Case Study on VR Empathy Game: Challenges with VR Games Development for Emotional Interactions with the VR Characters

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Abstract: Empathy development in young children (6 to 9 years old) sets a foundation for emotional regulation and social skills for children's futures. Researchers from the fields of virtual reality (VR) and game design highlight the potential of VR technologies as a great tool to promote empathy. However, there is little empirical and systematic knowledge on how to use VR technology to help promote empathy in young children. To address this gap, we developed a VR Empathy Game prototype to explore how VR experiences can inculcate empathy development in young children. To evaluate this prototype, we conducted a qualitative study with 15 children from 6 to 9 years old. We used an interpretive case study to provide an in-depth understanding of children's experiences with the VR Empathy Game. To guide participant selection, we used a purposeful sampling approach and intentionally included K-3 children with different empathy and social skills levels. This paper describes one case representing a challenge that children with a low level of empathy can experience while playing the VR Empathy Game. This case explains the game experience of a seven-year-old boy, Gabe. The case is entitled: "The VR Empathy Game Experience with a Focus on Exploring the Environment and Looking for Clues." Gabe confused intrinsic and extrinsic game goals and played the game focusing only on the VR environment. He perceived the game characters as an information source rather than building relationships with them unlike the children with a higher level of empathy. This case represents the group of four boys who participated in our study. In comparison with other participants, Gabe's case provided very little evidence of noticing the characters' emotions. Our findings suggest that game designers should provide additional scaffolding for children with little levels of empathy, including additional reflective questions and reminders to interact with the characters. We also suggest a follow-up study exploring how different storylines would help children's game experience.

Keywords: Virtual reality, empathy development, games for children, educational games, case study

1. Introduction

Designing games for empathy development is a new research area. There are no well-tested theoretical frameworks for such games. The most recent research in this area proposed a circular iterative empathy development model for analysing gamification strategies, which includes affective, cognitive, and behavioral aspects of empathy (López-Faican, 2021). However, there were no recommendations or further studies evaluating this model. In addition, this model did not specify the aspect of players' motivation and how it affects players' empathic experiences with the game.

Multiple researchers support using virtual reality (VR) as a promising tool for empathy development (Ang, 2008; Bayley, 2019). We found that children perceive and interact with VR characters as if they were interacting with real people (Muravevskaia, 2022). However, there is no clarity on how to design and scaffold such VR experiences to motivate young children to explore empathic interactions with VR characters.

To address these research gaps, we developed and qualitatively explored a VR Empathy Game prototype (Muravevskaia, 2017). This paper describes our lessons learned about designing a VR game for creating empathic interactions with the game characters. This paper describes potential challenges with a player's misinterpreting extrinsic and intrinsic goals of the game. To illustrate these challenges we used one case of a seven-year-old boy, Gabe, who was able to finish the game (extrinsic goal) without understanding the game characters' feelings (intrinsic goal). This paper provides game designers and researchers with insights on how to avoid such challenges.

2. Background

In this section, we discuss aspects of the educational game design, which relate to establishing the intrinsic and extrinsic motivation for the players. We then discuss the VR technologies related to the motivation of the players.

Extrinsic motivation. Ang (2008) distinguished two types of game goals: extrinsic and intrinsic. The extrinsic game goal is established in the game explicitly for the player through the game structure and narrative. Using

rewards for extrinsic motivation showed an increase in players' emotional involvement, however, it did not show any significant difference in learning outcomes (McKernan, 2015). In addition, Cohen (2001) states that children's games and play activities (badges, for example) based on extrinsic rewards have only a short-term effect on learning outcomes and strengthen a player's primary focus on rewards instead of the topic of study. Kohn (1991) suggests that using extrinsic rewards (e.g., badges or stars) as a method of motivation in games should be minimized because they decrease empathy overall. He suggests that for games designed with a focus on empathy development, an intrinsic motivation is preferred. Instead of using rewards, Rodrigo (2011) suggests using interactive characters and narrative, which can increase a player's emotional involvement as well. However, the relationship between the level of affective attachment and the player's motivation is not clear.

Intrinsic motivation. The intrinsic game goals are learning goals incorporated implicitly into the game (Ang, 2008). They might be organized as side objectives that help a player to achieve the main extrinsic goal. Tight interconnection between game narrative and educational content supports increasing intrinsic motivation, which serves as a basis for empathy development (Habgood, 2011; Aleven 2007). Habgood (2011) names a connection between narrative and education content, "intrinsic integration," which suggests keeping learning goals tightly aligned with the game's narrative and content. Intrinsic integration typically involves "concrete representations rather than abstract ones" (2011, p.175). However, the majority of these studies involve either middle or high school students (Rodrigo, 2011; Habgood, 2011; Ang, 2008), there is a research gap in regard to how the question of motivation should be approached in empathy development games for young children.

