The effectiveness of low poly Virtual Reality environments designed for reducing state anxiety symptoms

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Preface

This thesis would not have been what it is now if it was not for the help of Eriko Fukuda for the advice and the feedback, as well as guiding me through the process of writing this thesis. I would also like to thank Dr. Wendy Powell and the Department of Cognitive Science and Artificial Intelligence at Tilburg University for supplying the participants the Virtual Reality headsets.

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In this work a brand new research concept is proposed and investigated. This work attempts to assess the effectiveness of low poly graphics being implemented in Virtual Reality for the use of reducing state anxiety symptoms. The research question consists of the following: Can low poly Virtual Reality environments be an effective method for reducing state anxiety symptoms? In order to examine this, the effect of a Virtual Reality environment created using realistic graphics was compared to the effect of a Virtual Reality environment created using low poly graphics in their ability to reduce state anxiety symptoms in participants. The data was collected using a questionnaire based on the CUXOS state anxiety questionnaire. Participants self-reported their levels of experienced anxiety with the use of this questionnaire. Statistical analysis of the data indicated that there was no significant difference between the effects of the two Virtual Reality environments on the anxiety symptoms of the participants.

1. Introduction

In current day society many people experience stress and anxiety in their day to day lives. In fact, in America alone, one third of the population has been shown to have experienced a stress disorder in their lifetime (Borwin and Michaelis 2015). Anxiety itself is considered an emotion, a feeling of unease or nervousness. It is often caused by fear and anticipation of future events.

1.1 Anxiety Disorders

More severe, however, are Anxiety disorders. Anxiety disorders are mental disorders that are characterized by high levels of fear and anxiety. There are multiple kinds of anxiety disorders. There are generalized anxiety disorders and specific phobias. Generalized anxiety disorders are more irrational and are characterized by experiencing fear and anxiety on irrational levels about everyday troubles. Phobias on the other hand are characterized by anxiety and fear of specific stimuli, like public speaking (glossophobia) or a fear of heights (acrophobia) (Craske and Stein 2016).

These phobias are treated through the process of exposing the patients to the stimuli which they fear. This is called exposure therapy, and when it is performed using real life stimuli, it is called in-vivo exposure therapy (Sars and Minnen 2015). However, nowadays exposure therapy is also administered using Virtual Reality therapy, because of its many advantages.

1.2 Generalized Anxiety Disorder

Generalized Anxiety Disorder (or GAD) is very different from the phobias mentioned before. Instead of anxiety being caused by a specific stimuli, it is instead caused by much more general stimuli that are common to bring up feelings of anxiety in people such as health issues, money issues, death, but also family, work, friendship or relationship problems. What differentiates GAD from the common emotion of feeling anxiety is its severity. GAD is described as the excessive feeling of anxiety or worry over everyday problems, to the extend that it interferes with daily functioning (Behar et al. 2009).

The most common treatment methods for GAD, besides medication, are cognitive therapy and applied relaxation. The therapy method that will be focused on in this paper is applied relaxation. As with the therapy treatment for anxiety related phobias, so is applied relaxation therapy nowadays also administered through the use of virtual reality. In fact, research indicates that Virtual Reality can be used as a method to increase relaxation and reduce anxiety symptoms for patients (Gorini et al. 2010).

It is also important to mention that there are two forms of anxiety symptoms that can be measured using self-report based questions. State and trait anxiety. State anxiety questions aim to capture the level of anxiety that a patient is currently experiencing, while trait anxiety captures the anxiety levels in long term. Trait refers to personality trait, meaning that trait anxiety captures long term anxiety that is related to the personality of the patient (Zimmerman et al. 2009).

1.3 Advantages of Virtual Reality treatment

The use of Virtual Reality as a treatment method against Anxiety disorders has many advantages. First of all, and most importantly, it greatly reduces chances of physically harming the participant in the treatment process, compared to exposure therapy. This, because in-vivo exposure therapy for certain phobias can be very dangerous. For example, phobias that war veterans experience or a fear of heights. For such cases, Virtual Reality Therapy is a safer option compared to in-vivo exposure therapy.

