/Balkan scenario [see Figure 2D). After several minutes the truck is stopped, players hear a patrol questioning the driver, and an off-voice tells to be quiet and not to breathe. The door on the side of the truck swings open (fig. 2E), the cargo is being inspected, but nothing suspicious is found. When the door closes again several mandarins fall down, alarming the patrol, who consequently inspects the truck a second time. This time however, depending on whether the player is quiet and breathing, the system determines whether the protagonist is able to avoid detection, or not. For this study, both endings are virtually identical, fading the environment to gray, presenting the result of whether the player was caught or not, and ending with the auto-diegetic voice wishing a better future for those in a similar situation.

STUDY

ABTJ was deployed at three tech-oriented public events in Western Europe for a total of six days, between October and December of 2015. Of these events, one was free and two required only a small entrance fee. Furthermore, all three events had a focus on popularizing new technology, thus attracting a diverse population. This is an exploratory deployment study, with which we aimed at putting our RtD device "in the wild" and capture spontaneous reactions, with a grounded theory / open coding approach [2]. The objective was to probe reactions vis-à-vis empathy, embodiment and persuasive emotional appeals, to inform the future design of empathic and persuasive experiences through immersion.

We used an open-ended face-to-face interview protocol [22], formulated for attitude measurement [50,64], in combination with a photo elicitation interview protocol [34]. Interviews were conducted either in English or in Dutch. The interview script aimed at a better understanding a participant's attitudes and empathy (or lack thereof) towards non-European migrants. Photo elicitation was added specifically to frame the responses of participants from the perspective of a refugee, as the concept that empathy includes the communicating of one's own understanding within a particular perspective [85]. Six photo portraits depicting middle-Eastern people were selected from Flickr [91] by two researchers independently based on their diversity and their low degree of emotional face expressions.

Recruitment, Grouping and Interview Scripts

Inclusion in this study required participants to be over 18 years old, and agree to be recorded during the interview. All participants included in the study were from Western-European countries, in specific the Netherlands, Belgium, Germany and England. We randomly created two groups: prospective participants were approached either when waiting in line before experiencing ABTJ (Group 1), or immediately afterwards (Group 2). Given the limitations of field studies [66], we were particularly cautious not to prime participants before playing ABTJ, and therefore decided to only interview participants either before (Group 1) or after (Group 2) playing ABTJ. Priming participants from group 1, giving them opportunity to reflect on the plight of refugees or to spark a discussion with other participants waiting in line, before actually playing ABTJ, could dilute our qualitative understanding of ABTJ's effects on how participants elaborate on their experience afterwards. Group 1 is essentially our baseline group to assess the attitude of people, who did not try ABTJ, towards refugees at the given time and place, whereas responses from group 2, after playing ABTJ, contribute to the qualitatively evaluation of ABTJ's effects.

A total 70 people participated in the study, Group 1 had a total of 32 participants (13 females, 19 males,) with an average interview duration of 59 seconds per participant, Group 2 had 38 participants (13 females, 25 males) with an average interview duration of 93 seconds per participant. The two sets are of different size as not all the people approached ultimately gave consent to be interviewed.

After participants from Group 1 selected one of the six fictional characters ("whose journey do you want to experience?"), they were prompted to elaborate on the character's story, feelings, thoughts, hopes, and beliefs. The interview for Group 2 was identical, with modifications only to tenses (e.g. "whose journey did you just experienced?"). We specifically inquired how the character would think and feel as a method to understand participants' self-expressed attitude from the perspective of a refugee [50]. In our case, an attitude's cognitive components refer to the beliefs, thoughts and attributes held by participants vis-à-vis the refugee's narrative presented by our game. The affective components refer to the feelings and emotions assigned to these cognitive component [64].

We do acknowledge that a field setting (vs. a controlled lab study) might include greater distraction for participants, but it does also offer a more natural setting with greater realism and a more representative population sample [66]. Since participants were completely isolated from the environment during the experience, we found the advantages of a field setting to outweigh the disadvantages. Additionally, with a field setup we aimed for more accurate insights on future real-world application of empathy-arousing experiences as persuasive appeal (e.g. for NGOs and charities that promote their work at public events).

