

News perception in Virtual Reality

Creating an empathic 3D virtual reality experience for young adults

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ABSTRACT

This thesis covers the development process of a realistic representation of a news item in VR. Additionally, the thesis aims to test whether this technology can generate empathic feedback in young adults from 20 to 30 years old. Another purpose is to make recommendations for future developers who are going to work on similar projects.

The project is structured upon the Design Thinking Model and divided according to the stages: Empathize, Define, Ideate, Prototype and Test. The first part presents the results of the literature study and remote interviews. In that terms, the researcher investigated a psychological background of empathy, targeting specific emotions, preferences and opinions of young adults towards the news, and an appropriate production approach for the experience.

The thesis then defines the news item topic appealing to the target audience and the scope and success measurements for the end product. The researcher dedicated herself in the third phase to brainstorming ideas and creating the 3D environment and lighting setup for the demo. The fourth phase presents the results of multiple test sessions of the VR prototype with the target audience. The results of the user testing have proven that the experience helped the targeted participants to get a better understanding of the topic and slightly increased their empathy towards the victim.

For future practices, the study recommends assigning a larger development team with a broader range of skills, such as programming, audio design, psychology, 3D and technical art. To achieve high-fidelity visuals and better performance, the researcher advises investigating the Unreal Engine. Additionally, it may be profitable to optimize those for more affordable hardware for current or future similar products.

The professional product and the video of the VR experience can be found on Google Drive under the following link:

<https://drive.google.com/drive/folders/1CwsPZQi3PGchRtciiEKBPyCrGRx0NYW7?usp=sharing>

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1 INTRODUCTION

Technology has advanced exponentially in recent years. According to Kalogeropoulos (2020), so have the consumption and interests in the news of younger generations. In modern times young people's behaviour towards the news may lead to possible underdevelopment of empathy.

Young people are more likely to navigate news items that seem more appealing and relevant because of the headlines (Zeng, 2014). News articles get scanned to a limited extent, while essential details may get overlooked. Consequently, this leads to a low emotional impact on people and their empathic abilities, making it more difficult for organizations to reach this particular target audience. Nevertheless, modern immersive technology expects to address people's narrow vision and make news more impactful for the younger generation.

Kalogeropoulos (2020) stated that younger generations are a group of great interest and importance to the news agencies, so it is essential to gain an in-depth understanding of their attitude and preferences towards the news. There has been much research on young people's behaviour regarding this topic (Kalogeropoulos 2020; Zeng, 2014; Casero-Ripollés, 2012). In addition, the use of modern technology for the improvement of empathic abilities and elicitation of specific emotions was researched and tested much (Bertrand, Guegan, Robieux, McCall & Zenasni, 2018; Herrera, Bailenson, Weisz, Ogle & Zaki, 2018; Susindar, Sadeghi, Huntington, Singer & Ferris, 2019). However, none has explicitly focused on awakening empathy in young people and changing their attitude towards news items using three-dimensional virtual reality environments.

On behalf of the XR Lab at Saxion University of Applied Sciences, this study explored a possible approach to applying virtual reality as an empathy machine to transmit a news item in an immersive 3D environment. Correspondingly, two graduation students, Kateryna Malyk and Lea Kemper, collaborated closely on multiple aspects of the project. In this regard, Lea Kemper has dealt with storytelling and journalism in VR, technical aspects of the scene creation and VR setup in the game engine. Meanwhile, Kateryna Malyk took responsibility for empathy awakening through visuals while combining the asset and lighting creation for the demo.

1.1 COMPANY OUTLINE

The Saxion XR Lab, based in Enschede, the Netherlands, was the client of this assignment. The company is a new founding from Saxion University. Establishing an XR-focussed learning community was a long-awaited wish accomplished over one year ago.

Matthijs van Veen is accountable for the lab and directs it. Mark Boerrigter is the company and the project supervisor operating in the organisational and marketing fields. Both lab members are instructors from Saxion and are acquainted with CMGT studies. In addition, teachers in technical and educational areas and student assistants are also involved and working in the XR Lab. Although the organisation at this precise moment is compact, it has numerous partners in the industry.

According to Mark Boerrigter, Saxion designed the XR Lab to be a “twilight zone”. It aims to bind students, industry, research and education and to build a semi-real working atmosphere. (M. Boerrigter, personal communication, February 16, 2021) The lab provides a workspace where students, industry, research, and education engage and cooperate on various projects, whether for single, group, minor or even graduation assignments. Students also have an opportunity to focus on commercial projects.

The organisation aims to continuously investigate the interactive realities and the potential application for augmented, virtual reality and visual effects within the learning community. When focussing on the emerging technology, the XR Lab wants to explore its future uses in a wide variety of areas, including storytelling, education or health care. The broad spectrum of desirable subjects attracts student curiosity. In this consideration, even companies are willing to collaborate with the lab. Saxion’s XR Lab provides the learning community with robust and skilled technical assistance and advanced hardware. That is a perfect chance for the students to learn, innovate, experiment with emerging technologies and create their prototypes.

1.2 THE ASSIGNMENT DESCRIPTION

The assignment involved the practical use of virtual reality technologies as an empathy machine to reconstruct a specific significant and emotional news item. The purpose of the project was to evaluate the influence of the experience on the users. Additionally, compare the human perception of the News transmitted through a virtual world with conventional methods of communicating News. Realistic graphics make the virtual reality (VR) experience seem authentic, immersive and persuasive. Therefore, it contributes to a more powerful effect on the testers. In contrast to a traditional news item representation, the final result was supposed to enhance empathic abilities and be more impactful.

1.3 OBJECTIVES OF THE CLIENT

1.3.1 CLIENT QUESTIONS

The description of the assignment was closely related to the client question and objective. The client required answers to the following questions:

- How can VR be employed to awaken empathy among people as the ultimate empathy machine?
- Does the use of VR have an impact on the opinions, views and actions of people?
- Is there any difference between experiencing an event or reading about it online?

During the interview, the company supervisor raised a significant observation. Nowadays, individuals are prone to have tunnel vision when it comes to reading news articles. (M. Boerrigter, personal

communication, February 16, 2021) In this case, the article headlines and the texts get only scanned briefly. A variety of essential facts may get overlooked.

Although there were no specific guidelines or restrictions regarding the development, the production team had absolute freedom and flexibility throughout the complete process. That was an ideal opportunity to delve into the assignment with an open outlook. This approach helped to take into consideration any aspect that arose along the way. Therefore, all of the questions mentioned above and some further related factors had to get extensively explored.

From a technological perspective, it was necessary to examine potential innovative ways of using VR technology to create realistic, immersive and convincing 3D environments. So it could increase the impact on people. The assignment also supported the purpose of education. It means the production team got an incentive to create a product that fitted with the unique skill sets, capabilities and preferences. However, the resolution to the problem should have had an educational bearing on the end-users and extend the current narrow vision.

1.4 REQUIRED SERVICES

Either a prototype with the potential to be further developed by the future teams or a nearly finished VR experience was one of the products the client expected. That had to be a realistic reconstruction of an exciting and potentially shocking news event of considerable significance for the audience. In deliberation with the company supervisor, the production team had the freedom to select a specific news event. Both research findings and data gathered during the project got presented and delivered to the client. Moreover, from the client's perspective, there were no further limitations.

The client's philosophy stated that the team could obtain optimal outcomes when supplied with flexibility and freedom during the entire project. (M. Boerrigter, personal communication, February 16, 2021) It has left scope for experimentation and the development of creative and innovative solutions to the issue. This lead to improved outcomes where both parties got pleased. The team had to manage both the freedom and liability of the decisions themselves. The company supervisor guided the development process throughout the project.

According to the information stated above, one can confirm that a broad spectrum of possible solutions for the end-product was, in fact, probable. As long as the client's questions have been investigated and deposited within the experience, he had no other strictly formulated constraints and instructions about the deliverables.

1.5 LIMITATIONS AND RESTRICTIONS

Various barriers had to get considered during the project. Firstly, the graduation semester limited the development for up to 20 weeks. Moreover, several deadlines and deliveries, such as report drafts, final report, and the prototype, guided the project.

Available resources and a workforce of two graduation students were limited as well, leading to corresponding outcomes. Thus, the developers had to hold the interactive elements and the scale of the VR experience within the boundaries. That was where a challenge emerged. The potential topic of the news item had to be shortened efficiently and adjusted to the remaining production time. However, no relevant information and specifics should have gotten lost. As a result, the product persisted in a prototype after the process due to time and workforce constraints.

Due to the global pandemic restrictions, the connectivity factor with the peer and stakeholders was comparatively limited. Microsoft Teams video meetings allowed communication to some extent during the project. The options for the field research and prototype testing were bound to the Coronavirus situation and travel rules. These restrictions slowed down the pace of production and testing, leading to a limitation of the final product outcomes.

1.6 REPORT LAYOUT

This report enclosed the planning and the process of developing a news item in VR for the client, XR Lab, and the comparison of the impact left by the experience and the conventional news transmission. The planning and the report layout followed the design methodology called Design Thinking Model. This model divides into five stages: Empathize, Define, Ideate, Prototype, and Test.

In the first phase - Theory/Empathy - the research on specific topics was done. It included the research on emotions and empathy when using virtual reality technology, the market and already existing products, possible negative consequences caused by VR, immersive aspects and the best suitable game engine for further development. Additionally, the research part was supported by empathizing and researching the target group and their attitude towards the news and empathizing with the client/company to understand, follow and realize their needs and requirements.

In the second phase - Design/Define - the most meaningful aspects for the project were defined, such as scope, target audience and the general topic for the VR experience. Again, the knowledge gained in the previous phase enabled the development team to establish the crucial details before moving to the next phase.

The third and fourth stages of the Design Thinking Model got combined in the third phase - Production. The reason for that was that the generation and implementation/execution of ideas in the prototype happened and repeated themselves multiple times throughout the complete project. Thus, collected ideas regarding the visuals, the research results and defined goals, deliverables and target group were translated to the production of the 3D environment and lighting in the prototype, followed by the testing in the game engine.

In the fourth phase - User Testing - test sessions with the target audience occurred to find final answers to the research questions set at the beginning. First user tests focussed mainly on technical aspects, empathy arousal and immersion in VR in terms of visuals and the 3D environment. Second test dedicated to finding answers to the main research question.

Each project phase consists of several research methods applied to acquire the information needed. Therefore, the analyzed data got represented in the results section, and potential conclusions for further development were derived from those results and presented in the conclusions section.

The general conclusion section provides information on whether the study answered the main research question or not. It means whether VR technology can be used as an ultimate empathy machine and evoke targeted emotions and empathy in users.

The discussion section describes how the project developed and how obstacles were faced and how they got resolved. Additionally, the section highlights negative and positive aspects for the further development of the current project or similar projects by new collaborations.

2 PROBLEM DEFINITION

The emphasis with the client helped to define the problem statement. Additionally, it helped to understand their needs and getting acquainted with young people's attitude and preferences towards the news in general.

Nowadays, young people are more likely to navigate news items that seem more appealing and relevant because of the headlines. As a result, news articles get scanned to a limited extent, while essential details may get overlooked. Consequently, this leads to a low emotional impact on people and their empathic abilities, making it more difficult for organizations to reach this target audience. Nevertheless, modern immersive technology expects to address people's narrow vision and make news more impactful for the younger generation.

2.1 RESEARCH QUESTIONS

For this research, the main question was formulated as follows:

How to generate an empathic effect and target precise emotions for the events of a determined news item among young adults of ages 20 to 30 through an immersive and impactful demo of a VR experience that can serve as a promotion for the XR lab?

Therefore, the main question got broken down into several smaller pieces, in this case, sub-questions. These were necessary and aimed to simplify the research and development process to deliver the required end product.

1. How to awaken empathy and elicit specific emotions when using VR?

To create a VR experience that generates empathy, the psychological background of empathy had to be investigated. In addition to that, the first sub-question helped to gain an overview of how to target specific emotions, promoting empathy.

2. What are the possible negative emotional consequences when using VR?

Since it is essential to deliver a safe product that the client and users can use with no concerns, the developer had to get acquainted with the possible adverse effects VR can cause. Thus, the second sub-question was needed to create a solid base of knowledge on improving immersion and creating a safe VR experience.

3. How is the relationship between targeted young adults and the news?

The project needed an in-depth understanding of and a complete immersion into the target audience's preferences, attitudes and opinions on journalism. The third sub-question helped to empathize with the users and deliver a relevant and fitting product.

4. What makes a virtual experience immersive?

This sub-question was relevant because immersion plays a prominent role when it comes to VR. Therefore, it was needed to get acquainted with existing immersion elements that could be used during the development of the VR demo.

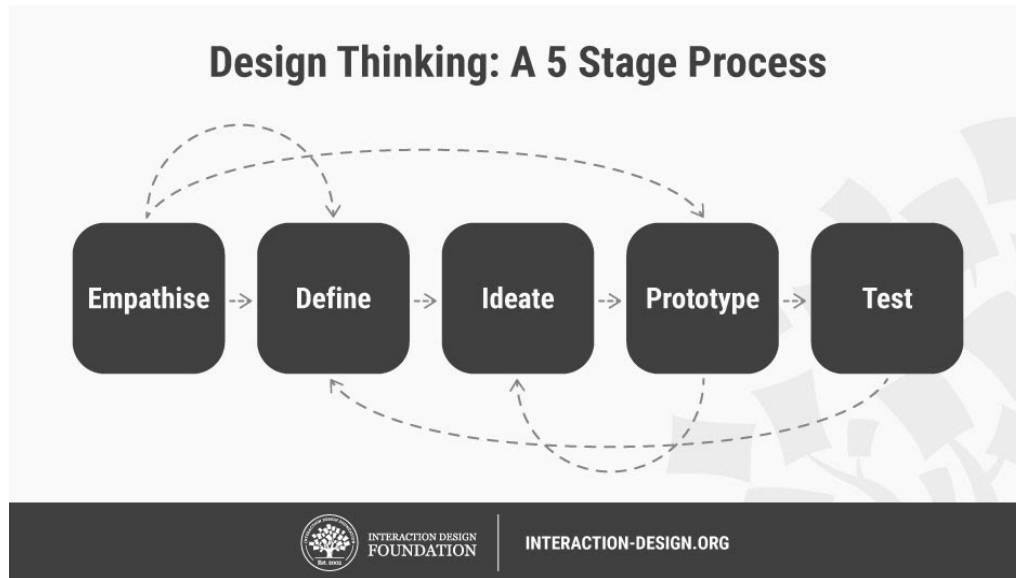
5. How to create an involving and impactful 3D virtual reality environment while using High Definition Render Pipeline in Unity

Transforming all research results into a practical solution was a crucial part of the project. Last sub-question was determined to fill the inexperience in HDRP and gain an in-depth understanding of the lighting creation and other visual aspects in the game engine.

2.2 RESEARCH METHOD: DESIGN THINKING MODEL

Figure 1

5 stages in the design thinking process



Note. An illustration of the design thinking model division into five stages. Adapted from *5 stages in the design thinking process*, by R. F. Dam and T. Y. Siang, 2021 (<https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process>)

The Design Thinking Model is a solution-based approach, helpful in dealing with complex or unknown problems during a project. With its structure, visualized in Figure 1, it leads the development team towards a human-centric way of thinking and understanding the parties' needs. Consequently, allowing to brainstorm ideas and smoothly flowing into the prototyping and testing phases. The developers constructed the project upon this methodology for a simple reason. The model allowed developers to constantly iterate, flexibly collaborate with the end-users and smoothly move back and forth between each stage, which leads to achieving better results in the end. (Dam & Siang, 2021)

Each stage focussed on finding answers to the specific sub-questions. As mentioned before, the Design Thinking Model allows moving between all phases freely. In this regard, the empathize phase primarily helped to progress theoretically in most of the sub-questions, leaving the practical answers to the prototype and test phases. Altogether, the first phase was used to find an answer to the second and third sub-questions. It also helped to obtain theoretical knowledge in the first and fourth sub-questions. During the define and ideation, combined with prototype phases, the fifth sub-question got theoretically and practically addressed. The final answers to the partly answered sub-questions were planned to be obtained during the final test phase of the project.