Secondly, while the creation of Virtual Reality environments can be expensive , it is often cheaper compared to existing methods. This is also reinforced by the fact that Virtual Reality environments can be re-used for the treatment of other patients who suffer from the same type of anxiety disorder.

Finally, research suggest that creating individual personalized Virtual Reality environments can be an even more effective method for reducing anxiety symptoms and treating anxiety disorders in patients (Pizzoli et al. 2019), more in this in the related work section.

1.4 Scientific Relevance

Because designing Virtual Reality environments for therapy has these advantages over existing therapy methods in the treatment of Anxiety disorders, research towards the creation process of these Virtual Reality environments can be very beneficial to mankind. Therefore, a research question was created. Can low-poly graphics be used to create an effective Virtual Reality environment designed to reduce anxiety? The possible use of low poly graphics and its effectiveness for the creation of Virtual Reality environments designed for therapy has not yet been researched. The hypothesis that will be tested is the following: the Virtual Reality environment created using low poly will have significantly more effect than the Virtual Reality environment that was created

using realistic graphics in regard of reducing the state anxiety level of the participants. If research indicates that low poly graphics are effective for this purpose, the creation of Virtual Reality environments designed for therapy becomes significantly easier, cheaper and faster. The scientific relevance for this current study originates from the proposal of a research concept regarding the use of low poly graphics for anxiety treatment which is entirely new and could lead to interesting and useful future research, as well as the fact that this study aims to investigate a cheaper, easier and faster way to create Virtual Reality environments designed for anxiety treatment.

1.5 Low Poly

Low poly refers to a digital art style in three dimensional modelling in which the meshes of models have relatively small number of polygons. A mesh is a 3D representation of a 3D model in which the collection of vertices, edges and faces of which the model is defined are highlighted. A polygon is a figure or shape consisting of only straight line segments. Therefore, circles or curves do not occur. In 3D modelling the number of polygons refers to the amount of triangles needed to create the model's mesh (Shaffer 2015). The low poly art style was popular during the creation of the first 3D games, not for its appeal, but because video game consoles at that time could not render models with many polygons, therefore the 3D models in games in the past consisted of low amounts of polygons. However, in the present the low poly art style has become very popular among the Indie game developing scene (CGTrader 2016). The indie developers scene is a rising movement among game developers in which developers choose to work alone or with a small group of people to create video games, rather than work for a large video game developer studio. The low poly art concept thrives here because of its advantages. In comparison to the realistic 3D modelling art style, low poly is cheaper and easier to create, giving independent creators more freedom and resources to finish their products. Examples of these kinds of indie games are Superhot (SuperhotTeam 2016) and Eldritch (MinorKeyGames 2014).

1.6 Advantages of low poly

First and foremost, because of the simplicity of low poly models, creating Virtual Reality environments using low poly graphics is significantly cheaper in regard of money as well as time compared to using realistic graphics.

Because the graphics in low poly rely on simple shapes with a low polygon count, it is easier to process for computer hardware. This means that cheaper hardware can be used to create and display the low poly Virtual Reality environments, compared to the hardware required for creating and displaying realistic Virtual Reality environments.

Also, because low poly graphics consist of simple shapes, the creation of low poly graphics requires less experience with 3D modelling, compared to the process of 3D modelling with realistic graphics. This means that researchers in the field of Virtual Reality therapy could more easily create specific Virtual Reality environments, without needing serious training or help from a professional 3D modeller.

If one considers the previously mentioned research towards the use of personalized Virtual Reality environments in the field of therapy, another advantage of low poly graphics becomes apparent (Pizzoli et al. 2019). If creating Virtual Reality environments becomes cheaper and easier due to the implementation of low poly graphics, it also becomes easier to create personalized Virtual Reality environments.

2. Related Work

The history of Virtual Reality for therapeutic use finds its origin at the creation of the first Virtual Reality system, the sensorama. The sensorama system was created in 1962 and was designed to deliver an immersive experience of a motorcycle ride. It is seen as one of the earliest Virtual Reality systems created.