Analytical Procedures, Coding Schemes and Concepts

We used a qualitative form of analysis through grounded theory / open coding [2], informed by humanistic HCI [8],

and informed by narratological [69,70] and pragmatist [54] analytical methodologies. The data resulting from the interviews is a combination of both English and Dutch voice recorded responses. The transcriptions were first coded according to participant's number, gender, choice of character, and whether a response belonged to either Group 1 or Group 2. After this coding, the responses were translated to English, and then we performed a thematic analysis on the textual data following a grounded theory / deductive approach [16]. Two researchers performed our preliminary coding independently, and we converged on four significant coding schemes to account for the recurring themes in our dataset (Socially-Shared Narrative Schemas, Post-hoc Narrative Interpolations, Emotional Markers, and Embodied Feelings). In the following, we present a brief outline of the theoretical grounding for each code.

Our study probes how participants recounted their experience as a refugee in ABTJ (Group 2), or how they envisioned being a refugee would be (Group 1). Doing so, we align with Ryan's [69,70] definition of "narrative quality" or "storiness", which is "a sort of cognitive template at work in many different media, [...] evoking specific cognitive effects in its interpreters' minds" [41]. In the wake of founding metaphors such as Janet Murray's holodeck [57] or Brenda Laurel's computers as theatrical performances [46], the practice of computer game design has significantly evolved in the past decades and produced outstanding interactive artifacts that merge playful competition with nuanced storytelling structures. Indeed, there are several ways in which interactive experiences and games allow players to expand beyond the embedded told-narrative [38]. In specific, we leverage our interview questionnaires and photo-elicitations to tease out the different interpretations of the experience with ABTJ by different participants and, by coding and analyzing participants' responses, we look for correlations between narrative effects and interaction.

We also examined markers signaling emotions in our participants' responses, with a specific interest in the cognitive and affective components [50] used to describe a perspective on migrants either before or after the experience. We coded emotional statements with Power and Dalgleish's [65] 'factor model for correlated basic emotions', as it elaborates on the strong connection between emotions and goals, which in turn fits well within the often goal-oriented nature of games [45]. Although we followed the categorization (both primary and secondary emotions) as presented by Power and Dalgleish's [65] as overarching structure, we also used the more complete list of secondary and tertiary emotions as introduced by Shaver et al. [72] and Parrott [61] for this coding. After coding the explicitly pronounced emotions we additionally decided to code several sentences that essentially describe certain (complex) emotions inexplicitly (i.e. as a result from sentence structure). We finally coded expressions of embodied feelings in our dataset. The notion of embodiment draws from a long tradition in philosophy and phenomenology: "our experience of ourselves and our world is always embodied and involves […] feelings that are typically unnoticed though […] indispensable for our proficient functioning" [75]. Generally, embodiment in HCI indicates the feedback from a body interacting with an environment. Dourish [24] understand embodiment as "grounded in and emerging out of everyday, mundane experience" which is "directed towards […] practical tasks" and providing "a source of meaning". In practice, we coded expressions in our data describing interactions between players and their environment, including quotes from participants telling about not only their own physical body acting upon parts of the device (e.g. the breathing sensor, the wooden crate…), but also about their avatar's simulated body interacting with the virtual environment.

ANALYSIS

We now produce a qualitative analysis of the data collected throughout our study. As this is an exploratory deployment, we went in as much as possible "as a blank slate", with the objective of capturing data for a study based in grounded theory. After transcribing and translating the data, a preliminary open coding was performed (by two researchers independently). Here we report on four significant coding schemes that emerged from our reading (Socially-Shared Narrative Schemas, Post-hoc Narrative Interpolations, Emotional Markers, Embodied Feelings), that we use as lenses to access our participants' experience through the narratives they produced.