3 FIRST PHASE: THEORY/EMPATHIZE

The first phase followed the first stage of the Design Thinking Model - empathize stage. The following section includes all information on the methods used, results obtained, and conclusions derived after initial research on the specific topics and empathizing with the parties concerned.

3.1 METHODS

The primary research method during this phase was desk research and literature study. Mainly topics, such as emotions and empathy in VR, previous uses of VR for empathy enhancement on the market, possible negative consequences and immersion elements were investigated. All resulted in qualitative outcomes. In addition, the literature research on the target group and their attitude towards the news, qualitative data has been gained.

All research outcomes were obtained from secondary sources, such as free access literature and academic papers from Core.ac.uk, Frontiers, ResearchGate and Plos One. In addition to that, multiple online articles and websites were investigated on the following keywords: *empathy*, *emotions* and *immersion*. For an empathic understanding of the target group, short remote interviews were conducted. Interviewed members provided additional and recent qualitative information about their personal opinions and preferences towards the news. Consequently, qualitative information on the client and the company was collected from a primary source called personal communication and was also used for empathizing purposes during the first phase.

All knowledge collected during these approaches was summarized and documented in the form of written documents. The data got analyzed through sharing and discussion sessions with the teammate, looking for market gaps, highlighting the relevant aspects and deriving important conclusions for further development.

3.2 RESULTS

3.2.1 Young people and news

The article about how younger generations consume news differently by Kalogeropoulos (2020) stated that young people got embraced in technology and digital media. Smartphones are a primary source of entertainment and have become reliable gadgets in everyday life. However, when it comes to news, they use it to get updated on the current situations or as a time-filler and relaxation while waiting. Therefore, the first destination of young people is social media, leaving the television yet a significant but rather secondary news consumption medium (Casero-Ripollés, 2012).

Almost all research participants from the target group confirmed using a smartphone, PC or other pieces of technology for news consumption than television and newspapers. Additionally, they have proved the use of the news:

Artur Tschukes, 2021: *“Ich lese Nachrichten hauptsächlich über Internet Browser am PC oder über Handy per App.”* [I read the news mainly via the internet browser on my PC or via a mobile phone using an app] (full interview transcripts are presented in [Appendix A](#));

Clarissa Ahlers, 2021: *“(…) Nachrichten gucke ich teilweise im Fernsehen, wenn man zufällig drauf schaltet und sonst eher über Handy. Zeitung nur selten, wenn es sich auf unsere Stadt bezieht und es für mich*

relevant erscheint.“ [(..) I sometimes watch the news on TV if you switch to it by chance, otherwise more on my mobile phone. Newspaper only rarely, only when it relates to our city and it seems relevant for me.]

Jan Kronauge, 2021: *“Ich höre mir jeden morgen durch die Alexa die Zusammenfassung der Nachrichten an, was dann ganz interessant ist, weil es dann in 100 Sekunden kurz und knapp das was gerade passiert und aktuell ist anspricht. (..)”* [Every morning I listen to the summary of the news through Alexa, which is very interesting because in 100 seconds it briefly addresses what is currently happening. (..)]

Modern digital media presents news articles in the form of a headline list with a picture. Thus, people tend to rely on headlines when lacking time, so Kalogeropoulos (2020). This attitude gets confirmed by a research paper about peoples’ engagement with news and journalism, in this case, referred to the Chinese population. The research by Zeng (2014) affirms that the audience navigates to articles that appear compelling based on the headlines. In other words, if the content proves to be uninteresting or not as expected, the audience leaves or moves on to the following article. The remote interviews conducted also provided relevant results on this aspect:

Patrick Großmann, 2021: *“Ich lese den Text nachdem mir die Überschrift zugesagt hat komplett und wenn Bilder vorhanden sind auf dem Handy schaue ich mir diese genau an.”* [I proceed on reading the text completely after the headline has pleased me and when there are images included I study them carefully on my phone.]

Clarissa Ahlers, 2021: *“Ich entscheide anhand der Überschriften und Bildern, ob ich den Artikel interessant finde und weiterlese oder ob mir die Überschrift reicht.”* [Based on the headings and pictures, I decide whether I find the article interesting and read on, or whether only reading the headline is enough for me.]

Jan Kronauge, 2021: *“(..) Sicher legt man den Wert auf die Überschrift die da steht. Oft hat man da tatsächlich große und aussagekräftige Bilder bei. (..) Ich habe mir sonst immer erst den kleinen Text unter dem Bild bei der Anzeige durchgelesen, bevor ich überhaupt auf den Artikel gegangen bin. Wenn ich merke, dass es nicht interessant ist obwohl die Überschrift interessant ist, dann bin ich da nicht weiter drauf eingegangen.”* [(..) Surely, you put emphasis on the headlines provided. Often there actually are large and meaningful images included. (..) I usually read the little text under the picture of the article before I even look into it. If I notice that it's not interesting even though the headline is, I do not read it completely.]

The researcher Zeng X. studied possible causes for young people’s apathy toward news presented in Table 1. Those can be divided into social and personal backgrounds. Mostly, news articles appear less attractive to their target audience on a social basis. For personal reasons, young generations tend to prefer more visual content instead of a flow of text. Something that is easier to read and requires low effort to understand the context. Another heavy personal reason is that news articles are not related to their audience. Therefore, it proves irrelevant, leading to a loss of interest in the news field and a lack of impact on people. Additionally, young adults prefer to spend more time on things they think are essential for them and not wasting a significant amount of time on irrelevant information.

Table 1

General social and personal reasons for young peoples' apathy towards the news

	Social causes	Personal reasons
General reasons	News is less attractive	Less interest in politics
	News and politics are not related to their lives	Young people feel being alienated by news and politics
	High social pressure	Think there are better/ more important things to do
	Journalists are better educated and draw news in a more literary way	Poor literacy
	Television news makes audiences less critical	Prefer visual messages

Note. The study was focussing mainly on Chinese citizens. Nevertheless, some of the social and personal reasons for news apathy do not differ much from those of other nationalities. Adapted from *Chinese young people's engagement with journalism: Perspectives and attitudes towards the news*, p. 124, by X. Zeng, 2014

After analyzing the interview outcomes, the results proved to be correct. Those confirmed and added to the information retrieved from already existing studies. All research participants have included a significant amount of information regarding their preferences when it comes to news:

Patrick Großmann, 2021: *"Ich mag es nicht wenn Werbung dazwischen kommt oder die Autoren ihre eigene Meinung in dem Artikel einbringen."* [I don't like it when advertisements get in the way or the authors include their opinions in the articles.]

Artur Tschukes, 2021: *"Was ich nicht mag sind Nachrichten, die gar keine wirklichen Nachrichten sind. (..) Ebenso bin ich kein Fan von Eyecatcher Nachrichten, die dich dann auffordern Geld zu bezahlen um den Artikel zu lesen."* [What I don't like are news articles that aren't actually news at all. (..) I am also not a fan of eyecatcher news that asks you to pay money to read the article.]

Clarissa Ahlers, 2021: *"Ich würde es bevorzugen, wenn die Nachrichten noch kürzer zusammengefasst wären, sodass man den Artikel schnell lesen kann. Und teilweise sind die sehr unverständlich geschrieben."* [I would prefer the news to be even more concise so that you can read the article quickly. And some of them are written very incomprehensibly.]

Anna Halsbenning, 2021: *"(..) befasse mich kaum mit Nachrichten, da es mich einfach nicht interessiert. Momentan sowieso nicht, weil es eh immer nur um Corona geht (...)"* [(..) I rarely deal with news because I just don't care. Not at the moment anyway, because it's always about Corona (...)]

Jan Kronauge, 2021: *“(..) Die meisten Sachen betreffen mich halt einfach nicht. (..) Ich finde es dann uninteressant und weiß nicht warum ich mir das anhören und meine Zeit dafür verschwenden soll.”* [Most things just don't concern me. (..) I then find it uninteresting and don't know why I should listen to it and waste my time on it.]

3.2.2 Empathy and emotions in VR

After analysing the graduation assignment, problem statement and client's questions, it was required to investigate whether VR is an ultimate empathy machine. According to the research paper by Bertrand (2018) and his colleagues, it is vital to understand the meaning of the psychological term “empathy”. Empathy is a social bonding where someone can feel somebody else's pain or imagine themselves in the same situation through perspective-thinking ability. There are multiple ways of training empathic ability through communication, print and digital media, and modern immersive technology. It is where VR technology comes into use. VR is a tool that can transport people into a virtual world and allows stepping into someone else's shoes through a perceptual illusion called embodiment.

It is significantly easier to enhance empathy through VR if addressing the empathy-related phenomena correctly, so Bertrand (2018) and others. It increases the chances of achieving optimal results. The most relevant empathy-related phenomena are mimicry, distress, perspective-taking/thinking, affective empathy, compassion and altruism. The base framework is to recreate and copy specific actions and expose the users to precise stress situations. While combining perspective-thinking, affective empathy and compassion, the users will learn to understand and feel targeted emotions. Those lead to an emotional state of caring about someone's well being. When the altruism stage gets achieved, the users have to feel ready to help people in need. Altruistic behaviour is highlighted by the desire to help people at their own cost while feeling empathy (Altruism definition | what is altruism, n.d.).

The research by Herrera and others described virtual reality technology as an ultimate empathy machine. People get the possibility to experience anything from a different perspective while moving freely in a virtual world and exploring the surroundings. The researchers compared the traditional and virtual reality perspective-thinking. Whereas traditionally, people were asked to imagine what it would feel like to be in someone else's shoes in specific circumstances through pure communication. VR uses visual and virtual content instead. VR is considered an effective platform to enhance empathy since entirely virtual surroundings give a certain feeling of presence and ease the enhancement process.

Letting the users feel stressed by someone else's distress is strongly connected to targeting precise emotions and inducing those in a VR experience. Evoking empathy relies on targeting other meaningful emotions. An existing study where the researchers tried to elicit specific emotions with VR tested its influence on decision-making and how absorbed the users were into the experience. According to the research by Susindar and colleagues, VR is an effective and reliable medium to elicit all kinds of emotions. When the goal is to target precise emotions, which leads to provoking empathy, exposing the users to stimuli through the VR experience is significant. In other words, create sensitive and characteristic environments that are focussing on specific feelings. Emotional surroundings increase the immersion and enhance the sense of presence in the virtual world.

3.2.3 Practical use of VR for enhancing empathic abilities on the market

The client, XR lab, is constantly researching the opportunities of VR and experimenting with this technology beyond the gaming field, according to personal communication with the company supervisor Boerrigter (2020) and Saxion (n.d). VR has already been used as an ultimate empathy machine to train empathic abilities in different work fields.

There are multiple work fields on the market that have experimented with this immersive medium. Primarily, news organizations and journalism got acquainted with VR. As stated in the online article about VR in journalism by (AR/VR Innovation Lab, n.d.), leading news outlets have started experimenting with VR technology in journalism, mainly with 360° videos played in the VR headset. Some examples of those agencies are The Wall Street Journal to Euronews, The New York Times, The Associated Press and The Guardian. The organizations used this technology to engage and build empathy with their audience.

According to Bailenson (2018), news agency NRP started the VR journey in journalism in 2012. The outlet wanted to recreate a disaster in the form of a simulation in VR, following the goal of enhancing the empathic ability and emotions of people experiencing it. Additionally, in his article Rogers (2020) stated that the television channel The Weather Channel (TWC) has been using mixed reality technology (XR) to communicate weather occurrences to increase the coverage of the news.

Companies that specially target the enhancement of empathy also have been using VR technology. For instance, a company called "Project Empathy VR" (<https://www.projectempathyvr.com/>) created thought-provoking, eye-opening stories in VR to show people's lives regarding the U.S. prison system. The films were shown through VR headsets to provoke empathy and enhance public understanding of this topic.

Another similar company called "Empathic Media" (<https://www.empatheticmedia.com/>) experimented with immersive media, combining VR and AR technologies, first-person storytelling and journalism to make people experience and feel something, not only to read a story. This way, the company could foster empathy between storytellers and specific subjects. Mainly 360° 3D videos got produced.

According to a similar organization to the Saxion XR Lab called "Virtual Human Interaction Lab" (<https://vhil.stanford.edu/>) located in Stanford, this organization researches and analyses the physiological and behavioural effects VR and AR. The Lab also provides research papers on whether this medium can influence humanity and society and enhance empathy. There are also several projects published connected to empathy in VR.

VR has grown its roots in the business and healthcare fields as well. For example, according to Condon (2020), a company called "Hilton" uses VR technology as a training mechanism to provide employees with empathy towards the customers. Additionally, give an insight into working in a different job position. Another example, as stated in the article by Finextra's editorial team (2017), the company Fidelity Investments used VR for the same purposes, simulating the working environment, training empathy and preparing employees for various situations.

Last but not least, VR usage in medicine. The article by Kłoda (2020) stated that healthcare uses VR to see through the eyes of their patients. Sony and Oculus allow doctors to improve their empathic abilities and use the VR application to support the future generation of doctors. Products developed for healthcare are mainly simulations as a 3D video shown in a VR headset.

3.2.4 Negative emotional consequences when using VR technology

To achieve the best results in terms of embodiment, feeling and absorption into the experience, it is essential to acknowledge potential harmful consequences caused by this medium. For example, Lavoie (2020) and his colleagues stated in their research that the most well-documented adverse side effects are nausea and the so-called vertigo effect. Vertigo is a sensation that someone or the environment around someone is moving. The symptoms accompanying the vertigo effect may be loss of balance, feeling sick, and dizziness (Vertigo Causes and Treatment, n.d.).

Additionally, it is relatively common that VR can reduce cognitive performance. For example, it can cause eye/visual fatigue accompanied by blurred vision and headaches when used excessively long. Besides that,

VR is capable of immensely intensifying as well as positive and negative emotions. Since realistic situations represented in VR have a more significant impact on the emotional state, enhanced negative emotions may lead to negative rumination, extending for several hours after the experience. Scott (2020) describes rumination as a habit of constantly thinking about adverse events that happened in the past. Therefore, it can be associated with negative effects on the mind and the body. It can result in anxiety, depression and other post-traumatic stress disorders.

Whereas all aspects mentioned above summarize psychological/emotional feedback, there also lurk potential physical hazards. In this regard, it is not unusual to suffer from physical fatigue or a sense of tiredness or lack of energy (O'Connell, 2020), postural instability, physical discomfort and disorientation when spending much time in VR. All can lead to loss of spatial awareness (Lewis, 2020) and even result in injuries in experiences with much movement.

3.2.5 Immersion aspects in VR experiences

Like empathy, immersion is also an essential aspect of a VR experience, so the online article (Immersion VR - Everything you need to know, 2019). When approaching immersion in VR correctly, it is possible to convincingly replace the user's natural surroundings with a virtual environment. Therefore, immersiveness is an essential element. Furthermore, it can regulate how engaging an experience can be, as stated by the online articles of Wigmore (2016) and a therapy team from Rewellio (n.d).

There are specific vital elements simultaneously used as a measurement for immersion and can increase the immersiveness of a VR experience. Although following the article by Wigmore (2016), it is known that an immersive experience includes continuity of surroundings allowing the user to look in multiple directions, as well as letting the player move freely in the scene, the visuals have to conform to human vision to avoid breaking the illusion of realism. In other words, it is crucial to keep an eye on the correct sizing of the environmental objects.

Moreover, physical interactivity and feedback should not be lacking in the experience. Through narratives and realistic sound effects, one can achieve the peak of immersiveness. The VR experience should include an engaging storyline and let the users experience something they would not normally do. Realistic placement and choice of sounds support a convincing recreation of reality in a virtual world.

3.3 CONCLUSIONS

Considering the market analysis of multiple industries using VR for enhancing empathy, one can say there have been made and released many products for empathy enhancement. Those items were mainly 360° and 3D videos or films shown through a VR headset. Currently, there are very few to no products on the market focusing mainly on awakening empathy through a fully 3D virtual environment, including intractability, movement, and entire spatial presence. In terms of sub-questions, the empathize phase helped to answer the following research questions:

Question 1: How to awaken empathy and elicit specific emotions when using VR?