While Virtual Reality hardware and software progressed as technology developed through the ages, so came into existence the first research towards the use of Virtual Reality in the field of therapy (North and North 1994). In this research the possibility of giving patients exposure therapy through the use of Virtual Reality was examined. The study was successful and the results indicated that Virtual Reality exposure therapy is an effective method for treating phobias.

The research idea of the current paper finds its origins in a paper from a master student. In this paper, it was researched how graphic quality of Virtual Reality environments influenced the effectiveness of the environments on reducing anxiety in participants (Hendriks 2018). In this paper, the goal was to determine the effect of a biofeedback device on the participants who experienced a Virtual Reality environment designed for reducing GAD symptoms. More related to the current paper, however, in this paper the effect of Virtual Reality image quality on the anxiety levels of participants was examined. The results of this research indicated that changing the graphic quality of the Virtual Reality environment caused no significant difference in the effect of the Virtual Reality environment on the anxiety levels of the participants (Hendriks 2018).

The choice of what the Virtual Reality environments for the current study should consist of was decided on the basis of a previous study. In this paper, the effectiveness of Virtual Reality as a method of relaxation with as goal to treat GAD was tested (Gorini et al. 2010). 20 patients suffering from GAD participated in an experiment in which the effectiveness of Virtual Reality as a method of physical relaxation as a treatment method for GAD was assessed. The results of this study indicated that Virtual Reality can be an effective method for treating GAD. The Virtual Reality environments that were used in this study consisted of nature scenery depicting a campfire, a beach, a waterfall. Because nature scenery was used for this study, as well as the paper mentioned before by Hendriks (2018), it was decided to use nature scenery for the current study as well.

For the current study, nature sounds are used. While different studies used different forms of audio for their research, like guided meditation (Hendriks 2018) or soothing music (Anderson et al. 2017), the choice was based on a study which was specifically aimed at studying the effect of nature sounds for Virtual Reality relaxation (Annerstedt et al. 2013). In this study the effect of nature sounds in Virtual Reality as a method for relaxation was tested. The results of this study indicated that using nature sounds improve the effectiveness of Virtual Reality environments designed for relaxation.

However, what differentiates the current paper from existing literature, is the concept of low poly. There exists no research towards the effectiveness of low poly graphics in the field of Virtual Reality therapy.

3. Experimental Setup

3.1 Participants

40 people participated in this study (23 males and 17 females).The average age of the participants was 34.22 *(SD = 13.23)*. The process of recruiting participants was based on voluntary participation. No reward was offered for taking part in the study. All

participants were recruited from the social circle of the researcher. The participants were randomly split into 2 groups. The control group, which will be referred to as the realistic group(8 females and 12 males) and the experimental group, which will be referred to as the low poly group (9 females and 11 males).

3.2 Design & Procedure

In order to test the functionality of low poly virtual reality environments, two separate virtual reality environments were created. The first environment was created using realistic graphics and the second environment was created using low poly graphics. Both of the virtual reality environments were created using the Unity game-engine (Unity-Technologies 2005). Assets were purchased online for the creation of the low poly environment (Synty_Studios 2015) and the realistic environment (NatureManufacture 2014). Both environments were created to more or less display the same nature environment of a small creek in a forest, as seen in figure 1. The reason why for the creation of these environments a nature scene was chosen, is because previous research towards the use of virtual reality environments to increase relaxation in participants indicates that virtual reality environments depicting nature has significantly more effect in increasing relaxation compared to other environments. (Anderson et al. 2017).

Also, the audio that was included in both Virtual Reality videos consisted of forest sounds such as birds singing, wind blowing through the treetops and audio of a small running creek or river (Weinder 2018). This audio was chosen because it fits both environments well and it is similar to the audio described in past research by Hendriks (2018).

Figure 1
Panorama view of the low poly environment (left) and the realistic environment (right).