Researchers from the fields of virtual reality (VR) highlight the potential of VR technologies as a great tool to promote empathy (Bailenson, 2003; Bayley, 2019). The spatial and physical affordances of VR seem to have a great potential for creating more engaging and immersive experiences for children than 2D games (Bayley, 2019; Price, 2003). However, there is little knowledge on the ways in which VR technology can help motivate young children to have empathic interactions. For example, Bailenson (2004, p. 429) advocates that VR allows "changing the nature of social interaction" through the transformation of interpersonal communication for both virtual and real worlds. Such transformation relates to three different dimensions: representation of the VR characters, sensory capabilities of players, and situational context (Bailenson, 2004; Shriram, 2017). Shriram (2017) states that the proximity and behavior of the VR characters can affect the motivation and the mood of the player. In addition, we found that children express similar behavioral patterns with VR characters and real people (Muravevskaia, 2022). However, it is unclear how extrinsic and intrinsic goals of the game can be accomplished in order to provide a transfer from the learned material to players' real life. In this paper, we address this open question and bring more understanding of applying extrinsic and intrinsic goals in VR games for empathy development in young children.

3. VR Empathy Game Design

We designed the VR Empathy Game prototype as an initial step toward creating a framework for VR empathy games. The aim of this game was to create an empathic environment for a player by providing an opportunity to explore the emotions of different game characters and to learn to communicate with them by expressing prosocial actions.

We created our prototype in the research suggestions from the game design literature discussed in the Background section. We avoided using rewards for extrinsic motivation. Instead, we created the world of the game based on the communication between a player and the game characters. Each game character represented four basic emotions. The Goose character represented the emotion of fear, Baba Yaga - anger, the Older Sister - happiness, the Younger Sister - sadness. In order to keep the learning goals of the game (i.e., exploring the emotions of the game characters) tightly aligned with the game's narrative and the content, we chose the Russian traditional fairy tale "Magic Swan Geese". This fairy tale invited a player to go on an adventure of finding their VR brother. The way to find out where the VR brother is guided a player to interact with each of the characters. In our game, a player can collect information only through communication with the game characters. In addition, we created opportunities for reflections so a player can make cause-effect connections between feelings and the stories of different game characters.

Children were able to interact with the VR characters using the following features: (1) dialog, (2) memories, and (3) glasses. The Dialog feature provided an opportunity to ask the game characters questions. Children could view the memories of each character to understand how the character's past experiences shaped their

personalities and emotional behavior. By wearing each character's perspective glasses, the player can see the world from the character's perspective. Wearing glasses alters the world's colors, sounds, and other characters. In order to finish the game, players were implicitly prompted to express empathy action (i.e., hug the character) towards Baba Yaga in order to help her feel better and return the VR brother back to a player. Details of the VR Empathy Game prototype features are presented in our previous publications (Muravevskaia, 2017).

4. Methods

We designed a qualitative case study to investigate how children from 6 to 9 years old understood and interacted with the VR Empathy Game characters and its environments. Our study was approved by IRB #201600947, which required us to collect signed parent consent forms and verbal children's consent. We conducted individual 90-minute sessions for 15 participants. Each session included three 30-minute phases: (1) pre-surveys, (2) VR Empathy Game experience, and (3) post-surveys and post-interviews. Data collected included interviews, observations, and empathy scales surveys (Bryant, 1982; Reid, 2013). To analyze the data, we used thematic data analysis including inductive and deductive coding (Creswell, 2018). We used an interpretive case study methodology (Stake, 2006; Creswell, 2018) and constructed several cases to explore different types of how children understood and interacted with the VR Empathy Game. In this paper, we discuss one of the cases (see Findings).

We addressed trustworthiness criteria in the following ways. First, this study used investigator triangulation to enhance credibility (Polit & Beck 2006). Second, after finishing the coding process, we conducted peer inter-rater reliability (Creswell, 2018; Landis, 1977) on the post-interview data source. There were four researchers not associated with the project who participated in the inter-reliability process. The inter-rater reliability rate of agreement for codes was 77%. Third, we used thick descriptions, including the context of the study as well as direct quotes from participants (Nowel, 2017). Fourth, we triangulated the following data sources: interviews, observations, debriefing notes, and Empathy Scales. In addition, we used member checking with the school psychologist (Novell, 2017).