The research outcomes obtained from the academic paper by Bertrand (2018) and his colleagues have shown that they must get transported into someone else's shoes to awaken empathy in users successfully. They also have to experience someone's story from a different perspective than their own. In other words, let the observer be present in any situation while being placed in a safe environment. It is much easier to develop empathy when affiliated and familiar with a specific target group or event. Since not everyone can and wants to experience the "Human Trafficking" topic, VR serves as a significant cause of safely getting acquainted with severe topics.

There are different ways of promoting empathy through personal communication, digital media, and modern technology. Besides that, immersive, interactive and visual technologies can help achieve a long-term effect on the users more efficiently. Therefore, it is essential to focus on developing a product that targets empathy-related phenomena described by Bertrand's (2018) research.

Enhancing empathy goes along with targeting specific emotional responses. After capturing the research results from the academic paper by Susindar (2019) and others, one can say that VR technology is, in fact, a more reliable medium than traditional media (TV, movies) when it comes to eliciting emotions. To elicit the emotions needed, the development team must create an emotional environment based on the specific news item and let the environment and its visuals speak for themselves. Exposing the users to specific stimuli enables a successful emotion induction.

Altogether, this sub-question was only partly completed. However, it was possible to answer the question theoretically and apply the knowledge to the end product. The development followed the empathy-related phenomena and exposed the users to a vibrant virtual environment. Whether the right empathic impact on the target audience was achieved or not, only the results of multiple test sessions could give a final answer to that research question.

Question 2: What are the possible negative emotional consequences when using VR?

There were many aspects to keep in mind before and during the development of the end product. The research paper by Lavoie (2020) and his colleagues, supported by the online article by Lewis (2018), helped understand what dangers a VR experience could accompany. Since VR can enhance the absorption into the gameplay/experience, it can also enhance emotions, be it positive or negative.

Consequently, the developers had to ensure safety for the people who will use this product to avoid long-term negative emotional consequences. Those were among other post-traumatic stress disorders and even severe physical injuries. The potential negative aspects had to be kept in mind and get observed constantly. Another possibility was to create trigger warnings and disclaimers depending on the morality of the content to alert users beforehand. Setting reasonable age restrictions could help avoid the product getting into children's hands and others under the age of the target group. The most crucial point was to create environments and scenarios appropriate to the specific age group.

After the research, all possible negative effects were taken into account during the conception and production. As a result, a theoretical understanding of this topic was acquired successfully. However, whether the experience was, in fact, having no major negative effects on the users could only be answered after conducting multiple test sessions. Consequently, this sub-question was only partly completed during the first phase.

Question 3: How is the relationship between targeted young adults and the news?

The young adults' age span included two different generations between 18 and 35 years old. According to the findings from Zeng's (2014) academic paper, the online article by Kalogeropoulos (2019) and the remote interviews, young people heavily rely on their smartphone devices. With time passing, young adults' preferences have also changed compared to traditional news mediums (newspaper, television). However, after interpreting the research results, it seemed the general patterns in terms of news consumption and preferences are similar across different countries in the world.

Multiple tips could be derived from the theoretical framework during this phase. To make something that appeals to the target group and changes their view towards the news, the prototype had to be short, understandable and easy to follow. Visuality played a massive role in engagement and interest, according to all interview participants. To awaken more interest in news, the product had to be relevant for the

users and directly or indirectly affect their lives. Only if having implemented young people's needs and wants it was possible to achieve the best possible results with the prototype.

Altogether, the third sub-question was completely answered through the research and remote interviews conducted during this phase.

Question 4: What makes a virtual experience immersive?

Immersiveness is a significant element of every VR application that is not allowed to be left out. Therefore, several relevant points presented in the result section served as a guideline on how to make the demo of the news item immersive. The functionality and visuals of the virtual environment stood in the foreground and deserved much attention.

To create an immersive experience, a lot of human senses had to get targeted and incorporated. The requirement for a high immersiveness was to mimic and replicate the virtual world as realistic as possible. It meant allowing the user to move freely, interact with their environment similar to the real world, and use near-life-like visuals to support the immersion. As summarized in the result section, emotional environments increase immersion and engagement. Letting the environment and its objects speak for themselves through their appearance and placement could lead to desired end results.

Narratives and audio were also crucial factors for the prototype. That way, users could get guided to interesting storyline developments and held under tension with intriguing sound effects and story elements. However, missing sounds and narratives in the prototype could lead to a lack of authenticity of the 3D experience.

Overall, the fourth research question was also partly answered during this phase. The theoretical information gathered could get practically used during the following stages. Only final results from the user tests could provide a definitive answer to the sub-question of whether the experience succeeded or failed to be immersive.

4 SECOND PHASE: DESIGN/DEFINE

After empathizing and researching, the information gained during the first phase served as a cause of defining the goals, deliverables and limitations for the final product. The second phase - Design/Define - was all about defining the scope, the topic for the prototype, technical workflow and potential indicators of success. All served as preparation for the ideation process during the third phase of the project. Additionally, it created a launching pad for the initial testing.

4.1 METHODS

The second phase consisted of conducting desk research and gathering qualitative data from secondary sources, similar to the previous phase. It mainly involved information with a technical background connected to getting acquainted and setting up the High Definition Render Pipeline (HDRP) in the new project in Unity3D. Additionally, more secondary sources were used to define the correct technical workflow for the production in terms of lighting, mood and atmosphere in the scene.

Besides desk research, the field research method was also used for acquiring quantitative data. In this regard, online questionnaires were created to help define the overall topic of the prototype. Firstly, potentially relevant and partly controversial topics have been researched. Then, the four most promising topics (Human Trafficking, Homelessness, Artificial Intelligence and Smartphone Addiction) were summarized and presented in an online survey, including a short description of the idea and its possible representation in the VR demo.

During the desk research mainly, a wide variety of tutorials was looked at to find the most efficient and practical solution for the project. The information gained from tutorials and official Unity documentation was analyzed in the form of implementation and testing on a sample scene in the game engine. The quantitative and qualitative data collected from the questionnaire got reviewed and scanned for similarities to help draw meaningful conclusions for further development. After studying the survey answers, the outcomes were pitched to the client, and potential ideas for the VR demo were shared.

At the end of the design/define phase, deliverables, goals, exclusions were managed with the help of a scope. Additionally, the developer has set up possible measurements for the success of the end product.

4.2 RESULTS

4.2.1 Technical aspects

Throughout the desk research on the technical aspects, the process helped collect helpful information, tutorials and guides for the HDRP setup in Unity. First, it was essential to get acquainted with the new rendering pipeline and understand how it works. For that, multiple tutorials got overviewed or scanned to find information about the possible features needed. The most valuable and informative video was provided by the official Unity YouTube channel. The tutorial from Unity (2020) focused on introducing the HDRP to the observers and provided information on the general setup in the project and lighting workflow. Among other things, also the light baking options, light and reflection probes configurations got addressed.

Meanwhile, this tutorial only covered the lighting and overall structure of the pipeline in-engine. There were other relevant elements needed for the complete scene setup. Another in-depth tutorial from the official channel of Unity (2020) provided information on creating a high-fidelity visuals workflow. The video mainly revolved around setting up all relevant elements that lead to high-quality lighting and visuals.

Thus, the tutorial additionally addressed the following components of the workflow: graphics settings, anti-aliasing (AA), level overview, volume setup and volume override configuration, volumetric fog, shadows and other post-processing effects.

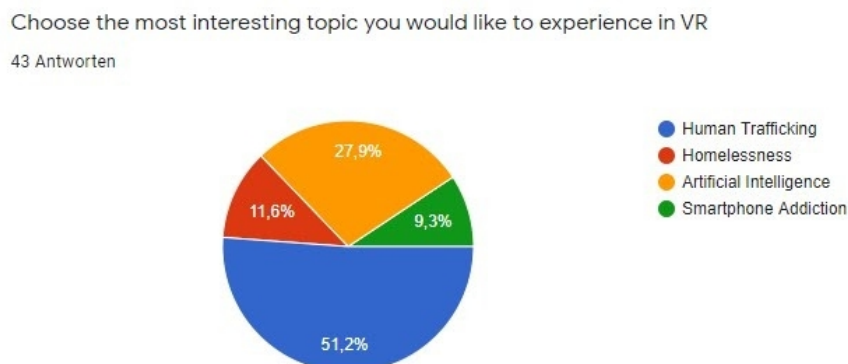
All additional theoretical information was retrieved from the official Unity documentation/manual regarding the HDRP (Unity, 2020). Since the material creation with Unity HDRP slightly differs from the standard pipeline, another significant element to be researched. To define the ideal textures export preset, the tutorial from Wittman (2018) on his YouTube channel got investigated. He guided the viewer throughout creating texture map outputs in Substance Painter until the implementation and correct setup in Unity HDRP.

Despite there being much shorter tutorials on the technical aspects, the aforementioned secondary sources provided the most relevant and detailed knowledge for further developing the prototype. The general information of the videos and documentation helped to develop more substantial knowledge of the topic. Additionally, it eased the defined process of the HDRP workflow in the Unity blockout before moving on to the ideation and production of the final demo.

4.2.2 Online survey

Figure 2

Overall survey results



Note. This circular diagram shows the final results of the survey conducted during the second phase. The participants could choose between four different topics for the VR prototype.

The online questionnaire targeted at the focus group helped to define what young people preferred general topic. The detailed survey outcomes are presented in [\(Appendix B\)](#). As represented in Figure 2, the survey was taken by 43 participants from 20-30 years, resulting in a significant preference in the “Human Trafficking” topic. In addition, each idea allowed the participants to add comments on the topic and leave overall feedback or remarks after finishing the survey.

A common similarity that appeared while reading through the results was that many users connected to games and entertainment when thinking of virtual reality. It was the element that awoke their interest. It can be both advantageous and disadvantageous when the users expect a playing aspect in this type of experience. Besides that, there were other facts particularly highlighted. People have often addressed the potentially permanent negative consequences (anxiety and other phobias) accompanying the VR experience.

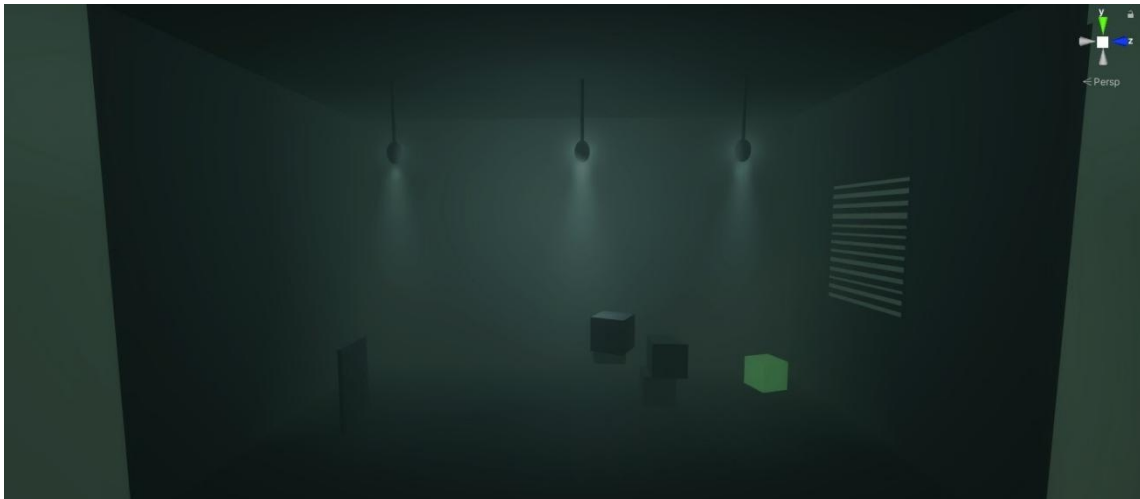
In addition to the participants' concerns, there was also an extensive amount of positive feedback on the topic. People expressed their thoughts regarding the news transmission through VR in general and how it could help create a significant emotional response when focussing on sensitive themes. Thereby, some topics could also gain more attention and help people learn about situations nobody wants to experience firsthand. Altogether, all participants could see the potential this innovative technology could have when using it for news transmission.

4.2.3 HDRP setup

The first step into production was the setup of the HDRP in the Unity project. The expertise gained was used in a sample scene for the creation and testing of the technical workflow. It served as a practice and skills polishing before moving onto the final blackout scene. As represented in Figure 3, all crucial elements, such as volumes and required volume overrides, volumetric lighting and fog, particle effects and emissive materials, were applied on the sample scene.

Figure 3

Sample scene and applied HDRP elements



Note. This scene shows the practice results of setting up HDRP in a Unity project for the first time. The sample scene included

- volumetric spotlights and point lights from placeholder light bulbs,
- the volumetric fog surrounding the 3D scene, and
- creating and testing emissive materials after baking the lights.

The general HDRP setup workflow and its elements are presented in [\(Appendix C\)](#).

4.2.4 Scope

Setting up a project scope is helpful for planning and documenting all project goals, deliverables, features and budget. It provides a clear overview of project management, so Tiwari (2021). Having a stable idea of what will be delivered and what gets excluded from the production is advantageous. The results mentioned in the sections above helped to define the scope for this project as a whole. Therefore, it was as follows:

Deliverables

For this graduation project, a prototype VR experience had to be developed, covering a relevant and possibly emotional news item. Furthermore, the experience had to be suitable for the HTC Vive VR headset. The development team got also asked to provide the client with the complete project folder and research summaries, besides a technically and visually functional product.

Inclusions

The VR experience had to include the most relevant mechanics and features for the immersion, such as teleportation for the movement, picking up some environmental objects, interacting, and inspecting them. Additionally, the end product had to be developed in a suitable visual style, including detailed, high-quality 3D environmental assets and lighting following a specific rendering pipeline in Unity3D. Test sessions of the VR prototype during the production were included in the planning. All pandemic restrictions and limitations were taken into account.

Exclusions

Due to time restrictions and a small development team, the experience did not represent the complete liquor store where the occurrences took place but only a storage room. It would require more assets, including realistic physics and animations, which means more production time and a larger team is needed. All UI elements, such as HUD and menus, were excluded completely to keep the experience the nearest to reality as possible. The user testing had to be limited to 5 participants due to the pandemic restrictions. Extensive test sessions had to be excluded completely. The sessions and meetings in person had to be limited and adjusted to the existing regulations.

Assumptions

The development team expected the product's success in terms of provoking thinking, waking empathy, and leaving a more substantial impact on the users compared to traditional news transmission. The demo should suffice as a promotional tool for future potential clients and cooperators. The VR experience was the first step into understanding the advantages of this immersive technology to the news field, which opened doors to more research and possibilities. As audio was another crucial part of this experience, it was expected by the team that environmental sounds and voice lines would have to be done by a student assistant provided by the XR lab.

Constraints

The testing of the product and interviews with the target audience was only possible to a limited extent. Furthermore, due to the global COVID-19 circumstances, all communication, observation, and testing were strongly limited to online mediums, such as Microsoft Teams or Email.

4.2.5 Indicators of success

The final product was required to enhance people's empathic abilities by inducing specific emotions and make news more impactful. Thus, during this phase, the possible measurements for the demo success were defined. The final product was testable on the following aspects:

- The users are capable of expressing feelings targeted by the VR experience. It is demonstrable by presenting the product to the participants, evaluating their reactions by observing and conducting a short questionnaire.
- Each empathy-related phenomenon got addressed correctly by the VR experience. It can be achieved by inquiring about a detailed feedback report from the participants after the test session.

- The users have developed a perspective-taking and empathic ability. In other words, users can understand someone else's perspective and feel their emotions. It can be achieved by interviewing the participants about their feelings and helpfulness towards others after the experience.
- The users were seriously immersed and impacted by the final product. It can be demonstrated by exposing the participants to specific stimuli through VR experience and evaluating the influence on decision-making and feeling of presence.