Each participant was given a survey, which was provided to them using Google forms (Google_LLC 2008). This survey started with questions regarding their personal details such as age or gender and previous experience with Virtual Reality, to possibly check for confounding variables. For the full list of questions regarding personal info of the participants, see appendix A. After that the survey captured the participants level of anxiety through the use of questions based on the Clinically Useful Anxiety Outcome Scale (CUXOS) questionnaire regarding state anxiety (Zimmerman et al. 2009). The CUXOS questionnaire regarding state anxiety was chosen because it consists of questions of which the internal consistency as well as validity has been thoroughly tested. The questions from the CUXOS questionnaire were all originally in past tense, and were therefore altered to present tense. For the full list of the modified CUXOS state anxiety questions, see appendix B. These questions consist of statements regarding the state of the participant, for example: “I feel nervous or anxious.”. These questions

consist of 5 item Likert scale answers ranging from 1 "not at all" to 5 "very much so". After filling in these questions, the participants were shown the virtual reality video that was assigned to their group. After watching this Virtual Reality video for 5 minutes, the participants were given the same questions regarding state anxiety.

The Virtual Reality video was displayed to the participants using a combination of their own smartphone and a simple Virtual Reality headset that was sent to the participants by Tilburg University. The Virtual Reality headset that was used for this research consists of a plastic headset in which you can place a smartphone. This headset makes use of Google cardboard technology (Google_AR_&_VR. 2014). After completing the first set of questions regarding their state anxiety, the participants receive a short instruction manual, that was included in the survey, as to how they can display the Virtual Reality video correctly. For the manual, see appendix C.

Virtual Reality youtube videos were created from both the Unity projects that contained the Virtual Reality environments. This was done, because it would allow for easy viewing of the Virtual Reality videos. Because of this, participants did not need to install new apps on their smartphones. As an extra benefit of this solution, Virtual Reality videos on youtube require significantly less processing power to display on smartphones, due to the fact that youtube Virtual Reality videos do not render the entire Virtual Reality environments, but instead uses captured 360 degrees video recordings.

The results for this study were calculated by assigning a score for each individual participant from before watching the Virtual Reality video and a score from after watching the Virtual Reality video. As described earlier, the questionnaire included two sets of questions regarding state anxiety, one from before the Virtual Reality video and one from after the Virtual Reality. These two scores were calculated by averaging the answers of questions regarding state anxiety for each participant. This resulted in an average score from before and an average score from after the Virtual Reality video for each participant. The difference between the two scores for each participants is the effect of the Virtual Reality video on the state anxiety of that participant. The effects of the two environments will be compared to test whether the effect of the low poly environment is significantly bigger than the effect of the realistic environment.

Finally, this study includes meta-analysis questions regarding the hardware that was used for the data collection in this study, meaning that this study is part of a bigger study. Regardless, if interesting results become apparent within these meta-analysis questions, they will be interpreted for this study as well. These meta-analysis questions consisted of questions regarding how comfortable the hardware was to use and how easy it was to set it up, for example: "I found the system unnecessarily complex". The answers that the participants could input consisted of 5 Likert scale answers, ranging from 1 'Strongly disagree' to 5 'Strongly agree'. No statistical analysis will be performed on these questions, however they will be examined to see if any problems occurred with the hardware.

3.3 Data

The resulting data was relatively clean. However, from the low poly group, three participants were dropped due to not completing the survey. From the realistic group, two participants were dropped for not completing the survey. Because of this, new participants were recruited as to make sure that the sample was large enough. The statistics regarding participant numbers mentioned before are up to date with this development.

3.4 Method / Models

The statistical analysis that was used for analyzing and comparing the resulting scores of the two groups will be done by comparing the results and determining if the effect of the low poly environment is significantly bigger than the effect of the realistic environment. The decision on what statistical method would fit the data best, was determined by the shape of the resulting data. The preferred method for statistical analysis was the independent samples t-test. However, this test requires for the data to be normally distributed, so before a method for statistical analysis can be chosen, the data must first be examined to determine if it is normally distributed.

To determine if the resulting data is normally distributed, the data will be checked for normality using a Shapiro-Wilk test. The Shapiro-Wilk test is a test for normality. If the results from one or both of the groups are not normally distributed, a non-parametric test must be used. This, because the normality assumption for the independent samples t-test is not met. If the data is not normally distributed, a Mann-Whitney-Wilcoxon test will be used to compare the results of the two groups. The Mann-Whitney-Wilcoxon test is a non parametric test, meaning it does not require the data to be normally distributed. It is essentially non-parametric counterpart to the independent samples t-test.