5. Findings

In this section, we present a case named, "The VR Empathy Game Experience with a Focus on Exploring the Environment and Looking for Clues," which represents 4 participants from our study. First, we introduce a participant who represents this case. Second, we provide a thick description of a gameplay experience. Third, we provide relevant excerpts from the postgame interview.

Gabe (a pseudonym used to protect the participant's identity) was a seven years old Caucasian boy, who had never had a full VR experience before and liked video games "a lot" (e.g., Pirates of the Caribbean, Lego). Considering Gabe's empathy level in real life, the school counselor described him as "having a hard time seeing from others' perspectives." Gabe's level of empathy, according to our Empathy Scales, was low (9 out of 14) which aligned well with the counselor's description of him. During the study process, Gabe was attentive to the researchers' words and followed the instructions. Gabe did not express many emotions. He seemed very calm, reserved, and answered our questions very directly and briefly. For Gabe, the VR Empathy Game was a "fun" experience, as he mentioned during the postgame interview. During the gameplay experience, he often exclaimed "cool" while seeing new objects or features in the VR environment. Navigation and operation with the game features were easy for Gabe. There were no usability challenges observed.

5.1 Study Experience

The study took place in a local elementary school in Florida, USA. The school counselor escorted Gabe to a room dedicated for the study. Then, the counselor left the room. Katrina, the researcher, guided the process while two other researchers helped with observations and taking notes. First, Gabe completed the pre-surveys. Then, Katrina explained how to use VR controllers to interact with characters and move between environments. Katrina also let Gabe know that he may stop the game any time if he needed. Then, she helped him put on the equipment and he started the game.

The VR game used for the study included different environments with different characters to interact with. After the introduction of the game was done, Gabe entered the Goose's environment, he immediately noticed the Goose. However, before interacting with the Goose, Gabe turned around and set off to explore the Goose's environment. After making a circle around the space, Gabe approached the Goose and asked him a question.

Gabe did not look at the Goose while listening to his response but instead looked around the environment. Then Gabe selected the Goose's memories. While watching the Goose's memories, Gabe periodically got distracted and looked around the VR environment and played with his VR hands. Gabe was less involved in the characters' memories and periodically looked around. Then, he went to Baba Yaga's environment.

First, Gabe walked around exploring the environment. At the moment when Baba Yaga appeared, Gabe took a step back from her in a way that suggests he was readjusting his position in order to see her better or to create a more comfortable social distance. Gabe asked Baba Yaga a question. Without waiting till the end of Baba Yaga's answer to his question, Gabe put on Baba Yaga's glasses and looked around. Then he left Baba Yaga and went to the Older Sister.

When Gabe arrived at the Older Sister's environment he walked around and explored. After Gabe saw the Older Sister, Gabe turned around and went to the plate with the environment again. The Older Sister, designed to engage with the players and not necessarily to respond to Gabe's unexpected behavior, coincidentally asked, "What are you looking for, child?" After hearing these words from the Older Sister, Gabe came to the Older Sister and asked her a question. He listened to her answer. Then, Gabe left The Older Sister's environment and went to the Younger Sister without checking Older Sister's glasses and memories.

In contrast to the previous environments, after entering the Younger Sister environment Gabe went directly to the Younger Sister. Noticing a new feature available (i.e., hug), he hugged her. However, he did not recall the act of hugging her during the postgame interview. He immediately switched to observing the environment and did not express interest in interacting with the Younger sister. Then, Gabe came back to the Younger Sister and asked her a question. After listening to the Younger Sister's answer, Gabe left the Younger Sister's environment to the Forest. After two minutes of playing with a stick, Gabe returned to the Younger Sister. Gabe watched the Younger Sister's memories, and periodically glanced at the environment and back to the screen playing the memories.

Afterward, Gabe returned to Baba Yaga's environment. Noticing the Hug feature, Gabe hugged Baba Yaga. In response to Gabe, Baba Yaga said that it is so kind of him, but she still is not returning the brother. Gabe walked around and then came to Baba Yaga and hugged her again. Then, Baba Yaga got kinder and said that she is sorry for being angry, and she returned Gabe's brother to him. The game was over. It took Gabe exactly 30 minutes to finish the game. Even though it appeared that he was interacting mostly with the environment, moving back and forth between environments, and only passively interacting with the dialog and empathy features, he was able to finish the game in time without help from the researchers.