4.3 CONCLUSIONS

In terms of sub-questions, the define phase helped to answer the following research question:

Question 5: How to create an involving and impactful 3D virtual reality environment while using High Definition Render Pipeline in Unity

To create an involving and impactful 3D environment with HDRP, it was significant to understand the basics and define a precise technical workflow of the chosen render pipeline. From the research through YouTube tutorials, Unity documentation and in-engine practice, the following could be claimed: an extensive amount of in-depth knowledge was needed if one wanted to use every specific feature HDRP provided. Not all applied to this assignment or fitted into the scope of the project.

Thus, applying the base knowledge on this topic could suffice to deliver a functional and possibly impactful prototype. Furthermore, during the desk research, a general guide on the setup of HDRP in a Unity scene has arisen, creating a launching pad into more complex workflows in the further phases of the project. A list of various valuable tutorials, tips and tricks has also resulted from the research process in the second phase. Finally, the knowledge gained served as a valuable starting point for the ideation and creation of moodboards for the lighting and atmosphere of the demo.

The information from the second phase helped to make progress towards answering the fifth research question, leading to a partially completed question. Theoretically, the research question can be covered with facts that there is, in fact, a possibility to achieve an impactful emotional response by using the knowledge acquired. However, multiple test sessions with the users have to occur to provide a final answer on whether this VR demo is involving and impactful through the HDRP.

Apart from answering the last sub-question, the second phase also clarified what news topic is the most gripping and engaging to the focus group. Defining a final overall topic for the VR experience opened doors to even more detailed ideation to find the best suitable news item to recreate. Other remarks accompanying the production phase were a potential use of disclaimers depending on the setting of the experience and implementing an engagement/gaming aspect to boost the immersion. Other project-related elements that resulted from this phase were the scope, clear deliverables and goals, and the indicators of success that created a base for further test sessions. The define/design phase was finalized by a meeting with the client, where all results and findings were presented, and final arrangements and decisions were met.

5 THIRD PHASE: PRODUCTION

The ideation, prototyping and in-engine testing were combined during the third phase since the Design Thinking Model was used. This combination occurred based on a fair amount of movement between these stages. Consequently, multiple iterations and implementations happened during the production of the prototype and its features. The following sections present the actual prototype creation while applying all knowledge acquired in the previous phases. In-engine testing during the third phase applied to testing all technical, functional, and visual elements in the prototype for possible iterations.

5.1 METHODS

This phase included a combination of methods of desk research and prototyping. After getting acquainted with the final news item provided by the teammate, ideation on possible looks of environmental objects and the mood of the scene have been initiated. The ideation technique used during this phase was mainly brainstorming. The scope and possibilities of the project were taken into account during the ideation sessions. All information on the possible representation of the news item was collected in a written document, including the description, possible production approaches and recommendations for the most prioritized visual and 3D elements. Altogether, the analysis of the ideation results provided a clear overview of what was required asset- and visually-wise in the demo to convincingly recreate the news item selected.

The desk research provided qualitative knowledge found in secondary sources. In this case, various technical and visual aspects, such as procedural material creation, Maya's nCloth for cloth creation and in-depth textile texturing workflow, had to be researched. The data came mainly from tutorials connected to modelling with Maya, texturing with Substance Painter, material creation with Substance Designer, or even features implementation in Unity.

Meanwhile, the previous sections created a base for the production itself. The testing in-engine delivered primary qualitative data after making use of the research results. Small check-ups took place after implementing a feature or something visual into the Unity blockout. In the case of troubleshooting, online blogs and documentations got investigated. The communication with teachers and students via Discord or Microsoft Teams also helped find the most efficient solution to the aroused issues.

During the third stage, the defined HDRP workflow got scrutinized once again. In this regard, the sample scene was used to apply the defined technical workflow steps and add new features to the final blockout scene. Each stage of progress in terms of lighting features, scene mood, and 3D assets was tested in the Unity editor's game view. A computer screen delivered different results when testing the features. Thereby, all central testing was done by the teammate who owned a VR headset. The results got shared, and feedback was applied afterwards.

5.2 RESULTS

5.2.1 Ideation

The complete results of the production phase are presented in the VR prototype itself. Nevertheless, some additional aspects had to be highlighted in this section. The ideation process has led to beneficial results that served as a base for environmental development. It directed the developer to investigate possible looks of the assets and mood settings for the final scene. As a result, visualized in Figures 3 and 4, a moodboard with real-life references for the potential 3D objects and a style sheet for the environment lighting/mood has been created.

Figure 4

Moodboard with real-life references for potential 3D assets



Note. The images mainly served as inspiration for the room/building visuals and the most important assets for the demo.

Looking at the images, one can say that the environmental objects in the VR experience were supposed to be dirty, broken, look unfinished or almost abandoned. That was the main aim and focus of the moodboard represented in Figure 4.

Figure 5

A style sheet for the lighting and mood of the scene



Note. The images and colour palettes served as an inspiration and example of the visuals/lighting setup the developer wanted to pursue in the VR prototype.

From Figure 5, it can be derived that the scene should have been kept rather dark, uncomfortable and dusty. All images in the style sheet had some crucial elements. Those were among the others the „God Rays“ or sun/light rays coming through the windows or blinds, a foggy, dusty environment making the rays even more visible. The colour palette was kept rather dark and cold.

Additionally, a detailed list including prioritization and a description of all assets required for the demo has arisen. Table 2 visualizes an example of the structure of the table.

Table 2

An excerpt from the asset list

Asset	Priority	Difficulty	Relation to Story
concrete walls (4x)	high	high (due to material creation in SD)	unfinished walls, parts of concrete broke off, bricks are showing, the room is not taken care of (meaning the victim seems lesser to the traffickers or “not worth it”)

Note. The asset list table was divided into four columns. Each asset got assigned a priority and difficulty level.

- **Asset** column was naming of the asset and the amount of it needed;
- **Priority** from high to low delivered information on how important this asset was for the VR experience;
- **Difficulty** from high to low with an explanation of why it was so was used to be able to estimate the creation time of that asset;
- **Relation to Story** provided a short description of the asset and why it was needed for the demo.

5.2.2 Initial blockout scene

After the teammate provided the final layout of the blockout, the set in stone HDRP workflow was transported from the sample scene onto the demo scene. Nonetheless, some more minor changes occurred to the previously tested HDRP setup regarding visuals and lighting, as presented in Figure 6. In addition, some of the elements became more polished than during the first try in the sample scene.

Figure 6

Initial HDRP set up in the final blockout scene



Note. In the first version of the lighting setup in the final blackout scene, four volumetric points and spotlights were assigned to the placeholder assets. Some volumetric fog was added to give more depth to the scene. The scene was not wholly lit and had relatively low exposure to keep the room uncomfortable. The lighting and fog effects had no specific colour tint at that stage of development.

5.2.3 Final scene

The final prototype was subjected to several smaller and larger iterations in light intensity, ambient colour and 3D assets implementation progress, among other additional features. A significant change to the looks of the scene occurred due to heavy performance issues when testing the scene with the VR headset. The real-time lighting and the volumetric effect of the HDRP asset have caused significant delays and FPS drops after creating a build of the experience. Most of the HDRP effects had to be reversed or left out altogether, leading to a significant change in visuals. All changes of the scene during the production phase led to the following result presented in Figure 7.

Figure 7

Final visualization of the VR demo scene



Note. All placeholder assets were exchanged by the final models including the textures. All volumetric elements had to be removed due to performance issues. Instead of real-time lighting, the developer changed all light sources to baked and baked all lighting. With a reflection probe and additional (now invisible) light sources it was possible to bring back some reflections and details to the textures.

The iterations during the production phase resulted in a detailed development process from the beginning of the project until the delivery of the demo. The largest iterations were collected in the form of visualizations. The product at different stages of development, as well as some particular milestones/features implemented or changed along the way, are visualized in Figure 8.

Figure 8

Scene development process



Note. The figure above is divided into two columns. The left one consists of the most extensive iterations of the experience throughout the use of all HDRP elements. After downgrading due to performance issues, the iteration process of the final scene is represented in the right column.

5.3 CONCLUSIONS

In conclusion, one can say that the ideation and its multiple brainstorming techniques are of great value to any project. It helped get a clear vision of what is needed for the production, avoiding starting the process without any particular clue. It allowed the developers to plan and organize all elements required and set the deliverables beforehand.

Another significant point learned during this phase was that the potential negative consequences must be kept in mind when setting the mood or adjusting the lighting setup. Otherwise, it is proven by the research results from phase one that the experience may trigger unwanted disorders in users, such as epilepsy or claustrophobia. Therefore, it is also of great relevance to constantly check the performance of the scene and its features, in general. That way, negative emotional responses could be avoided. Anyhow, the Design Thinking Model proved once again to be an ideal approach for this type of project, as it allowed the developers to make adjustments and optimizations while working quickly.

6 FOURTH PHASE: USER TESTING

The final stage of the demo development consisted of conducting multiple test sessions throughout the project. The following sections present all methods, approaches, results and conclusions derived from the user tests. The main goal of this phase was to gain feedback, improvement suggestions from the target audience and find a final answer to the main research question.

6.1 METHODS

Throughout the user testing phase, mainly qualitative information was obtained from primary sources. In this regard, the primary approaches were test sessions, online surveys and observation. The first user testing was processed remotely from home. The developers were taking part in a video call via Microsoft Teams with five participants in the XR Lab. Before the actual test process, two online questionnaires were provided by the developers. The first one was focussing on questioning the participants after they have read the news item online. After the actual play session, the target audience had to fill in a second survey. It focused on getting first impressions on the prototype, finding possible technical and functional issues, and getting a starting point on the representation's empathy, impact, and immersion level.

The second and final test session was structured similarly to the first one. Slightly updated online questionnaires were prepared. As a result of changing restrictions due to Covid-19, the development team could be present during this user test. The last session was focussing mainly on getting answers to the sub-questions and the main thesis. Thus, whether the VR representation of the online news article was impactful and has awakened empathy in participants.

The main difference in the testing process was that the developers could observe the users during the experience and obtained primary information on their behaviour, body language, and emotional and physical feedback. All valuable data gathered during the test sessions were noted in a written document. An additional tool for analysing the results were the previously defined indicators of success. Those have played a significant role as a measurement instance to get final statements and derive relevant conclusions.

6.2 RESULTS

6.2.1 Remote test session - 11.05-12.05.2021

The development stage of the scene at the time of the first user test was mostly a construction site. In this regard, the scene consisted of a mixture of blockout/placeholder pieces and low-poly finalized assets, as visualized in Figure 9.

Figure 9

Scene state during first test session



Some 3D assets were still missing textures since one developer focused on the lighting setup first. In terms of lighting and mood of the scene, the lighting setup was considered to be nearly finished. It consisted of volumetric fog and light in a suitable colour palette and dust particle effect filling in the room. Except for one voice line signaling the end of the VR experience, there were no other sound effects, ambient sounds or other voice lines implemented.

Once again, five users have confirmed the research results on young people's attitude and preferences towards the news. They mostly retrieve information from digital devices, such as PC, smartphone and the internet in general. Despite all not having heard about this type of news representation before, the participants expected an interactive simulation or recreation of the environment presented in the online article. Most people have already felt some empathy towards the victim after reading the news.

After testing the prototype, some experienced a slight change in empathy and confirmed that the news item had a higher impact on them than reading. The visuals, lighting and textures were often highlighted positively. Nevertheless, the lack of audio implementation and unfinished visuals in the prototype damaged the immersion and impact during the test session. The complete overview of the testing and survey outcomes are represented in [\(Appendix D\)](#).

Throughout the first test session, the developers have observed some major performance issues, which was not specifically mentioned by the testers themselves. The observation resulted in new ideas and potential ways of fixing the performance issues.

6.2.2 Test session - 01.06.2021

During the planning of the last test session, the scene had to undergo significant changes regarding the visuals and lighting setup. Other than that, the prototype scene, presented in Figure 7, was complete in terms of 3D assets, textures and lighting. Audio-wise all ambient sounds and other sound effects were implemented. However, the voice lines were still missing by the time of the final test.

This time, the survey results before the test session have also proven that the participants were able to develop empathy after reading. They have also shown that reading the online article has targeted the right emotions already. After the users have tested the almost finished VR prototype, people could better understand the victim's perspective. The participants highlighted that the experience made them feel uncomfortable, sad, depressed and hopeless. Additionally, they have highlighted the accuracy of the representation.

In terms of immersion and impact, the opinions had split up. Meanwhile, most of the users experienced a more significant impact and felt absorbed in the 3D scene. The minority explained being drawn out of the experience. The reason for it were the extensive noises surrounding them in the XR Lab, the lack of a body representation in the scene and more minor bugs. The complete overview of the testing and survey outcomes are represented in [\(Appendix E\)](#).

6.3 CONCLUSIONS

The first test session in the early development stage of the product provided crucial clues for the further development and improvement of the prototype. Some participants have highlighted some inconsistencies in the scene. Those were among others missing 3D assets that were only placeholders at that time. Also, many 3D assets were missing textures, which was also a major issue visually- and immersion-wise. Therefore, the developer started producing the missing 3D assets and textures and implementing those into the prototype.

According to the developers' observations, the rendering pipeline needed to be examined again and revised accordingly. The real-time lighting got exchanged to baked, and all lighting information was stored in lightmaps through light baking. Besides that, volumetrics were disabled, which led to a smoothly running build for the final test session.

The outcomes of the final test session were used to provide the final answers to the main research question. Besides that, the success of the product was also measured by the indicators of success defined beforehand. Those were a guideline whether the product achieved the desired result and can give a positive answer to the thesis.

1. The users are capable of expressing feelings targeted by the VR experience.

In terms of this indicator, the product was considered successful. The scene was represented to express uncomfortableness, sadness, hopelessness, and anxiety, among other negative emotions. The answers from the questionnaire had confirmed that all participants were able to name specific emotions and feelings they have experienced throughout the test. The emotions that were planned to be targeted by the scene matched those mentioned by the testers. Consequently, one can say that precise emotions were, in fact, elicited correctly and successfully, bringing the product nearer to the desired result.

2. Each empathy-related phenomenon got addressed correctly by the VR experience.

The questions in the online survey were based on the six empathy-related phenomena. In terms of mimicry, all of the participants have recognized the article details in the scene. Therefore, the news item was accurately mimicked with the prototype. Almost all testers were left with a feeling of uncomfortableness after playing the experience. In this aspect, the scene has also achieved the correct response. Most of the users mentioned that nobody could ever truly and completely understand what a victim was going through. Nevertheless, most people believed that the experience helped get a better understanding of the "Human trafficking" topic.

In terms of affective empathy, all participants named the correct feelings the developers tried to target with the VR experience. This aspect proved to be successfully achieved. Some participants have confirmed being more empathic towards the victim and carrying about their well-being after experiencing the news item in VR. Nevertheless, there were exceptions regarding the connectivity. Some believed that a simulation never could show an accurate representation of what the victim indeed went through. There is more room for improvement in this aspect, but the experience still managed to slightly improve the majority's empathic feelings compared to reading news.

The scene has awoken altruistic behaviour in the majority of the testing participants. However, the opinions took very different paths. Some users were still unwilling to help, not due to the experience itself but due to the way they see things and their own opinions on the topic. Other than that, the experience has correctly transmitted the message. Almost all testers provided correct responses to each empathy-related phenomenon.

3. The users have developed a perspective-taking and empathic ability.

Derived from the online survey answers, the users were able to describe what they experienced through the eyes of the main character. The responses proved that the testers had developed a perspective-thinking/taking ability during the experience. Even though not all participants confirmed having a considerable empathy level towards the topic, most of them have felt some slight positive changes. Some testers were ready to help people in need, be it for a donation or raise awareness. Consequently, the product was considered successful in this aspect as well.

4. The users were seriously immersed and impacted by the final product.

According to survey outcomes, almost all participants have noticed a difference in reading an article and experiencing it in VR. Exceptionally one participant did not feel any difference due to constant work with the VR technology. The majority of testers confirmed that VR technology and the experience had left a meaningful impact on themselves.

In terms of immersion, the major part of the testers has felt immersed in the story. Due to the interactiveness, lighting, mood and detailed surroundings, the immersiveness got supported. Nevertheless, with some noise-cancelling equipment or a calmer environment, the immersion would not break. The product succeeded in delivering the news item in a more immersive way while leaving a more considerable impact on the target audience.