Socially-Shared Narrative Schemas

The themes of migration from Africa and the Middle East, and of refugees escaping war-torn countries have been significantly present in Western media in the past decades, often becoming a polarizing topic in social and cultural discourses. Expressly leaving aside the political implications of these subjects, as a first step in our study we probed for spontaneous narratives about migrants from a group of our participants that had not yet interacted with ABTJ. With this first coding scheme, we teased out quotes from participants who produced coherent narratives about the experience of being a migrant without having interacted with ABTJ. Participants in Group 1 (interviewed before interacting with the artifact) were shown a diverse set of photo portraits, and asked to choose one. In a short open-ended interview, they were asked to envision and tell a short narrative from the point of view of the selected character, including events, contexts, thoughts and feelings. The participants themselves acknowledge the influence of mass media – as Peter (pseudonym, #33, Male, Group 1, Portrait 4) notes: *"This is of course […] borrowed from the news, so I don't really have an idea about her on a personal level..."*

We observe some recurring narrative structures across these data – stories that, despite containing negative elements, are also about determination, willpower and the fight for a better future. Emma (pseudonym, #37, Female, Group 1,

Portrait 2) proposes: *"It looks like she is holding something. I think she is like a person who has demonstrated or up and against something in her country, and eh, and therefore she is kind of strong, will power and because of that, as a consequence, she has to flee her country. She might have some children, and a husband. Maybe her husband is dead, and eh, her children might already be somewhere and she is protesting and wants to change something in the country she comes from."* In addition, Kevin (pseudonym, #79, Male, Group 1, Portrait 2) elaborates: *"I think he is about the same age as I am, so I think he is a student and I think he is looking for the best future, just as we look at our future here in the Netherlands. He will seek this better future possibly in Europe or somewhere else where it's safe because I think you have the best change to be secure, be safe, and have a better future in countries or states like the European Union or the United States or comparable countries."*

Whereas some participants also produced very short and generic descriptions, the examples proposed here show some articulated (albeit stereotypical) ones. There seems to be a recurring narrative schema at work here, arguably ingrained in some mainstream media representation of migrants and refugees. Thematic nuclei in these archetypical structures include the escape from a war-torn country to avoid violence or persecution; embarking on a long, difficult and stressful journey trying to reach a safe haven; worries about what the future might bring; and having to leave family behind in the process. Let us now return to the embedded narrative programmed into ABTJ: for the purpose of our study, that storyline was designed to be as generic as possible, without deviations from a canon of refugee stories. It mentions the protagonist's brother's abduction, the decision to flee the country, a dangerous journey by sea and a ride in the back of truck, hiding in a small space between crates – all elements that fit into the socially-shared narrative schema outline above, of which Emma's and Kevin's quotes demonstrate an implicit knowledge.

After having compared ABTJ's narrative design with a general basic socially-shared response to a narrative photo elicitation technique, we will now proceed to examine how it was later reconceptualized by participants after having interacted with ABTJ.

Narrative Interpolation

The concept of narrative interpretation, or the creation of a story-like account of first-person experiences, is not new in digital media and game studies [38,69,70], and also constitutes the basis for a number of research methods leveraged in HCI practice, from experience sampling to diary studies. In this section, we report on not only how participants narrated their experience interacting with ABTJ, but also how they spontaneously interpolated it by adding extra details not explicitly present in the system.

In our data, we highlighted portions that clearly refer to the diegetic world represented in ABTJ, but at the same time do not exist in the embedded narrative. Following the same protocol of Group 1, participants in Group 2 (interviewed after interacting with the artifact) were shown photo portraits, asked to choose one, and told that the person depicted was also the one they "enacted" during the experience. Then, they were asked to tell a short narrative from the point of view of the selected character. Mark (pseudonym, #47, Male, Group 2, Portrait 3) produces these interpretations, not literally and immediately connected to the embedded narrative: *"[It was] you make yourself very, very small, very insignificant, you sit in a corner behind boxes, your window is very small."* Daniel (pseudonym, #31, Male, Group 2, Portrait 3) further expands: *"Well, I guess that I felt how anxious it is to endure the journey, and constantly on the lookout to avoid being discovered, be sent back, or murdered […] Especially when it [the truck] was stopped. Because in the beginning I thought, it is going quite well, look a bit out of the window, and let everything just pass by. And when the door really opened it started to feel quite tense. It was the moment I was also pointed out to hold my breath when I thought, oh yeah, then I was suddenly totally pulled into the experience, oh yes, this is how it is, quite exciting what's happening here. […] I really thought, oh this is the moment that I should really remain quiet because otherwise I might soon be discovered."*