5.2 Interview Excerpts

During the postgame interview, Gabe, referring to the game, said that "it was a fun experience." When we asked Gabe whom he imagined himself in the game to be, Gabe said: "I was myself." This suggests that he did not imagine himself being any of the game characters from the game story. Even though he identified himself as a child of the VR parents when asked about the game's goal, he did not say "my" brother or "my" parents as some of the other children did. This might suggest less social engagement with the game characters. When asked about the goal of the game, Gabe said that the goal was "to get brother" in order "not to get in trouble with [VR] parents," which was the extrinsic game goal. Gabe said that characters' words and features were "the clues" for finishing the game, and he considered them the sources of the information. Gabe also figured out that "giving a hug to Baba Yaga helped to get the brother back" even though he did it "only to get the brother back."

When Katrina asked Gabe about what the Glasses showed, Gabe simply answered that Glasses showed "things that I may have not seen or heard without the glasses." Gabe did not mention the characters' emotions or how they felt. When asked about the Memories feature, Gabe said that the memories represented "the past that they [characters] remembered." Gabe clarified that "at the very end they [memories] all had different parts." It seemed that Gabe was able to see the connection between all the memory pieces presented by different characters, however, Gabe was not able to make connections between Baba Yaga's past and her current emotions.

6. Discussion

In this section, we discuss our findings and describe the role the VR Empathy Game played in a participant's experience. Also, we outline implications and make suggestions for future work. Our findings provide evidence

of the VR Empathy Game serving as an opportunity to explore a VR environment. However, we observed that Gabe was not interested in interacting with the characters. Gabe was following the arch of the game narrative, which represented an extrinsic goal. However, he did not connect this information with the characters' feelings, which was our intrinsic goal. Gabe perceived the characters and the information they shared as game clues. We suggest that Gabe's behavior was caused by the challenges with empathy. In this subsection, we discuss these findings in the following order: (1) Immersion in the Gameplay Process, (2) Challenges with Focus on Characters and with Engagement into the Storyline, (3) Lack of Empathy Evidence, (4) Potential VR Empathy Game Experience Challenges.

6.1 Immersion in the gameplay process

Brown (2004) suggested that attention to the game task is an important indicator of immersion referring to immersion. Gabe remembered all the pieces of memories from each character and was able to make connections between them. This suggests that even if his behavior looked distracted and seemingly haphazard movement from one environment to another, Gabe was attentive to the information he was collecting from the game. Also, Gabe expressed attention to the game environment objects and experimented with playing with sticks and cones in different ways (e.g., throwing, exploring how they go through another). While Gabe's case did not provide visual evidence of his attentiveness to the communication with the characters as he was noticeably distracted by the environment while watching characters' memories or listening to their words.

6.2 Challenges with a focus on characters and with engagement in the storyline

Gabe did not express much interest in interacting with the characters. For example, upon entering an environment, he did not rush to ring the bell to interact with the characters. In each environment except for the Younger Sister, Gabe took some time to explore the objects the environment had to offer (e.g., sticks and pinecones) before calling the character. Once Gabe met the characters, they did not draw his attention for more than several seconds. For example, right after Gabe came to the Goose's environment and noticed the Goose, he turned around and went to look around the environment without rushing to approach the goose just yet. Only after making the circle around the space, Gabe approached the Goose and picked one of the Dialog questions to ask the Goose. The same happened in the Older Sister's environment. While listening to the characters' initiated Dialog feature, he did not look at them but rather looked around the environment. For example, Gabe did not look at the Goose while listening to his response but looked around the environment instead. Sometimes Gabe interrupted the characters speaking by using another game feature. For example, without waiting till the end of Baba Yaga's answer to his question, Gabe put on Baba Yaga's glasses. This suggests Gabe was not interested in interacting with the characters and getting to know them.

6.3 Lack of empathy evidence

In order to understand why the character feels a specific way, a child needs to recognize that character feels an emotion (i.e., affective empathy) and to understand the reason why this character feels the way that they do (i.e., cognitive empathy) (Obuchova, 2006). In our research, we considered emotional recognition as evidence of affective empathy (Jardine, 2015; Decety & Svetlova, 2012). We were looking for evidence of Gabe understanding how characters felt. Of all the characters, Gabe correctly named only the emotion of the Older Sister, which was "happy." For the other characters, Gabe was a bit confused in his naming of their emotions. He called the Younger Sister, who was sad and crying, "mad." Goose's emotion, which was fear, was identified by Gabe as "mad" because "he [Goose] had to do things for Baba Yaga." Interestingly, Gabe constructed the cause and effect of the emotions of the characters based on their past experience. However, the cause and effect were based on his subjective explanation rather than what was happening in the game story. During the postgame interview, Gabe struggled with identifying the characters' emotions. Gabe was using the words "I guess" every time we asked him to describe the emotions of the characters. This suggests that he was not sure of his answers. This suggests evidence that Gabe was challenged with emotional recognition, which was a construct of affective empathy in our research.