7 CONCLUSION

This study aimed to test whether VR technology can be used as an ultimate empathy machine to represent a possibly emotional news item. The product should suit the preferences of young adults from 20 to 30 years old. Recreating a news item in VR meant getting an understanding of how empathy worked, making the experience immersive and convincing, and achieving an appropriate mood and empathic feedback. Ideally, the research has been done to deliver the client a functional VR experience that could be used as a promotion for the XR Lab.

The main research question for this graduation project was as follows:

How to generate an empathic effect and target precise emotions for the events of a determined news item among young adults of ages 20 to 30 through an immersive and impactful demo of a VR experience that can serve as a promotion for the XR lab?

The literature study, production, conduction of online questionnaires and user testing with the target group helped the graduation students to create a functional VR representation of the news item. The research results on the young adults helped to understand their preferences and needs and apply the findings to the experience. Through the research on empathy and emotions, the experience could be structured accordingly, address all empathy-related phenomena and target specific emotions.

The user test of the final product has successfully shown that the VR experience helped develop and slightly increase empathy in the target audience. After exposing the target audience to a written news article and an innovative replacement, the students achieved a positive outcome. According to the indicators of success, one can say that the product proved to achieve all goals set beforehand. The experience confirmed that VR has a more significant impact on users than reading news on the internet.

Additionally, this study provided a possible convincing and involving answer to the client's questions. Besides successful emotional and empathic feedback, the students managed to deliver a fully functional prototype using modern technologies. The product can be used as a promotion for the XR Lab because it addresses a market gap and delivers an innovative solution to that.

One should not forget that the product remains a prototype. There is much room for improvements. Nevertheless, the two graduation students opened doors for even more opportunities and ideas and created a solid base for further development on „News in VR“.

8 DISCUSSION

Despite the results of the final user testing being relatively positive, there were some obstacles the developers faced. The following sections present issues encountered by the student during each stage of the development and what solutions were applied.

8.1 First phase: Research/Empathize

A considerable obstacle of the first phase was the acquirement of information and the conduction of interview sessions. During the worldwide pandemic, everything connected to communication has to occur remotely and online. Thereby, all interviews, especially at the beginning of the project, had to be conducted from home. During the interviewing process, the student has noticed lower responsiveness when executing an interview via text messages on WhatsApp compared to in-person communication. It was significantly harder to judge whether the potential participant had free time or was willing to answer the questions. In some cases, the student has not got any response at all.

The solution to this problem was to find the best suitable social media application to conduct remote interviews since it is the first choice for the target group. The best approach was conducting group voice or video calls to get immediate responses. It was also relevant to try reaching as many people as possible to get sufficient answers for further development.

8.2 Second phase: Design/Define

A significant obstacle during the second phase was no prior knowledge regarding the HDRP in Unity3D. An extensive amount of new information had been taken in. The knowledge of working with the game engine was at a lower level at the beginning of the project. Nevertheless, the student had some experience working on a VR experience with Unity, focusing on asset creation and implementation of those in the engine.

The problem was fixed by spending a high amount of time researching and learning the new rendering pipeline. Once facing issues, the student looked immediately for help, whether on the internet, blogs, YouTube tutorials, official Unity documentation or asking the learning community members through Discord or Microsoft Teams. Consequently, the end results were not expected to be the same as that of people with several years of experience with this pipeline and lighting composition.

8.3 Third phase: Production/Prototype

During the production phase, the student faced difficulties in in-engine testing of the implemented assets and features. There was no possibility to test the updates in VR but only on the computer screen. The student had no access to their own VR headset due to the remote working. Additionally, another major obstacle faced during this phase was the extensive performance issues due to the low compatibility of HDRP and its features with VR.

In terms of in-engine feature testing, the solution was to contact the teammate and ask for feedback immediately. The implemented new features and details were tested by the teammate in VR and afterwards communicated to the student. This approach was the only possible solution since the Covid-19 restrictions and lockdowns had to be kept in mind. Even though the approach was quite time-consuming, it delivered the desired results.

The solution for the performance issues was the implementation of light and reflection probes, downgrading in terms of HDRP effects, and making use of baked lighting. Overall, to avoid the same issues, in-depth research on HDRP and its practical use with VR should have occurred during the initial phases of the project.

8.4 Fourth phase: User testing

The most significant barrier during the last stage was the worldwide pandemic. All Covid-19 regulations and limitations resulted in complications in aspects of travelling between Germany and the Netherlands and conducting multiple test sessions with a higher number of participants. The rules were constantly changing, which did not allow an organisation of in-person test sessions in advance.

The execution of the user tests had to be limited to a specific amount of participants Corona compliant. The sessions had to be planned in-depth and prepared all remotely. Another solution to the situation was conducting group calls through Microsoft teams with testers and teachers working in the XR Lab. That way, the XR Lab got provided with a prototype, set up the testing area and run the application on their computers. The potential participants got privied to the testing procedure during the call.

If the regulations allowed to travel to the Netherlands and the students could be present during the test session, multiple rules had to be followed. Thus, it was essential to keep a safe distance, wear mask protection, follow the hygiene rules, and disinfect the hardware continuously. Overall, the test sessions were not executed perfectly, but it was still possible to obtain information needed for further development when using a plan B.

9 RECOMMENDATIONS

This section presents recommendations for further development/practice and use of the project results to wrap up the report.

In the light of the obstacles identified and the study's findings, the client is recommended, among others, to re-think the team composition. For creating a functional prototype, one 3D and one technical artist have sufficed during this project. Nonetheless, to achieve much better results technically- and visually- wise a broader team consisting of an engineer, audio designer, multiple artists and ideally a psychologist would be of great advantage. In addition to that, the duration of the development process could be extended to one year to achieve high-fidelity visuals and a high-quality VR experience.

In terms of research, future developers should spend more time investigating the empathy and emotions related aspects and how to implement the knowledge to achieve more vital empathic feedback. The chance to achieve better results in terms of impact on and immersion of the target audience would increase if the team composition were adjusted. Therefore, a more potent gaming aspect, more interactivity, and introduction to decision-making features could be added. As highlighted by the young adults after an initial survey, an experience with a gaming effect wakes more interest and appeals more.

A significant lesson learned during this project was that an extensive confrontation with possible game engines is crucial. It is recommended to take other possible engines into considerations, for instance, Unreal Engine. Unity3D proved to be suitable for creating functional prototypes during the study. To achieve better visual results and better performance in a build, future development teams have either wait until Unity3D's HDRP features get supported entirely by VR or start working in more suitable engines right away.

Aside from a different production approach to this topic, it is also recommended to test the prototype with more participants once Covid-19 restrictions allow it. The number of test sessions was limited due to the organization, planning and government regulations taking precious working time from the actual production. Testing and interviewing the target audience in larger groups would provide much more practical information and suggestions for improvements. Ask more people questions means more information can be extracted, and a better emphasis on the focus group can be built.

The test sessions and survey results have proven that the target audience is interested in the modern execution of journalism. Nonetheless, not everyone can afford expensive VR hardware and gaming computers. It would be of great advantage to investigate different possibilities to share the experience with the target audience. One possible approach to the problem could be optimizing the product for more affordable hardware.

The best option could be optimizing it for, for instance, a headset compatible with iPhone and Android smartphones under 50 Euro. Smartphones are the primary entertainment devices for young people. Another possibility would be providing users with access to the experience through a web browser. That way, the users would not depend on expensive gaming laptops or PCs but only an affordable VR headset.

The prototype and research results delivered can be used to inspire similar projects or even as a base for continuing working on the same product. It is recommended to polish out the current product in terms of visuals, interactivity, sound and 3D assets to achieve accurate and long-term results. The demo also can be used as a base for cooperation between Saxion's XR Lab and potential clients and partners.

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11 APPENDICES

11.1 Appendix A

Questions:

1. *Wie stehst du zu Nachrichten, sei es digital über Handy, Radio oder traditionell mit Zeitung?*
[How do you feel about the news, be it digitally via cell phone, radio or traditionally with the newspaper?]
2. *Was sind die Sachen die du nicht magst, wenn es um Nachrichten lesen geht?*
[What are the things you don't like when it comes to reading the news?]
3. *Wie genau gehst du vor, wenn es um Nachrichten lesen geht?*
[What is your procedure of obtaining news?]

Answers:

Patrick Großmann, 21 years old

1. *Neutral*
[Neutral]
2. *Ich mag es nicht wenn Werbung dazwischen kommt oder die Autoren ihre eigene Meinung in dem Artikel einbringen.*
[I don't like it when advertisements get in the way or the authors include their opinions in the articles.]
3. *Ich lese den Text nachdem mir die Überschrift zugesagt hat komplett und wenn Bilder vorhanden sind auf dem Handy schaue ich mir diese genau an.*
[I proceed on reading the text completely after the headline has pleased me and when there are images included I study them carefully on my phone.]

Artur Tschukes, 27 Jahre

1. *Ich lese Nachrichten hauptsächlich über Internet Browser am PC oder über Handy per App.*
[I read the news mainly via the internet browser on my PC or via a mobile phone using an app.]
2. *Was ich nicht mag sind Nachrichten, die gar keine wirklichen Nachrichten sind (z. B. Kommentare oder irgendwelche Abnehmtipps). Ebenso bin ich kein Fan von Eyecatcher Nachrichten, die dich dann auffordern Geld zu bezahlen um den Artikel zu lesen. Nachrichtenportale die sowas anbieten nutze ich deswegen auch gar nicht. Oft auch weil deswegen die Authentizität leidet (z. B. Welt, Bild)*
[What I don't like are news articles that aren't actually news at all (e.g. comments or any weight loss tips). I am also not a fan of eyecatcher news that asks you to pay money to read the article. That's why I don't use news portals that offer something like that. Often also because authenticity suffers as a result (e.g. "Welt", „Bild“)]
3. *Ich lese so ziemlich fast alles was ich interessant finde. Vor allem internationale Geschehnisse die auch mich betreffen (Kryptowährungen, Corona). Außerdem interessieren mich auch neue Erkenntnisse (Astrophysik, Lifehacks und mehr). Allgemein versuche ich meine Nachrichten immer danach zu filtern, ob ich damit meine Zeit verschwenden würde oder nicht (Was selbst nach jahrelangem Lesen noch vorkommt)*

[I read pretty much everything I find interesting. Especially international events that also affect me (crypto currencies, corona). I'm also interested in new findings (astrophysics, life hacks and more). In general, I always try to filter my news according to whether I would waste my time with them or not (which still happens even after years of reading)]

Clarissa Ahlers, 24 years old

1. Ich befasse mich weniger mit Nachrichten. Also Nachrichten gucke ich teilweise im Fernsehen, wenn man zufällig drauf schaltet und sonst eher über Handy. Zeitung nur selten, wenn es sich auf unsere Stadt bezieht und es für mich relevant erscheint.

[I don't deal much with the news. I sometimes watch the news on TV if you switch to it by chance, otherwise more on my mobile phone. Newspaper only rarely, only when it relates to our city and it seems relevant for me.]

2. Ich würde es bevorzugen, wenn die Nachrichten noch kürzer zusammengefasst wären, sodass man den Artikel schnell lesen kann. Und teilweise sind die sehr unverständlich geschrieben.

[I would prefer the news to be even more concise so that you can read the article quickly. And some of them are written very incomprehensibly.]

2. Ich entscheide anhand der Überschriften und Bildern, ob ich den Artikel interessant finde und weiterlese oder ob mir die Überschrift reicht.

[Based on the headings and pictures, I decide whether I find the article interesting and read on, or whether only reading the headline is enough for me.]

Anna Halsbenning, 23 years old

Ich sehe das auch genauso wie Clarissa aber befasse mich kaum mit Nachrichten, da es mich einfach nicht interessiert. Momentan sowieso nicht, weil es eh immer nur um Corona geht und die Zahlen oder welche Maßnahmen getroffen wurden.

[I see it the same way as Clarissa, but I rarely deal with news because I just don't care. Not at the moment anyway, because it's always about Corona and the numbers or what measures have been taken.]

Jan Kronauge, 20 Jahre

1. Ich befasse mich selten mit Nachrichten.

[I rarely deal with news.]

2. Warum ich sonst keine Nachrichten gucke ist eigentlich ganz einfach. Die meisten Sachen betreffen mich halt einfach nicht. Zum Beispiel heute im Fernsehen ging es mal um kinder und das Lesen. Ich habe keine kinder und bin selbst keins mehr. Ich finde es dann uninteressant und weiß nicht warum ich mir das anhören und meine Zeit dafür verschwenden soll. Andererseits ging es auch wieder um Corona Maßnahmen, Lockdown Verlängerung und co. und das betrifft irgendwie alle und sowas guck ich mir dann schon mal an.

[Why I don't watch the news is actually quite simple. Most things just don't concern me. For example today on television it was about children and reading. I have no children and I am no longer one myself. I then find it uninteresting and don't know why I should listen to it and waste my time on it. On the other hand, it was also about corona measures, lockdown extension and co. and that somehow affects everyone and then I do watch something like that.]

3. Ich höre mir jeden morgen durch die Alexa die Zusammenfassung der Nachrichten an, was dann ganz interessant ist weil es dann in 100 Sekunden kurz und knapp das was gerade passiert und aktuell ist anspricht. Das ist ganz cool. Sonst ist der Umfang sehr groß. Ich setze mich nicht um 8 Uhr morgens dran und gucke mir was 15 min lang was mich größtenteils nicht interessiert.

Mit den Anzeigen von Google habe ich bei meinem alten Handy tatsächlich ab und zu gemacht. Sicher legt man den Augenwert auf die Überschrift die da steht. Oft hat man da tatsächlich große und aussagekräftige Bilder bei. Dann guckt man sich das an, liest die Überschrift. Man denkt dann es könnte mich doch wohl interessieren und man hat doch sowieso nichts zu tun am Bahnhof. Ich habe mir sonst immer erst den kleinen Text unter dem Bild bei der Anzeige durchgelesen, bevor ich überhaupt auf den Artikel gegangen bin. Wenn ich merke, dass es nicht interessant ist obwohl die Überschrift interessant ist, dann bin ich da auch nicht drauf gegangen.

[Every morning I listen to the summary of the news through Alexa, which is very interesting because in 100 seconds it briefly addresses what is currently happening. That's really cool. Otherwise the scope is very large. I don't sit down at 8 a.m. and watch something for 15 minutes, which for the most part doesn't interest me.

I actually used the articles from Google every now and then on my old phone. Surely, you put emphasis on the headlines provided. Often there actually are large and meaningful images included. Then you look at it, read the headline. Then you think it might interest me and you have nothing to do at the train station anyway. I usually read the little text under the picture of the article before I even look into it. If I notice that it's not interesting even though the headline is, I do not read it completely.]

[Back to text](#)

11.2 Appendix B

Complete overview of the survey results on the topic of the VR experience:

News Items in VR - Which Topic is the most interesting for You?

To help our graduation project, we gather information about which news topics young adults (ages 20-30) are most interested in. Underneath, you can give your opinion about four possible topics for a VR prototype. When choosing, keep in mind that the news item would be displayed in a Virtual Reality Experience with interactive features. The project revolves around recreating a news item in VR that's interesting for the target group, impactful, and might even be shocking or controversial. This questionnaire is anonymous and will only be used as a quantitative survey for our graduation project. Please leave your opinions down below, be as honest as possible, and feel free to add any extra comments, ideas, or expectations you might have :)

1. How old are you?
2. Where are you from? (Nationality)

3. Topic 1: Human Trafficking

A global but rarely covered issue: People go missing or get abducted for e.g. sex trafficking, illegal organ trades, or illegal adoptions, among other reasons. Most of it is organized via the internet. The goal of this experience is to bring awareness to the topic and lead people to do more research by themselves. The VR experience would put the player in the position of a victim of abduction. (Example cases: Jaycee Lee Dugard, Elizabeth Smart) They find themselves in a shed and can interact with their environment to figure out who they are and to try to escape. But beware: The more noise the player makes, the angrier their kidnapper will get.