These quotes demonstrate how our participants interpolated the narrative they experience by adding details not originally present in the embedded script. Neither the narrating voice of ABTJ, nor the on-screen action depicts the protagonist making himself/herself *"very, very small"* (Mark), or *"being constantly on the lookout"* or *"[starting] to feel quite tense"* (Daniel). And, yet, these interpolations do make sense within the overall narrative, and the two participants were arguably using them as a means to interpret and convey their own personal experience with ABTJ. However, if we simply lump these phenomena together, we risk keeping them opaque: to address them more effectively, we need to isolate them and apply additional coding schemes specifically on that subset of data, thus teasing out other salient characteristics.

Emotional Markers

We discovered participants leveraging a broad variety of linguistic markers to indicate emotions within the narrative accounts/interpolations they produced of their ABTJ experience. To examine them more in detail, we made a first broad pass coding emotional statements utilizing Power and Dalgleish's [65] 'factor model for correlated basic emotions'. This categorization includes Happiness, Fear, Sadness, Anger and Disgust as primary emotions, and was later expanded following Shaver et al. [72] and Parrott [61] to account for more complex ones (e.g. loneliness, despair, relief, distress, pride).

The following quotes present some examples of emotional markers we teased out from within parts that are clearly

narrative interpolations. On the one hand, we observe a broad palette of markers, ranging from simple to ones that are more complex. For example, Emily (pseudonym, #12, Female, Group 2, Portrait 4) reports: *"[it was] very exciting, tense, especially, yes, you especially are very vigilant, and pay attention. I did not quite know where [the character] came from, but with the water you feel some kind of shortness of breath."* (note: she is referring to the part in ABTJ representing water rising around the protagonist). Frank (pseudonym, #4, Male, Group 2, Portrait 3) mentions an ambiguous condition: *"Ehm. She was sad, but also happy. She was the only survivor of a ship which sunk. And then she was really just very anxious, and especially when she was almost discovered."* Other participants similarly use *"anxious"*, *"tense"* (Benjamin, pseudonym), or *"scared"* (Brian, Anna and Sarah, pseudonyms), *"afraid"* and *"nervous"* (Arthur).

In addition to this, we also observe other more nuanced expressions that convey an emotional connotation coupled with other components that are rooted in physical and/or narrative contexts, such as *"But the [interesting] experience is especially the part when you are locked up in that truck and that you are in her skin. Smell helps, and I felt that I was there, found that it works well"* (Linda) or *"you feel trapped"* (Paul). Whereas the previous examples (e.g. feeling fear) may emerge from a simple open coding, we need to consider multiple dimensions to account for these more complex ones.

Embodied Feelings

If we temporarily collect all the strands of this analysis so far, we notice – throughout many of the narrative interpolations produced by our participants – an abundance of expressions pointing to one's own body, to body parts and to bodily characteristics. This prompted us to apply another specific code to tease out how our participants leveraged embodied terms and expressions to convey better specific feelings, emotions and perceptions.

A first recurring theme involving embodiment is the sense of being physically constricted, almost to the point of claustrophobia. Susan (pseudonym, #4, Female, Group 2, Portrait 4) mentions *"If you are sitting there [note: hidden in a truck] for a whole day it should be awful, I never really realized, I never, it feels quite small, claustrophobic. […] I didn't really feel fear, it was more desperation."* Others talk about being "*locked up […] and […] in her skin"* (Linda), *"your contact with the outside world is minimal. Uh, yeah, and you feel trapped"* (Paul) and *"you realize how lonely one must feel […]this confined perspective"* (Lily).