Cognitive empathy is based on understanding why the character feels a specific way (Obuchova, 2006). When we asked Gabe about the reasons why characters feel the way they do, Gabe explained why characters felt the way they did based on his subjective assumptions rather than the real stories from the game memories. Gabe connected all the game pieces. However, Gabe's ability to connect the parts of the game did not hint Gabe to connect it to the characters' emotions. Moreover, we have noticed that while answering questions about the character's emotions, Gabe felt tired and distracted. We suggest that he was not interested in talking about emotions. We got the impression that Gabe did not even understand why we asked him questions about

emotions and how it connects to the game. Therefore, we suggest that Gabe's case did not provide evidence of cognitive empathy.

6.4 Potential VR Empathy Game experience challenges related to extrinsic and intrinsic goals

The findings from our case study contribute to the Game Design field by addressing Ang's (2008) open question about how to use intrinsic and extrinsic goals in educational game design. Ang (2008) distinguished two types of game goals: extrinsic and intrinsic. The extrinsic game goal is established in the game explicitly for the player. While the extrinsic goals are externally imposed by the game structure and narrative, the intrinsic game goals are learning goals incorporated implicitly into the game. They might be organized as side objectives that help a player to achieve the main extrinsic goal. In our VR Empathy Game, the extrinsic goal was to complete the game by saving the VR brother. Our intrinsic goal was to identify the emotions of the characters (affective empathy), to build the cause and effect understanding, of why characters feel that way (cognitive empathy), and to act prosocially toward Baba Yaga to make her feel better. Ang (2008) suggested no empirical clarification about which goals might be more beneficial for empathy games in game design research. We suggest that an intrinsic goal is more important for educational empathy games and they are built on the extrinsic goals of the games. It is important to set extrinsic goals so that these goals guide the child's understanding of the intrinsic goal instead of mechanical actions to complete the game.

In our VR Empathy Game, players need to leverage both the intrinsic and extrinsic goals to save the VR brother. We designed the VR Empathy Game so that without empathy towards the characters (intrinsic goal), players cannot find a brother (extrinsic goal). However, we observed children like Gabe performing the game empathy actions towards finishing the game without empathizing with the characters and even without understanding their emotions, but rather as a part of the game mechanics. Therefore, players like Gabe achieved the extrinsic but not the intrinsic goal, which was the ultimate game's goal.

6.5 Implications

We found the narrator's reminders helpful to keep children focused on the characters. After hearing the words "What are you looking for here, child?" from the Older Sister, Gabe came to the Older Sister and asked her a question. This suggests that game reminders to return to the storyline and game characters helped Gabe remember the characters and return to interacting with the game character. For game designers, this is a design suggestion to draw the attention of children to the game characters. This can be helpful for students who are not attentive or easily distracted. It also can be helpful for children who prefer exploration of the VR environment to interactions with the game characters.

6.6 Future Research

We suggest follow-up research to explore how to set and scaffold extrinsic game goals for children like Gabe so that achieving them would help such children to understand and achieve an intrinsic goal. Following Chapman (2007), who found that boys tend to get more interested in the information while girls are interested in narrative and characters' feelings, we suggest paying attention to the gender differences in VR Empathy Game experiences to conduct further research. It could potentially suggest using different narratives for children of different genders and with different levels of empathy.

7. Conclusion

This paper described a case representing a challenge that children with a low level of empathy can experience while playing the VR Empathy Game: "The VR Empathy Game Experience with a Focus on Exploring the Environment and Looking for Clues." This case illustrated a potential confusion by children between intrinsic and extrinsic game goals. It might cause perceiving the game characters as an information source rather than building relationships with them, as children with a higher level of empathy did. This case represented very little evidence of noticing the characters' emotions. Our findings suggest that game designers should provide additional scaffolding for children with little levels of empathy, including additional reflective questions and reminders to interact with the characters. We also suggest a follow-up study exploring how different storylines would help children's game experience.

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