Rating from 1 - 5 (1=boring, 5=interesting)

Additional comments and expectations section

4. Topic 2: Homelessness

Homelessness numbers are increasing continuously all around the world. Currently, people who have lost their homes are exposed to a double threat: COVID-19 and the cold days. The extent of this problem may be underrated by many people and even the government. The goal of the VR experience is to raise awareness and let people see through the victim's eyes and feel the struggle of everyday survival. The VR experience would take place in an underpass during winter and represent the daily struggles of a homeless person based on the existing real-life events. The player can interact with objects and explore the environment to reveal the story and the message of the experience.

Rating from 1 - 5 (1=boring, 5=interesting)

Additional comments and expectations section

5. Topic 3: Artificial Intelligence

Technology advances fast and so do AIs. The big question states: Is it possible that AIs develop further than humans can understand? And if they do so, will they be helpful to the human race or hostile? The goal of this experience is to explain the current state of AI technology to help people form their own opinion about the topic. The VR experience will focus on a single, recently developed AI (such as GPT-3, for example) and explain its basic functions visually in a science-fiction-like setting. The player would be standing on a piece of hardware that connects multiple sections. Those divide the complicated nature of a formless AI into visible and understandable bits of information.

Rating from 1 - 5 (1=boring, 5=interesting)

Additional comments and expectations section

6. Topic 4: Smartphone Addiction

Nowadays, smartphones are essential in our daily lives and have become the main source of entertainment. There is a creeping danger a lot of people might not see: when the excessive use of a phone turns into a disorder. The goal of this experience is to raise awareness, provoke thinking and show what an obsession with smartphones can lead to. The VR experience will focus on different possible consequences of smartphone addiction. The player will find themselves in a dark environment - a city captured by the technology. The player can explore the "dead" city and interact with the visualizations of the consequences, further disorders and dangers hiding behind the small gadgets.

Rating from 1 - 5 (1=boring, 5=interesting)

Additional comments and expectations section

6. Choose the most interesting topic you would like to experience in VR

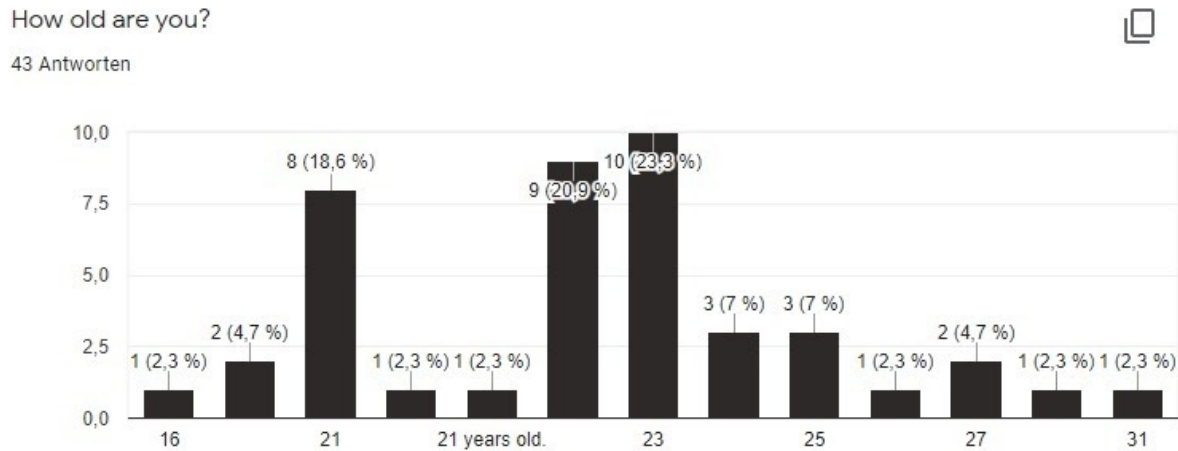
- Human Trafficking
- Homelessness
- Artificial Intelligence
- Smartphone Addiction

8. Explain your choice section

Following sections provide detailed answers to the survey:

Figure 10

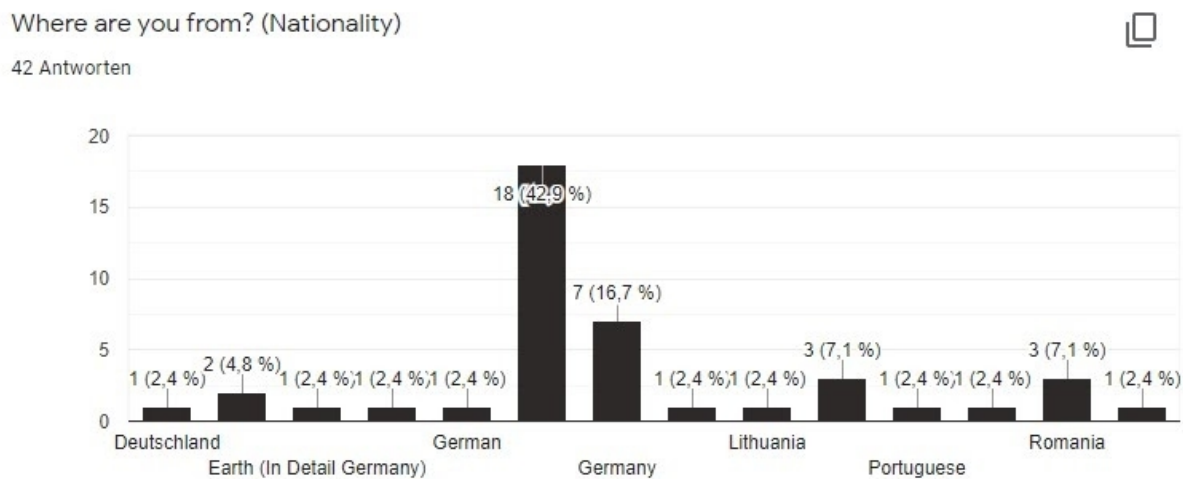
Results of participants age



Note. This diagram shows the age of participants starting from (exceptionally) 16 to 31 years. Simplified view: (16 Years): **1**; 20 Years: **2**; 21 Years: **10**; 22 Years: **9**; 23 Years: **10**; 24 Years: **3**; 25 Years: **3**; 26 Years: **1**; 27 Years: **2**; 29 Years: **1**; (31 Years: **1**)

Figure 11

Nationality of the participants



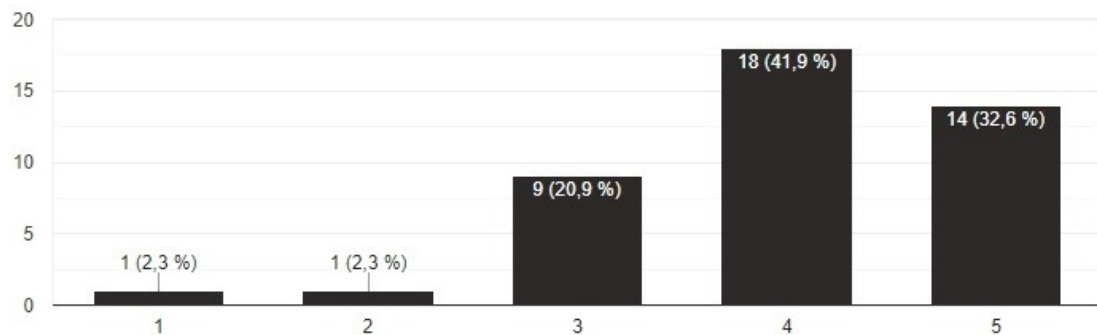
Note. This diagram shows the final very international results on the participants' nationality. Simplified view: Germany: **31**; Italy: **1**; Netherlands: **4**; Portugal: **2**; Lithuania: **1**; Romania: **3**; n/a: **1**

Figure 12

Interest level on the Topic: Human Trafficking

Topic 1: Human Trafficking

43 Antworten



Note. This diagram shows the final results of the level of interest for the first topic from 1 to 5 (1=boring, 5=interesting)

Additional comments and expectations:

- Ähm
- It sounds similar to a VR room escape.
- It would make a good horror game, but I don't know if it can raise awareness or anything like that
- Very nice escaping / survival topic. Sounds very interesting.
- I'd probably be scared as hell
- Would need trigger warnings if violence against the Player character is shown.
- Could deeply traumatize people and cause permanent harm
- Lithuanians have really high human trafficking rates so I guess that's why it's relevant to me
- Being in the process of getting kidnapped, like walking in the street at night and having someone stalk you
- *Spannendes Konzept und ein wenig behandeltes Thema. Ein Schlagwort was für mich generell drüber steht ist "moderne Sklaverei". Ein weiterer Punkt: Was für Einflüsse hat Human Trafficking auf uns und unseren Alltag. Wie kann man eine Brücke zur Zielgruppe schlagen und Bezug nehmen?*

[Exciting concept and a little discussed topic. A catchphrase that generally stands above it for me is "modern slavery". Another point: What influences does human trafficking have on us and our everyday lives. How can you build a bridge to the target group and refer to them?]

- Strange to think about it. But interesting.

- Good to be aware of, but i don't think most Players would be able to do much about that Problem and might just feel Bad afterwards (which is also good for awareness at least)

- if the player starts without knowing who she/he is, there should be a fairly good explanation for it or even prepare a short trailer, so there is some information about the hostage and then find small pieces through the gaming experience, like pictures, a wallet etc ...

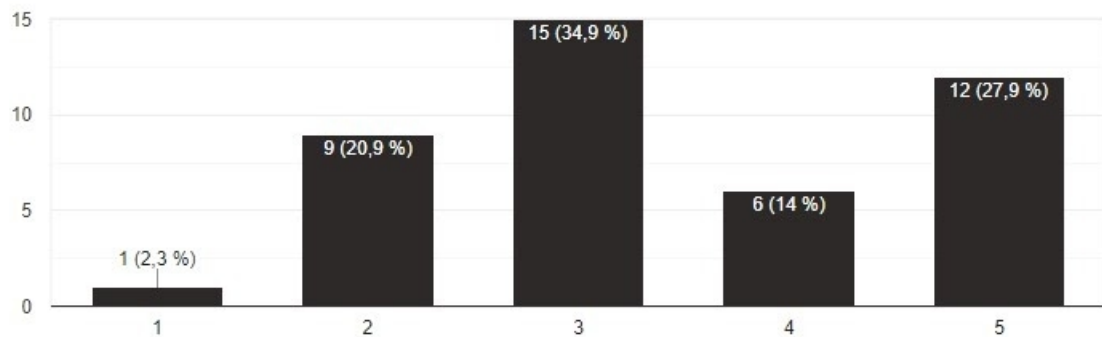
- if the player gets busted while escaping, maybe don't reset the game entirely, just put the hostage back in capture, let go a day or two and make the guards even more aware, but let the player have the same information, but also make up some new ways to escape, as time goes by

Figure 13

Interest level on the Topic: Homelessness

Topic 2: Homelessness

43 Antworten



Note. This diagram shows the final results of the level of interest for the second topic from 1 to 5 (1=boring, 5=interesting)

Additional comments and expectations:

- Living in a share apartment

- Could probably raise awareness of the struggles of homelessness and how the government often leaves the affected alone

- Could make people more compassionate

- Konzeptionell noch etwas zu vage ausgedrückt einen Mehrwert aus dieser Beschreibung zu ziehen, die über die "typischen Geschichten" aus Büchern, Videos und Fernsehen hinausgeht. Obdachlosigkeit ist immer wieder ein Einzelschicksal und nicht so strukturell und organisiert wie andere Vorgeschlagene Themen. Falls ihr aber andere Infos die aktueller und Augen öffnender sind, dann teilt sie bitte!

[Conceptually expressed a bit too vaguely to draw added value from this description, which goes beyond the "typical stories" from books, videos and television. Homelessness is always an individual fate and not as structural and organized as other Suggested Topics. But if you have other information that is more current and eye-opening, please share it!]

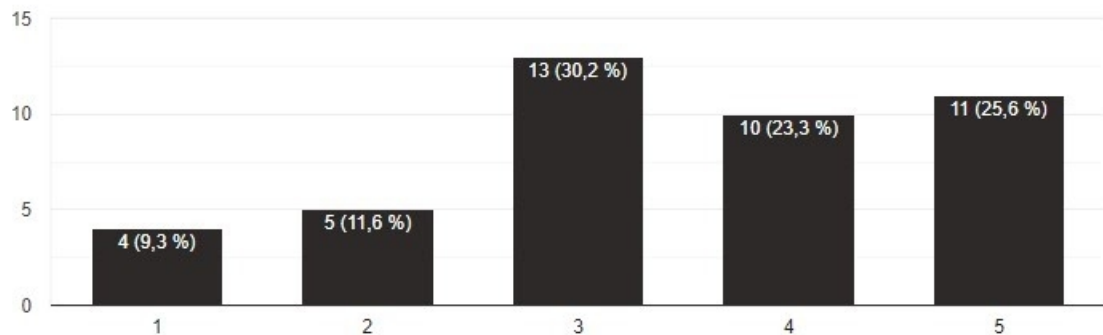
- The young part of me says: "hey how difficult could it be, to be homeless? Let's try it." The older part says: "Shut up, it's hard to survive in winter without a warm home. You already get sick, if the window stays open the whole night. So be quiet little me. XD" I would say give it a chance.
- With homelessness the player would be able to do something about it in real life after playing (helping with food, money etc), at least more than the human trafficking
- I think it's difficult to cover all major topics related to homelessness, such as drug addiction, lack of access to hygiene facilities or all ways of gaining money to pass the day
- People would understand how it is to be homeless and support homeless people more.

Figure 14

Interest level on the Topic: Artificial Intelligence

Topic 3: Artificial Intelligence

43 Antworten



Note. This diagram shows the final results of the level of interest for the third topic from 1 to 5 (1=boring, 5=interesting)

Additional comments and expectations:

- I'm a bit afraid
- Without the playing aspect, it might not be fun for a lot of people. But as a purely educational thing, it would be very good
- The concept is too abstract for me personally.
- Could raise awareness for the Problem
- Interesting but overdone
- *Das klingt wie eine schöne Inszenierungs Möglichkeit für ein Museum!*

[That sounds like a nice presentation opportunity for a museum!]

- I like this mind game about AIs and NN. It's an interesting topic. I think AIs and NN could develop so quickly that we couldn't understand it anymore. Today some Neural Networks (NN) are that complex, so we can't understand it. But it's so fascinating. It's a play with fire.

- Have been done before I believe

- AI is always interesting, but i think that topic might be overdone already

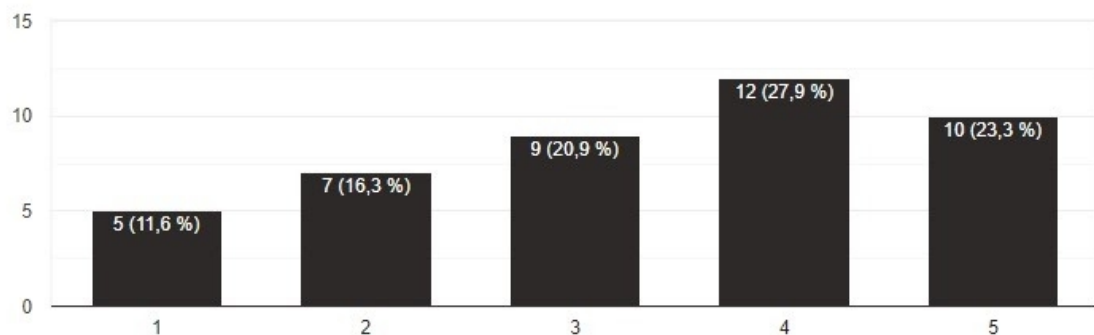
- Should be understandable for people who aren't experienced with AI

Figure 15

Interest level on the Topic: Smartphone Addiction

Topic 4: Smartphone Addiction

43 Antworten



Note. This diagram shows the final results of the level of interest for the fourth topic from 1 to 5 (1=boring, 5=interesting)

Additional comments and expectations:

- This is definitely too much

- Great setting!