4. Results

Assumption checks were made on the data to determine what statistical analysis method was best to use. First, normality was tested. the results of the normality testing indicated that the data was not normally distributed, therefore a Mann-Whitney-Wilcoxon test was performed.

4.1 Assumptions

The assumption checks were performed to check if an independent samples t-test was the right method for analyzing the difference in the effects of the two Virtual Reality environments.

Shapiro-Wilkins test for normality indicated that the change in anxiety levels measured before and after the realistic Virtual Reality video does have a normal distribution $W(20) = 0.90$, $p = .048$.

Shapiro-Wilkins test for normality indicated that the change in anxiety levels measured before and after the low poly Virtual Reality video does not have a normal distribution $W(20) = 0.96$, $p = .530$.

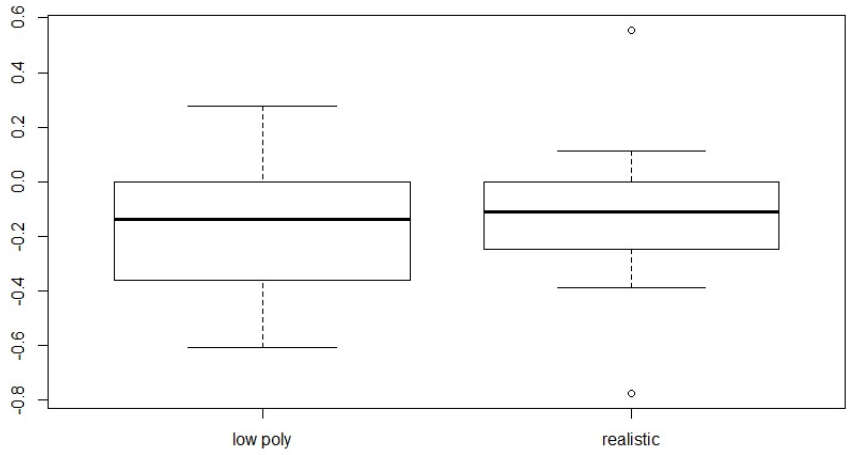
The normality assumption checks indicated that not all of the data was normally distributed. Therefore, instead of using an independent samples t-test, Mann-Whitney-Wilcoxon non parametric test was used to perform statistical analysis on the measured effects of the two Virtual Reality environments.

4.2 Main analysis

A Mann-Whitney-Wilcoxon test indicated that the effect of the low poly Virtual Reality environment $(Mdn = -0.139)$ was not significantly greater than the effect of the realistic Virtual Reality environment $(Mdn = -0.111)$, $U = 205.5$, $z = 0.149$, $p = .882$. Therefore the hypothesis is rejected. The results of the statistical analysis of the data provides no evidence that the effect of the low poly Virtual Reality environment on the anxiety levels

of the participants was significantly larger than the effect of the realistic Virtual Reality environment on the anxiety levels of the participants.

Figure 2
Boxplot displaying the distribution of the measured effect on anxiety for each group.



If the data is closer examined and visualized, it is more apparent why there is no significant difference between the measured effects of the two Virtual Reality environments. The distribution of the data for both groups appears to be very similar according to figure 2.

5. Discussion

While the results of the statistical analysis did not indicate significant results, it is likely that several factors interfered with the outcome of this study.

5.1 Covid-19

Most importantly, Covid-19 influenced the data collection for this research in significant ways. First of all, as mentioned in the discussion, the data could not be collected in person. This was not possible due to the risk of spreading Covid-19 and thus endangering the health of the participants, their families as well as the researcher himself. This problem was solved by sending individual simple Virtual Reality headsets which were usable in combination with a smartphone. These headsets being mailed to each participant allowed for data collection with Virtual Reality to continue without endangering the health of the participants or researcher.

The downside of this solution is that the researcher could no longer personally inspect and handle the data collection, meaning that it was up to the behaviour of the participant to perform the data collection correctly. In the results this was visible. Several participants only filled in the survey halfway. These participant were removed from the final data set. Still there was no way to tell with confidence that the data collection was done correctly for each participant. The fact that this method of data collection also made it significantly harder for the participants to ask questions to the researcher could also have influenced the results.