Different participants elaborated on being prompted by the installation to control their breathing, such as "*It was the moment I was also pointed out to hold my breath when I thought, oh yeah, I was suddenly totally pulled into the experience, oh yes, this is how it is, quite exciting what's happening here"* (Daniel). But breathing was also pointed out to be something on which the device and the embedded story have an indirect effect: for example, Emily refers to the scene in which the protagonist is getting submerged in water and reports that *"[in] the water you feel some kind of short[ness] of breath"* – it should be mentioned that the device worn by users was not actively restricting their airflow in any way. The emphasis that participants placed on bodily feelings and on physical sensations in their recounting of the experience is significant. It suggests how a first-person mixed-reality experience may provide players with a repertoire of embodied feelings – even those not explicitly mentioned in the embedded narrative – over which they may elaborate.

The four coding schemes, and related observations, that emerged from our exploratory study are partially surprising. We found evidence of participants clearly situating their experience in the contemporary mass-media discourse (Code 1: Socially-Shared Narrative Schemas), and yet being well-disposed to interpreting freely and add to the embedded narrative (Code 2: Narrative Interpolation). This suggests not only a promising level of engagement, but also the use of the immersive experience as an "activator", some kind of a catalyst that users leverage to tell original stories about migrants. The third and fourth coding schemes (Emotional Markers and Embodied Feelings) are interesting for their distribution, as they often co-occur in our dataset. This suggests that emotions and physical stimuli, real or simulated, may mutually influence and reinforce each other. We observe many of the foundational components of empathic relationships emerging from the data we collected, further motivating the exploratory agenda of designing for empathic appeals with immersive technology. We point at these elements as an ideal middle ground between the two fields we outlined in the beginning – persuasive games for humanitarian empathy, and provocative aesthetic experiences – and we see further potential and a yet-understudied problem space at the overlapping of the two. We will now extrapolate three design opportunities and related concepts, supported from our RtD process, deployment and analyses, which we offer to the design community as an input for future works.

DESIGN OPPORTUNITIES

Following our observations and analysis, we can discern three different game design opportunities to stimulate empathy arousal in virtual reality. These are visceral engagement, moments of reflection, and affective appeals.

Visceral Engagement

The concept of viscerality has already been explored in HCI design, as exemplified by Norman [58] describing the "visceral level" of an artifact as its look, feel, sound and, more in general, its material components as they support and orient its intended functions. He argues that humans "are exquisitely attuned to receive powerful emotional signals from the environment that get interpreted automatically at the visceral level" [58]. This seems to derive from a metaphorical understanding of the term "visceral" as in the colloquial "gut feeling", and it is not the

only possible connotation we may assign to this concept. Stark reminds us of the etymology of visceral: "affecting inward feelings, and [stemming] from the Latin words *visceralis* or internal, and *viscera*, plural of *viscus* [which means] internal organ, inner parts of the body" [80]. For example, Benford et al. [11], Levisohn et al. [47] and Byrne et al. [19] have already begun exploring aesthetic experiences produced by stimuli acting on users' bodily core, such as breathing, sweating [11] and vertigo [19]. Indeed, the data we collected demonstrate how our participants often conceptualized their experiences in peculiar ways, resonating with this second meaning of viscerality. This is clearly still a much underexplored design space, whose study has been made timely by the rapid diffusion of immersive, tangible, and wearable technologies. Our study and related literature point at clear opportunities for new designs; a design space characterized by viscerally engaging experiences that are insuppressible and intense, difficult to name, feelings that are excited from outside of our bodies, but are felt deep inside. The vertigo caused by the fear of heights, the uneasiness of gazing in a stranger's eyes, the sense of weightlessness and breathlessness in a rollercoaster may be good examples of this opportunity space. We support this proposal by pointing at two moments in ABTJ that have consistently been described through expressions denoting visceral engagement - the part where the user is submerged in water and the part where the player sits between crates, looking outside, while the truck is driving. Both parts provide multisensory experiences that go beyond the audio-visual (the proprioceptive feelings of breathing and of being constricted between crates), that have an inward directionality (inhalation, pressure), and are uncomfortable, if not threatening, to the user's avatar. For example, a participant said she experienced a shortness of breath when visually submersed in water, even though the mask did not restrict airflow. The other moment, when sitting in the truck, participants presented experiences that relate to the feeling of being trapped, cramped and claustrophobic, some explaining that this made them feel very small and insignificant. Being able to create these intense moments provides a compelling case for using immersive technologies, and in particular multisensory/embodied mixed-reality experiences, to explore complex feelings that are otherwise difficult to convey. This could indeed allow a deeper, more empathic relationship with the characters represented.