- The only people complaining against that are boomers

- Gutes Thema, dabei sollten die Chancen von Smartphones aber nicht unter gehen. Ein Handy Süchtiger wird sich darauf stürzen und stützen. Eine einseitige Behandlung würde dem Thema nicht gerecht werden. Kein schwarz-weiß denken bitte!

[Good topic, but the chances of smartphones shouldn't go under. A cell phone addict will pounce and lean on it. A one-sided treatment would not do the subject justice. Don't think in black and white please!]

- Yeah I mean, i write this text on my smartphone.XD

- I don't get how smartphone addictions will be visualized in a "dead" city

- Kinda weird tho with Smartphone addiction / tech addiction while wearing a VR Set

- I think it would raise awareness of an addiction people don't see yet. The best case would be that people start to reflect on their own behaviour.

- Eine gute Idee aber ich weiß nicht, ob eine verlassene Stadt der richtige Ort wäre, um auf die Konsequenzen der Sucht hinzuweisen. Die Sucht und die Folgen der Sucht betreffen ja mehr einen persönlich und sein Umfeld anstatt eine ganze Stadt. Ich fände es daher interessanter, wenn man im Kopf eines Süchtigen ist, der über einer Therapiesitzung mit den Themen konfrontiert wird.

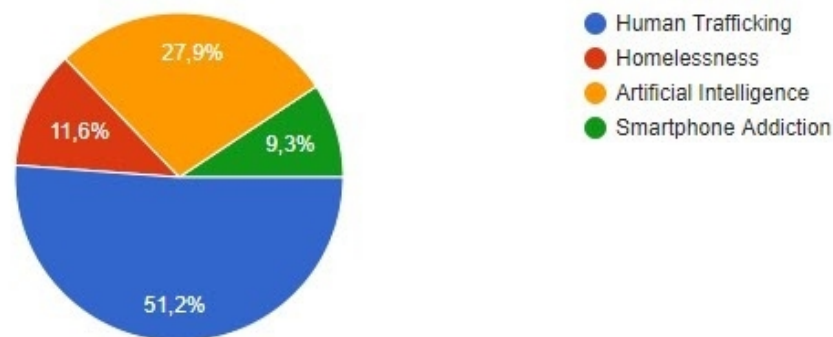
[A good idea but I don't know if an abandoned city would be the right place to point out the consequences of addiction. Addiction and the consequences of addiction affect you personally and your environment rather than an entire city. So I would find it more interesting to be in the mind of an addict who is confronted with the issues over a therapy session.]

Figure 2

Overall survey results

Choose the most interesting topic you would like to experience in VR

43 Antworten



Note. This diagram shows the most favoured topic among young adults. Each topic is presented with a specific distinguishable colour.

Explain your choice:

- I think this is one thing that Could help humanity evolve in all kinds of things

- I am really interested in the possibilities for the "Human Trafficking" and "Addiction" themes. Both would also make great horror games (considering the synopsis) but a city filled with fears and disorders may hit a tad too hard for me because of my social phobia. Additionally, the human trafficking one sounds like it could belong to the mystery genre which I like.

- Smartphone Addiction is something I experience in parts myself (Good ol' FOMO and accidentally spending way too long scrolling through content you don't even care about), and the setting sounds great. My first thought was Cyberpunk, but more dystopian.

- The behaviour of humanity itself is dangerous. Especially at the moment and especially when interacting with minorities or weaker ones. This has to stop! Human trafficking is absolutely unbearable and it needs to be stopped. I always say: Learning by doing. So in my opinion it is necessary for humanity to experience the feelings and circumstances of minorities and the bad things which happen to them so humanity will learn!

- The first topic seems very new to me and has probably the most potential to ease up the players heart rate.

- *Es ist ein Thema was zu wenig thematisiert wird*

[It is a topic that is not addressed enough]

- *Weil die Sozialen-Medien das private Leben kaputt machen.*

[Because social media ruin private life.]

- They all deliver a good message. But the first one connects it with an entertaining factor

- Although I find human trafficking the most interesting and important I wouldn't like to find myself in such a situation (even though it's play pretend I get scared pretty easily and i really don't like that, so thanks but no). Regardless, I think homelessness is a not very well discussed topic and these people are often seen as "trash" or "worthless" or just not worth the attention (which i find very wrong). Also I find the idea very interesting because one probably can't imagine what it is like being on the streets and that experience might help create more awareness and respect towards the homeless

- Homelessness can happen to anybody, that's what makes it interesting. The vr experience should have different sides.. like the bad part of getting fired, the cold environment of the streets and maybe a moment that is a bit brighter when someone smiles and gifts you a meal or some bucks. Human trafficking could be a little bit to gruesome... Why should somebody want to experience such bad feelings? Smartphone addiction could be a good story too. Maybe with some different point of views. The addicted one and someone that is not addicted. To get different perspectives on things. I hope I could help

P.s. I don't really have an opinion on artificial intelligence.

- A topic most are not well educated about and, same as homelessness, something people do not want to think about or accept as often occurring. It can create the biggest emotional response from all these concepts because it contains a sensitive topic.

- It is a thing that if simulated a lot could be better understood

- I want to know How it would be to live in a World with AIs who are smarter then Humans and what that means for me

- It would be horror and I find that lit

- It's thrilling. The other ideas can be good too but I would need more info

- *Sehr viel Potential für mehr Aufklärungsarbeit. Die anderen Themen sind ebenfalls interessant und wichtig aber wurden schon etwas öfter behandelt - Zumindest in meiner Filterblase. Bin gespannt welches Thema ihr behandeln werdet und viel Erfolg!*

[A lot of potential for more educational work. The other topics are also interesting and important, but have been dealt with a bit more often - at least in my filter base. I'm curious what topic you will deal with and good luck!]

- I would choose homelessness beside artificial intelligence. Both are interesting topics. So I would choose both.

- That has the most exciting gameplay premise. The other ones sound like just explore games. Like an interactive museum almost

- Most interesting in a way that you can help/understand people afflicted afterwards. Otherwise it would be human trafficking, but that might just be another horror game and make one feel icky after, not think about it cause you can't really do much about it as a normal person

- the given idea for "human trafficking" sounds like the most entertaining but also most challenging idea for the player ... you can experience a stealth like environment with a possibly deep background story

- Even though all topics are interesting and worth gaining attention, I would love to see human trafficking in a VR-experience the most. I would love to see how the protagonist tries to

escape his/her kidnapper, only to face the ugly truth almost every victim has to face: there is

no Happy End. I think that would deliver the message really well.

- AI and technology are becoming a bigger part of our lives, so it is important to understand how it works and what dangers and benefits there are.

- Ich denke das "Human Trafficking" das größte Potential der fünf Themen hat, um das Gesehene auch zu verinnerlichen. Man kann um dieses Thema eine unendlich große Welt erstellen und ihn vor verschiedenen Butterfly-Effects stellen, sodass man evtl. auch einen Wiederspielwert in der Simulation entwickeln kann. So kann man noch mehr auf die Konsequenzen des Handelns des Spielers drauf eingehen und ihn mehrere Lösungsansätze geben, falls es zum Ernstfall kommen sollte. Ich glaube daher, dass die Spieler aus dieser Situation am meisten profitieren.

[I think that "human trafficking" has the greatest potential of the five topics to internalize what has been seen. You can create an infinitely large world around this topic and place it in front of various butterfly effects, so that you can possibly develop a replay value in the simulation. So you can go even more into the consequences of the player's actions and give him several possible solutions in the event of an emergency. So I believe that this situation is where the players benefit the most.]

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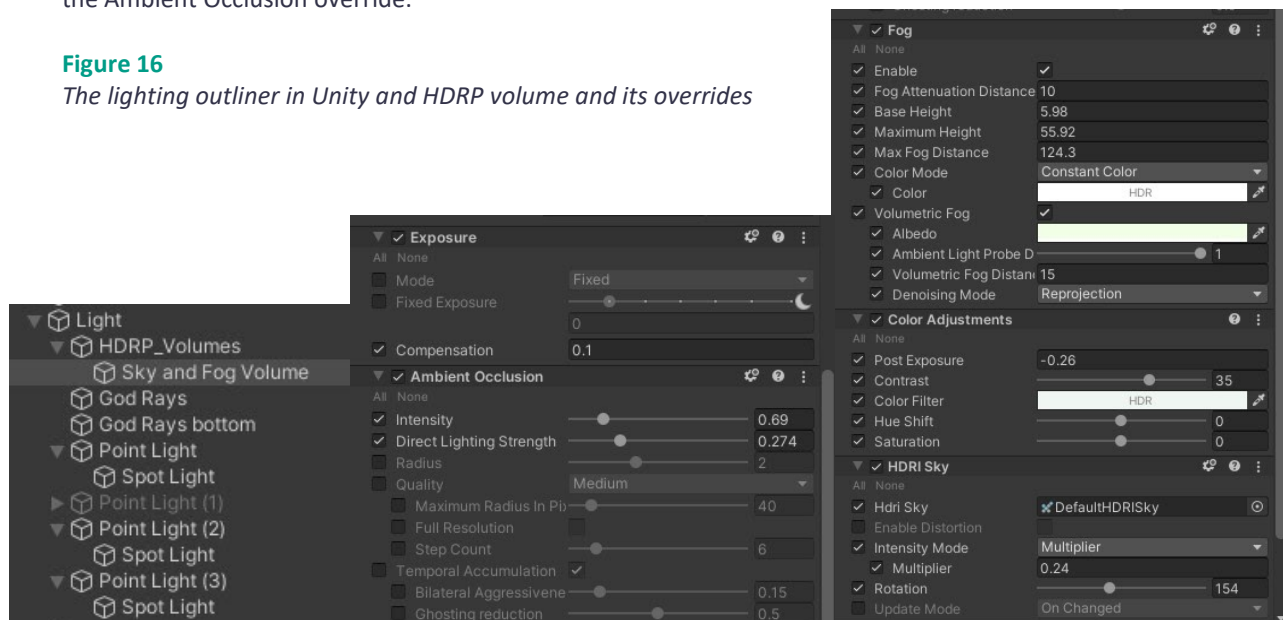
11.3 Appendix C

After creating an HDRP project in Unity3D, adding specific elements to the scene is essential to add a volume to the scene. In that volume, one can add different volume overrides that represent post-processing effects and HDRP elements. As represented in Figure 16, a volume called "Sky and Fog Volume" was used for this project. Adding volumetric fog and lighting is possible by creating a Fog volume override and working with the options provided. One can change the colour, density, distance and height of the fog effect. There is an override called "Color Adjustments" to change the overall colour of the whole scene. In case the scene needs a skybox, one has to add the HDRP Sky volume override. Pre-made or own skyboxes can be used there.

Exposure override needs to be created to change the brightness of the scene. Depending on the mood the scene is pursuing, it can be made darker or brighter. To add more ambient occlusion details, one can use the Ambient Occlusion override.

Figure 16

The lighting outliner in Unity and HDRP volume and its overrides



Note. All elements used during the project for the HDRP setup are represented above.

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11.4 Appendix D

(user testing results of first official test session; remote testing - 11.05-12.05.2021)

Complete overview of the survey results before the first remote testing:

(before) News Item in VR - Test Session 11.05.2021

This is the first test session of the News Item in VR demo with multiple participants. The demo covers the story of a recent human trafficking/modern slavery incident at a liquor store in the US. Please take the time to fill in this survey before you play the WIP demo.

1. How and when do you access/look up news? (source, device, etc.)
2. What do you expect of news? (e.g. relevant for you, short or detailed, etc.)
3. Have you seen or heard about news items in VR before? Please evaluate
4. What are your thoughts/opinions on the presented topic?
5. Do you feel empathy for or a connection to the victim? Yes/no why?
6. What do you expect from this experience?

Following sections provide detailed answers to the survey before the actual test:

1. How and when do you access/look up news? (source, device, etc.)

- Never actually, I get most of the news through others. sometimes I get some accidentally through youtube videos
- Either internet or television
- Usually in the morning, and on my computer or phone
- I mostly get "normal" news from nu.nl or rtlnieuws.nl. and tech news from tweakers.net. Also when I open Google Chrome on my phone I get a feed of news about stuff I'm interested in.
- Chrome newsfeed on mobile, or instagram news pages

2. What do you expect of news? (e.g. relevant for you, short or detailed, etc.)

- I'm never rly interested in it, so I don't expect anything.
- That it's unbiased and fairly reported.
- I usually expect too depressing world news, and tech news.
- It should be relevant to stuff that is happening. It should be accurate and factual and not unnecessarily long.
- Unbiased, to-the-point and interesting

3. Have you seen or heard about news items in VR before? Please evaluate

- Nope
- I have not.
- I've only ever seen new in VR in fiction(movies, books, shows)
- I haven't heard or experienced it before.
- No

4. What are your thoughts/opinions on the presented topic?

- It's kinda fucked up. I know humans can be rly shit, but this is another reminder.
- It's sickening and quite disturbing
- The human trafficking case? It's fucked up. Forcing that guy to work and live in a store for pennies is degrading and abusive.
- It is almost unimaginable that this is still possible and happening in 2020/2021. I haven't heard about this story before but it is definitely really horrible.
- It's a very serious topic, but I feel no connection to it

5. Do you feel empathy for or a connection to the victim? Yes/no why?

- I feel bad for them ofc, I don't feel a connection though. I feel bad for anyone that needs to deal with shitty situations forced upon them by others.
- Yes, I guess it's basic human empathy, you read something horrible so you try and relate to their situation, which brings about empathy
- I feel bad for the victim and hope that they get their money and get settled in a safe position financially and physically
- Yes. I can't imagine being forced to live and work in this kind of environment without being paid. It's just tragic.
- No, because I don't know the victim or anyone like him

6. What do you expect from this experience?

- I have no idea what to expect? I imagine it's some 3d interactable UI that displays the news?
- A more interactive/more cerebral way to look at a news item.
- I expect to either see a simulated environment of the scene where this crime took place or maybe animated infographics with a newscaster speaking over the animations

- I expect to see a recreation of the kind of environment this person lived. and to get a good explanation of what went down with this story.

- An interactive representation of the liquor store

Complete overview of the survey results after the first remote test session:

(after) News Item in VR - Test Session 11.05.2021

Please answer the following questions honestly after playing the WIP demo of the news item VR experience. The first test session mainly focuses on technical feedback because of the work in progress state of the scene but please keep in mind that the experience is supposed to change the impact of the story and empathy of the player.

1. Has your empathy towards the victim changed after experiencing the news item? Please elaborate.
2. Is there a noticeable difference of the story's impact on you between the article and the VR experience?
3. Were there any positive or negative effects of the experience? (physically, mentally, etc.)
4. Do the visuals look convincing and was the environment of the story recognizable?
5. Are the interactions logical and does the gameplay feel convenient?
6. Did the experience meet your expectations? Please elaborate.
7. Are you interested in this type of journalism? Why/why not?
8. Feel free to add more feedback or a message to us!

Following sections provide detailed answers to the survey after the test session:

1. Has your empathy towards the victim changed after experiencing the news item?

Please elaborate.

- Yes, you can get a better sense of the horrible living conditions that this person was subjected to.

- No, I don't feel any more connection to anyone

- Not really. The scene depicted was close too, if not better, than I imagined.

- A little bit. If you can see how this person lived it gets a bit more personal. You can imagine living in these conditions would be horrible

- Not really, I could imagine what it was like already, it was definitely more immersive into the story though.

2. Is there a noticeable difference of the story's impact on you between the article and the VR experience?

- It's a lot more immersive like this if you can see the horrid state
- I feel like the VR experience doesn't really tell a story. It lacks context
- No
- It was impacted a little bit. It could be better if there was a story that was being told as you were playing the VR news article.
- Yeah definitely

3. Were there any positive or negative effects of the experience? (physically, mentally, etc.)

- Not for me, I'm quite used to settings in VR that are horror/thriller related so I might be desensitised a bit.
- Nothing to speak of, I think
- No
- It did not really affect me physically or mentally.
- Not necessarily more so than the article already had

4. Do the visuals look convincing and was the environment of the story recognizable?

- Yes, they were. The objects and textures are really high quality and it didn't feel out of place at all.
- The visuals were very nice and I did realize the space was from the article, but it did not feel like a liquor store
- The visuals are spot on, and really fit the mood you are trying to achieve
- The environment was good except it would be better if there was a bit more intractability. Also, more textures on the objects would have been nice. But I can understand that it is still a WIP. Now that I think back I might have been able to open the drawers as well. But this wasn't obvious straight away.
- Yes, the art and visual effects were really good. there was an issue with the transparent effect of the teleport location not showing up properly.
- Besides that, there were some inconsistencies between the room and the story. The story mentioned clothing on the desk and a sink that was used for bathing. there was a mop and a bucket, but no sink.