5.2 Hardware

Another downside of this solution was caused by the Virtual Reality headsets themselves. Some of the Virtual Reality headsets that were mailed to the participants were broken or had broken parts. One participant contacted the researcher, because his Virtual Reality headset arrived broken in pieces. Also, in the questionnaire in the section which reviewed the technical systems that were used in the data collection, two participants reported that they had trouble adjusting the Virtual Reality headset to function properly. The Virtual Reality headset that was send to the researcher was also broken, the lenses could not be adjusted correctly to produce a sharp image.

5.3 Participants

It also became apparent from the data that most participant got a low score on the anxiety related questions before watching their assigned Virtual Reality video. This could mean that the participants that were used for data collection did not have a lot of symptoms related to anxiety. This research recreated with participants that are confirmed to have an anxiety disorder could yield more detailed and more conclusive findings.

5.4 Measurement

The questions in the questionnaire which aimed to capture the participant's level of state anxiety were based on the CUXOS anxiety questionnaire. However the CUXOS questionnaire only has a relatively small amount of questions regarding state anxiety, compared to the State Trait Anxiety Index (STAI). The STAI questionnaire would be better fitting and further research using the STAI questionnaire could lead to interesting and useful results. Unfortunately, for this research it was not possible to use the STAI questionnaire, considering that it is locked behind a serious paywall (**?**). It would also be interesting for future research to include a measurement of heart rate or another form of physical measurement, because the CUXOS state anxiety questions as well as the STAI questions measure anxiety, based on self-reported introspection of the participants. Adding a physical measurement device such as a heart-rate monitor would increase the validity of the data, because if it was combined with the CUXOS or STAI questionnaire, it would capture both the self-reported anxiety levels as well as it would measure a physical symptom of experiencing anxiety.

Finally, in the questionnaire that was given to the participants included a brief manual on how to set up the Virtual Reality headset system correctly and how to view the Virtual Reality video that was assigned to the participant his group. For the manual, see appendix C. However, two of the five participants, of whom their results were removed due to them not completing the survey, complained that this manual was not clear enough. It is possible that more problems occurred due to the manual not being clear enough, but no other problems were reported to the researcher. As mentioned earlier, due to Covid-19 the researcher could not be present during data collection. In future research regarding the subject, it would be beneficial to the research if there was some method of direct communication between the participants and the researcher included in the process of data collection.

6. Conclusion

In conclusion, a study was created to examine the effectiveness of low poly graphics implemented in Virtual Reality therapy. To asses the effectiveness of low poly graphics, a Virtual Reality environment created using low poly graphics will be tested against a Virtual Reality environment created using realistic graphics in their ability to reduce state anxiety symptoms in participants. Therefore, two Virtual Reality environments depicting nature scenery were created and tested.

The effectiveness of the Virtual Reality environments was determined using two sets of questions based on the CUXOS questionnaire (Zimmerman et al. 2009). These scores resulting from the questions were compared, one from before the Virtual Reality environment and one from after the Virtual Reality environment.

Statistical analysis that was performed on the resulting data returned no significant results. Because of this, the hypothesis was rejected. The statistical analysis of the data indicates that the effect of the low poly Virtual Reality environment is not significantly more effective compared to the effect of the realistic environment in regard of reducing the anxiety levels of the participants. Due to insignificant results no further conclusions or indications could be drawn from the collected data. Regardless of the results of the statistical analysis of the data, this study still has a contribution to the scientific community. This, because it addresses a literature gap and proposes a new research concept. Further research towards the concept of implementing low poly graphics in Virtual Reality designed for the field of therapy could lead to interesting and useful results.

7. Self-Reflection

The most significant concepts I learned while creating the Virtual Reality environments. The creation of these environments provided me with several technical difficulties which I had to overcome, and in that process I learned quite a lot about creating Virtual Reality environments.

The software that I used to create them, as mentioned in my thesis is the Unity game engine. I learned how to create virtual reality environments in them as well as to capture a video or image of the Virtual Reality environments that I created. The latter required some complicated coding.