Although visceral engagement remains an underexplored area, we propose that one can stimulate visceral reactions by taking away players' agency of bodily freedom, creating a sense of confinement through physical space and objects, or acting of biofeedback during gameplay, for example analyzing the players' breathing to determine game progression. Discomfort and suspense are another aspect to consider. For example, we observed some of our participants waiting in line before ABTJ being (unnecessarily) worried about the game possibly restricting their airflow – an element that relates to the uncomfortableness of the "Rising Action", first described by Benford et al. [11].

A Moment of Reflection

Mixed-Reality experiences do not only offer the possibility to sense and feel being "somewhere" else, but also to sense and feel being "someone" else, in first-person experiences that are much more immersive than other screen-based media. Temporarily "inhabiting" other people's perspectives, sensing what they sense and potentially feeling what they feel would seem to address most characteristics required for an empathic experience. However, a fundamental question emerges: when we adopt someone else's point of view through an immersive device, with whom are we empathizing? With the person we "temporarily inhabit"? With other people entering our field of view? Clouds Over Sidra, whose gameplay has been described as "you're sitting there in her room, [...] when you look down, you're sitting on the same ground that she's sitting on" [56], clearly favors this second opportunity. We wonder whether there might be more potential in immersive technologies than what we are using now: can players empathize with their avatars? ABTJ, an essentially solitary experience, has explored this specific opportunity.

And yet, an issue surfaces: if empathizing is the process with which one understands unjudgmentally the experiences, the feelings, and the difficulties of another person, then this is made more complicated by a first-person perspective which does not immediately provide the participants with "someone to empathize with" other than with oneself. As Bob (pseudonym, #27, Male, Group 2, Portrait 2) mentions *"I think I played as myself"*. This process would require reflection and introspection, to allow users to separate themselves from the character. However, reflecting in games is non-trivial, as creating a rich experience leads to a "flow paradox", where being more involved with gameplay can lead to less critical reflection [79]. Does this mean that immersive and interactive first-person experiences that promote empathy are unlikely? On the contrary, as a future design opportunity, we point at empathic relationship with one's own avatar as a still understudied possibility to examine. As a prerequisite, we emphasize the usefulness of leaving a moment of reflection to participants. We argue that this would give them the chance of using the material they experienced to empathize. In our study, this chance was actively evoked through the post-questionnaire (to collect further data, a debriefing session would have been necessary [31] but in a natural setting these follow-up sessions are not easily organizable). But *in lieu* of a formal debriefing, we found that some participants spontaneously used the two-minutes of ABTJ when the protagonist just sits in the moving truck without any told-narrative or challenges as an opportunity to reflect. Some participants report that this moment offered a chance to drift away in thoughts, almost like a mindful experience. This might have actually also presented a moment of

reflection and deeper processing: a moment in which participants had the time to relate their virtual experiences to someone else's experiences in reality, realizing how lonely and claustrophobic such a journey would feel for a refugee. Very recently, a similar argument has been put forward by Marsh, in the context of learning about the great barrier reef [52].