5. Are the interactions logical and does the gameplay feel convenient?

- The interactions are logical and the locomotion part of the gameplay feels good though.

- Most interaction is logical, just the objects that were not interactable felt out of place
- Everything controlled as it should
- As I said in the question above it would have been better if there were more visual queues about what you can interact with. Also fixing the teleport marker on the floor (which I could not see) would have been nice.
- I'm not sure what the gameplay was besides just being in the room, looking around and being able to grab things and move around in the room?
- Interactivity wise it would be slightly more immersive if throwing glass bottles would break them.

6. Did the experience meet your expectations? Please elaborate.

- Yes it did, I already felt a bit off centre by the nature of the article itself, the VR room really does capture that feeling about it being off somewhat
- I went in with no expectations about what to experience, but I did not really experience anything
- Yes, the experience met my expectations. It seemed to be an attempt to make the viewer empathize more with the victim by placing the user in the victim's shoes.
- It under-delivered a bit because I expected to hear the news article in VR. So that would mean guiding me around a bit more and telling the story while I can move around.
- Well, I actually expected a UI with the story, not an actual interactive room.
- Having the actual article voiced would be nice though. so you can get the story while being in the room.
- One concern I have though is the viability of creating custom art and environments for lots of different stories. Environmental art isn't necessarily cheap or time-efficient. Overtime with an asset database where you can easily pull default assets from (of course right now you can get a lot from the internet as well) could make it cheaper. But until then you'll still require a lot of custom art.

7. Are you interested in this type of journalism? Why/why not?

- Yes, I feel like a lot of people (including me) have been desensitized by the barrage of negative news that comes at you every day, this is a great way to "force" people to feel empathy.
- Maybe, if the storytelling element is more incorporated into the VR experience
- NO. With the amount of depressing and awful news that already exists in the world, we do not need to empathize more with the victims of such tragedies. During the pandemic, a new term was coined, "Doom scrolling". It's when you just scroll through news and media, and because

it's all depressing and sad you end up scrolling through mountains of depressing images and stories. Humans are very empathetic creatures. Tragedy for others can easily cause depression and anxiety to onlookers.

- It is really cool to see this way of showing news getting developed. I think it has potential (If it is accessible for many people which is currently hard because not everyone has a VR headset).

- This would actually be a LOT more interesting than nu.nl XD

8. Feel free to add more feedback or a message to us!

- Maybe some more ambient noises or lighting, particles, etc could bring the scene to life. Lovely graphics though!

- The teleport destination marker can't be seen on the ground. It can only appear on walls and shelves. I think the floor is too high or the texture is obscuring the decal.

- IMO, this format of news is highly ineffective.

- Thank you for the cool demo and good luck with your graduation assignment.

- Whoops uhm, I've written my feedback in the answers above ^

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11.5 Appendix E

(user testing results of the second test session; presence test session - 01.06.2021)

Complete overview of the survey results before the first remote testing:

(before) News Item in VR - Test Session 01.06.2021

This is the second test session of the News Item in VR demo with multiple participants. The demo covers the story of a recent human trafficking/modern slavery incident at a liquor store in the US. Please take the time to fill in this survey before you play the WIP demo.

1. What are your thoughts/opinions on the presented topic? How do you feel after reading about it?
2. Do you feel empathy for or a connection to the victim yet? Yes/no why?
3. What do you expect from this experience?

Following sections provide detailed answers to the survey before the actual test:

1. What are your thoughts/opinions on the presented topic? How do you feel after reading about it?

- Angry, slowly losing faith in humanity, disappointed in the way law is rigged against such people.
 - Its obviously a horrible thing to happen, I feel slightly bad while reading but its hard to grasp or relate so I dont feel much different after reading it
 - shocked, that this still happens.
 - I have empathy for the victims and some anger towards the store owners.
 - I think the human traffickers should get prosecuted harsher for their activities. They wasted people's lives, that is time they will never get back besides the trauma
- It is an incredibly sad topic. I don't feel any different after reading the article. Stuff like this happens every day. Its very sad

2. Do you feel empathy for or a connection to the victim yet? Yes/no why?

- empathy - yes, I can not relate personally but it still makes me sad to know that this happens somewhere in the world
- Yes, eventhough its hard to even fathom it sounds horrible
no not really
- Empathy yes, because I can understand the situation they were in and feel for them. A connection no, because I have never experienced something similar
- Not really, because you see terrible news everyday. Of course, I don't wish this to anybody, but I could live my life perfectly fine knowing that this happened.

- I feel a small amount of empathy but nothing too deep. I feel sorry for them and I wish this shit wouldn't happen.

3. What do you expect from this experience?

- POV of the abused staff at the stores

- I expect to be able to relate more, be able to place myself in the victims shoes better and therefore have more empathy towards them than I already have

- not much.

- I have no idea

- Probably the living conditions of a person who has been abducted to such a place in order to visualise and empathise the player (me) more with the subject.

- I expect a virtualized environment of the area the man was held captive in. Dark tones, and dreary moods.

Complete overview of the survey results after the first remote test session:

(after) News Item in VR - Test Session 01.06.2021

Please answer the following questions honestly after playing the WIP demo of the news item VR experience. This test session mainly focusses on the emotional and empathic impact of the story and the differences between the experience and the article.

1. How did the experience make you feel? (Ex. anxious, depressed, sad, etc.) Explain why.
2. Did the experience match the article accurately?
3. Did you feel under pressure and uncomfortable during the experience? Why/Why not?
4. Did you understand what the victim was going through? Please elaborate.
5. Can you imagine what the victim has felt in that situation? Please name possible feelings/emotions.
6. Did you feel a connection to and empathic towards the victim during the experience? Do you care about their well-being? Please elaborate.
7. Would you be willing to help victims of human trafficking and modern slavery? Be it for raising awareness or donating to specific organizations. Why/Why not?
8. Has your empathy towards the victim changed after experiencing the news item? Please elaborate.
9. Is there a noticeable difference of the story's impact on you between the article and the VR experience? Did the experience leave a meaningful impact after playing?
10. A sense of presence is a feeling of currently being part of a virtual world when being highly involved. Did you feel spatially present in the virtual environment throughout this VR experience? Why/Why not?
11. Are you interested in this type of journalism? Why/why not?
12. Were there any technical issues that prevented you from playing the experience or that severely strapped you out of the immersion?

Following sections provide detailed answers to the survey before the actual test:

1. How did the experience make you feel? (Ex. anxious, depressed, sad, etc.) Explain why.

- sad and disrespected (being the player and supposedly being forced to write these notes)
- Sad, Seeing the situation that person was in made me sad
- morose.
- It made me feel trapped. The size of the room I was put in was claustrophobia-triggering (which is good, because that's your goal I'm guessing ;)) However I did not get into it entirely because the sound was either not there or not working or maybe a little too quiet for the vr headset, (Or did I use it wrong?). sound does a lot to immersive experiences
- sad, because I assume it is the room the victim had to live in. It is small and there is just a small mattress on the floor with a little blanket.
- It didnt really make me feel anything. It was obviously a very sad scene, and the conditions this person was forced into were horrible. But it didn't trigger anything in me

2. Did the experience match the article accurately?

- More than I expected, yes. it made me feel even worse than only reading the article
- From what I can tell, it did
- yes.
- Very well so! I recognised a lot of items mentioned in the article. For example the bucket, the mattress on the floor, mop and shower - it was all there :)
- I guess it did
- It was larger than I expected

3. Did you feel under pressure and uncomfortable during the experience? Why/Why not?

- Yes, the lighting in the room was very dim, the "bed" was tiny, looked uncomfortable and the notes made me sad for the people who wrote them.
- I didnt feel pressure but I did feel slightly uncomfortable, while looking around in the experience, but I think that was also kind of the point
- a little bit. there are sort of black panels floating in between the frames of the shelves. They distract, a little bit.
- I did feel uncomfortable, because of the size of the room. I dont like small rooms, so this makes it very eerie and uncomfortable for me.

- not pressure, but a little uncomfortable. I got the feeling i had to look for something, but there really wasn't much to do in that room. I think that was the point.

- Not really. there is no sense of urgency or threatening.

4. Did you understand what the victim was going through? Please elaborate.

- yes, seeing what these people have to go through is awful

- I dont think I can ever fully understand but I do think I have a better understanding than when just reading the article. The room visualization helped with seeing the actual situation.

- I am not entirely sure. I understood the backstory from the news article, however I was a little bit confused by the notes on the table.

- Because of the dark and damp looking room I can understand or experience a little bit what the victim was going through.

- yes and no, I can understand the feeling that this gives a person. but I can't relate to it because I know it is a simulation and that I can leave whenever I want. something the victim couldn't do.

- I dont think anyone could get an accurate understanding about what this person was going through from this simulation

5. Can you imagine what the victim has felt in that situation? Please name possible feelings/emotions.

- Sadness, depression, powerlessness, hopelessness

- I can imagine the victim must've felt extremely isolated, depressed and stuck. Maybe hopeless, without seeing a way out of the situation.

- Yes, despair/hopeless feeling.

- I believe the victim could have felt desperate, in a sense that they have no perspective to get out of this situation they have found themselves in. Desperation, Sadness, but also maybe genuinely 'lost the will to live' kinda feeling. I believe that a person living in these circumstances might feel lost and helpless.

- yes, frustration and sadness. because there really isn't much stuff in the room. it has no personality. I couldn't live in a place like this. It is also very dark and creepy.

- depressed, scared, sad, hopeless

6. Did you feel a connection to and empathic towards the victim during the experience? Do you care about their well-being? Please elaborate.

- a lot more than actually by simply reading the article, I saw it through their eyes, and felt the way they feel. the conditions are much worse than what I expected, and it felt like the room came out of a horror movie

- Definitely, seeing the situation allows me to feel like I know what they've been through a bit better and makes me very empathetic towards them and caring about their well being.

- a little bit if you ask, but nothing big. Obviously I don't want to share his experience/situation.

- Ultimately, I did not. However, this is not due to the execution of the project, it definitely brought me a closer look into this subject, however, news articles like these present themselves rather often in news networks. There will always be a cruel story about something like this and as unfortunate as it is, I did not connect to the person, because terrible news spoiled me in that way.

- not really, because I know that this is a simulation and it may not be a real representation of what the victim felt or went through

- I care about their wellbeing but I wouldn't say I gained any more of a connection with the victim

7. Would you be willing to help victims of human trafficking and modern slavery? Be it for raising awareness or donating to specific organizations. Why/Why not?

- I would support already existing organizations and share information to raise awareness

- Yes, I think it's a great cause and donating or raising awareness should be promoted whenever possible.

- No. Humans are not worth it (dark answer, I know). There are billions of us. Suffering will always exist.

- I am unsure. There are a lot of other pressing matters in the world and it becomes hard to prioritise them. Of course, people can get emotionally attached to one of them, however, as said before, it is complicated to find 'the most important' one of them. Ultimately, if I were to donate money, I would probably give it to a broader human rights organisation, rather than a highly specific one only focuses on human trafficking and modern slavery. Specific organisations oftentimes lack the money and power to make an impact (which is quite ironic of me not contributing to those, but I want to see my money well spent)

- maybe, that would depend on what I would have to do. But if there is something that could do that would directly help them I would.

- Yes, I definitely would be willing to help victims of human trafficking and modern slavery, Financially, logistical, etc

8. Has your empathy towards the victim changed after experiencing the news item? Please elaborate.

- I felt bad and sad for them in the first place but I could relate a lot more after the experience

- Yes, It is way easier to imagine how the victim must have felt during the entire situation when 'physically' placed in the same room. I felt bad for the victim before, but the experience amplified that feeling.

- A little bit.

- A little bit. When I read the article I thought to myself 'oh, another terrible thing in the world', and as mean as it sounds, I could've lived with it. However after the experience, it definitely changed into the direction that I think about it more, that I wouldn't wanna see myself in that position.

- not so much, because when reading the news item I also imagined a room similar to this. So seeing it in the simulation didn't really have an impact on the empathy I already felt.

- No. The news article was enough for me to feel empathy for the victim

9. Is there a noticeable difference of the story's impact on you between the article and the VR experience? Did the experience leave a meaningful impact after playing?

- yes, I felt the hopelessness of the people.

- I think without the context of the news article, the experience wouldn't have made that big of an impact. But with the news article being presented first, the experience increases the impact significantly.

- No, because I work with VR I already know in everything that it's not real. So I automatically don't feel different.

- VR definitely leaves a more impactful impact on me than a news article.

- I guess it did a little, not so much that I would remember it the next day. But it did help with visualizing the experience the victim may have had.

- Yes. the experience did not leave any meaningful impact on me.

10. A sense of presence is a feeling of currently being part of a virtual world when being highly involved. Did you feel spatially present in the virtual environment throughout this VR experience? Why/Why not?

- I felt immersed into the story. The small room, low ceiling and dark lighting made me feel a lot worse than what I imagined it would be like just by reading the article

- Yes, just being able to freely walk around, without any set goal, really made me feel immersed in the virtual world.

- No, hands disappear when you grab something, which they don't do in real life. Also, I don't see a body when I look down. The positives are that I can grab a bottle, throw it somewhere, hear the sound it makes. It can be fleshed out much more, as in, glass breaks, makes a different sound than wood crates etc. but this experience gets the job done, so no hard feelings. Just stating the obvious.

- I did due to the interactive components in the world, I could grab and inspect objects, the world was well detailed, however a bit too dark to see in my opinion. Color correction can do a lot in Unity.

- Yes, I knew I had a headset on and was controlling my movement with controllers. Also I could hear voices from the real world, which pulled me out of the experience a bit.

- I was not immersed if that's what you mean.

11. Are you interested in this type of journalism? Why/why not?

- yes, but it seems inapplicable for every article. I would expect the enormous amount of effort for a single article to deter regular journalists of practicing this type of journalism.

- Depends, if I had a VR set I would definitely occasionally want to be able to relate myself to this level. I feel like it was a good experience, in the sense that I could empathize with the victim much more. I wouldn't want to be immersed like this with every story though, as I feel that could be mentally taxing with how much bad stuff happens in the world. For raising awareness or specific situations this type of journalism is very effective though.

- No, I prefer sitting on the couch and watching a screen/tv.

- Virtual reality journalism - yes I am. Because you can connect a little bit better to the actual background and show people like me how it's really like.

- yes, for sure. this could really help bring a story to life and make you understand it better.

- NO. This type of journalism would be horrible for society. We already see a shit ton of awful news out there. Trying to immerse the public more is going to be disastrous. Doomscrolling is already a huge problem

12. Were there any technical issues that prevented you from playing the experience or that severely strapped you out of the immersion?

- I lost one of the notes by accidentally pushing it inside the desk. Grabbing and walking was not the most intuitive but I quickly learned the controls. The rest was good. I liked the little spring on the mattress, it was a nice little detail.

- Not particularly, I had one small period where my hands fell to the ground but just pressing some buttons fixed that pretty easily and it didn't ruin my immersion for long.

- my hands/controllers wouldn't load in on the first few tries. After a 3rd reboot they did, luckily. No further issues.

- Not really. In the beginning, my camera was tilted due to a misplaced sensor (i would probably recommend using a different vr set for an experience like this. In the second attempt I wasn't calibrated correctly, but that didn't break my immersion. The movement was quite fiddly, I would've probably preferred fixed waypoints or a walking controller.

-I like I said above, the noise from the real world pulled me out of the experience, maybe this could be converted with noise-cancelling headphones.

- The headset didn't really fit properly for me everything was kinda blurry, and the player controller was too low to the ground.

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