Also, in the process of making the system (the Virtual Reality headset and the software) work as smooth and as easy as possible, I learned several things.

First of all, I realized that it was not possible or very complicated to display the Virtual Reality environments by creating an application. This would exclude IOS users as it is significantly more difficult to publish a game on the IOS app store in contrast to the Android app store. To tackle this problem, I learned how to create virtual reality videos for youtube using Adobe premiere and coding within the unity engine. However, still some participants complained about how difficult the system was to use. In the future, I would like to create a more in depth explanation of how to set up the system and how to view the Virtual Reality environment.

Also, at the beginning of the process of creating the virtual environments, I attempted to create both Virtual Reality environments and the 3D models from scratch. I soon realized that that was not beyond my skill, but that it would simply take too much time as well as the fact that it could raise complications for my research. After all, it is not true that my proficiency with 3D modelling is as good as professionals. In existing Virtual Reality therapy, the environments are of a high and professional quality.

Therefore I chose to use existing models, created by professionals, which I purchased online.

In regard to the research paper and the research process, I also learned a lot. First of all, my time management was not efficient while creating this thesis. I prioritized tests, exams and projects, which consequently allowed for little time to work on my thesis. In the future I would take more of my free time to complete and perfect my research paper as well as the research process as a whole.

I also learned how important it is to formulate questions and explanations in a survey correctly. I did not receive any complaints regarding the questions, but two of the participants that I know personally commented on them, saying that it was possible to understand them, but that they could have been formulated more clearly.

For the research paper itself, I ran into the problem that there is little to no research on one of the core subjects of my thesis. As far as I can find, there is no scientific research towards low poly as a concept. In the future, to combat this, I would perform my literature search more diversely, using different methods of searching research papers. Including books in my literature search would also be a good idea for further research.

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Appendix A: Personal info questions

1. What is your age?
2. What is your gender?
3. What is your current highest educational level?
4. What is your country of origin?
5. What is your main language?
6. How much experience do you have with Virtual Reality?
7. In a typical week, about how many hours do you spend gaming?
8. Approximately how many times have you used Virtual Reality (VR) before?

Appendix B: State anxiety questions based on CUXOS

1. I feel nervous or anxious.
2. I worry a lot that something bad might happen.
3. I worry too much about things.
4. I am jumpy and easily startled by noises.
5. I feel "keyed up" or "on edge."
6. I feel scared.
7. I have muscle tension or muscle aches.
8. I feel jittery.
9. I am short of breath.
10. My heart is pounding or racing.
11. I have cold, clammy hands.
12. I have a dry mouth.
13. I am dizzy or lightheaded.
14. I feel sick to my stomach (nauseated).
15. I have hot flashes or chills.
16. I feel a lump in my throat.
17. I am sweating.
18. I have tingling feelings in my fingers or feet.

Appendix C: Headset and video manual

In the next part of the research, you will experience a Virtual Reality environment. But first, you need to set up the VR headset with your phone.

The first step is to try the headset on and adjust the straps so that it is comfortable to wear.

After that, open the youtube VR video on your phone and pause it: https://www.youtube.com/watch?v=nHfZhtacmVQ&t

Make sure the volume is comfortable.

Then you pull the small handle on the side of the Virtual Reality headset. The part of the headset that holds your phone should slide out. Place your phone into the slider and make sure the off button of your phone is not being pressed by the phone holder.

After this you can slide the phone holder back into your headset. You can now adjust the headset's lenses in order to have a clear view. When the view is clear, slide out the phone holder, press play on the video and slide it back in.

You can now watch the Virtual Reality environment. When the video has ended, continue to the next part.

If you still have trouble setting up the VR headset, watch the first half of the following video: https://www.youtube.com/watch?v=_LuyQV_iSJk, or contact me (m.janse@tilburguniversity.edu).

After watching the video, continue to the next part.

Appendix D: Meta-analysis questions

The Meta-analysis questions that were included at the end of the questionnaire are the following:
1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I feel confident using the system.
10. I needed to learn a lot of things before I could get going with this system.