We underline how the majority of narrative expansions and reported visceral reactions took place in that specific moment. We call for designers to create pockets of downtime, where people cannot (or, more preferably, do not wish to) do anything else than experience. The inclusion of mundane activities that create moments of apparently meaningless action could be a yet-underconsidered resource for these kinds of retrospection and introspection.

Affective Appeals

About a decade ago, Bogost argued that games have unique persuasive powers mainly due to their capacity to make arguments through their rules and procedures – a characteristic he named Procedural Rhetoric. Procedural Rhetoric is "The art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images or moving pictures", focusing instead on "using processes persuasively" [13]. Although it is argued that games can use other dimensions for persuasion as well [30,35,44], none is as exclusive to games as procedural rhetoric. However, now with the rapid diffusion of immersive technology we might have an additional, more emotionally engaging, aspect that is unique to games, which is the experience of a mediated presence.

Our analysis suggests multiple ways designers can use mixed-reality to strengthen the affective appeal of their game, in particular through embodied multisensory experiences. Tying back to Bogost's use of rhetoric [13], we wonder whether multisensory and affective persuasive appeals may function in the same way as visual enthymemes [78]. For future designs, we point at the use of scents as a means of pulling players into the experience, or to create discomfort by including less pleasant scents. Affective appeals might also leverage fear/terror as ways to set up a type of persuasive argument (enthymeme). However, with highly immersive (multisensory) experiences, saddening or frightening experiences can be quite overwhelming, and designers should therefore be cautious to avoid events that could possibly cause great distress [53]. To illustrate, for an early prototype of ABTJ we experimented with scents like smoke and mold, which we discontinued for the final prototype as it proved too unbearable to endure.

CONCLUSIONS

With the recent rise of virtual and mixed reality, many questions surfaced on the potential of immersive technologies to influence how we think and feel about reality, with in particular the captivating potential to foster empathy by having players inhabit another person's perspective. But despite the strong interest from industry, already labeling virtual reality as "the empathy machine" [56], little research has actually focused on the arousal of empathy through immersive experiences, and subsequent persuasive processes. Following a Research through Design approach we created A Breathtaking Journey, a multisensory mixed-reality game that provides the player with a first-person perspective of a refugee's journey. A qualitative study was conducted on three tech-oriented public events, followed with with a grounded theory/open coding methodology to tease out empathy-arousing characteristics, and to chart this novel game design space. We observed reactions coherent with the characteristics of empathic responses, and formulated three design opportunities for further applications and research in this field. We offer these, stimulating visceral reactions, introducing moments of reflection, and leveraging affective appeals, as a contribution for future work.

The first design opportunity relates to the stimulation of viscerally-engaging experiences. Our study and related literature point to a design space characterized by visceral feelings, insuppressible and intense, difficult to name, sensations that are excited from outside of our bodies, but are felt deep inside. These feelings are difficult to mediate through legacy media and seem to require a sense of presence. The second opportunity space relates to a moment of reflection. Immersive technology can support the temporarily first-person "inhabiting" of another person's perspective, sensing what they sense and feel what they feel. This seems to address most characteristics of empathic experiences, guiding players to empathize with their avatars. Our study points at a way to overcome this issue by introducing a moment of reflection, the inclusion of down-time to temporarily slow down the pace of the experience, and offer players a mindful moment to acknowledge the other person they are inhabiting. The third opportunity space relates to the affective appeals of immersive technology. In our study we found that participants primarily expand through emotions, rather than logic. This is partly due to the setup of the design, but also a clear indication that immersive technology is able to convey complex emotional experiences such as loneliness and insignificance quite effectively.

There is clearly much more research and design work to do in this application domain, whose opportunities are far from being exhausted. We exposed a still untapped potential for (persuasive) game design research and applied game design, presenting both an exemplar prototype and three opportunities to guide further design and research. In this vein, we urgently call for game designers, interaction designers, immersive journalists, and hardware makers to seriously consider the emerging opportunities of a more empathic way of designing immersive experiences.

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