Creating a VR experience for stressful preschool teachers

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Abstract

Most people have probably heard of the term Virtual Reality (VR). The computer technique Virtual Reality is used to present a virtual world to a user but differentiates itself from other media platforms with its’ higher level of immersion. The Virtual Reality movement is starting to expand from the field it has gained the most recognition from, the gaming industry. New innovations within Virtual Reality shows the possibilities to explore fields such as health care. The results from this have shown great potential and some area of use have even topped more traditional medical treatments such as cases of pain relief. The design process of this study have explored this relatively new way of using the VR. The goal has been to investigate how to design Virtual Reality for a vulnerable target group regarding their health. Preschool teachers is one of the top occupational groups in the country that produces the most cases of sick absence. The cause of this derives from mental health issues brought by poor work environments. This is the context that I’ve investigated in this study.

The following text covers my exploration of the field doing research and then using the extracted data together with different theories in psychology and Virtual Reality design to come up with a design solution to fit my purpose. My findings pointed me to key factors such as sound elements, proper VR interactions and environmental restoration effects.

Keywords: Design, Virtual Reality, Interaction, Preschool, Stress, Restoration

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1 Introduction

Försäkringskassan reports that preschool teachers together with after-school teachers are placed second in the country regarding occupational group with the highest number of reported illness per employee. What is even more staggering is that during the last couple of years the number only seems to be increasing. The most common cause for these diagnosis is mental illness, which includes symptoms of burnout and exhaustion. It is also reported that many employees of childcare experiences a poor quality of their psychosocial work environment which is linked to poor mental health (Försäkringskassan, 2015).

In a segment during the morning show Nyhetsmorgon a movement called The Preschool Revolt is discussed (2018). Two preschool teachers are interviewed where one of them is the initiator of the movement. They talk about the crisis many preschools around Sweden are currently facing and have been facing for many years; too large groups of children and not enough staff and resources to cover it. One teacher reports seeing colleagues showing up at work and immediately falling in tears the second they walk through the door. This type of burnout symptoms is not at all uncommon in this line of work. These worn out and drained teachers requires abstinence from work which then requires more covering staff. An evil circle affecting both teachers and the children within their care.

1.1 Background

Many foresee a great future for the computer technique known as Virtual Reality (VR). Brooks (1999) talks about the goal of VR as being able to create more immersive experiences and an increasing feeling of presence of the users. Immersion could be described as the perception of actually being in the computer generated world. VR has mostly been advertised as a gaming product, but in the last few years it has also been experimented as a tool in mental health care. Using techniques from cognitive behavioral therapy (CBT), it aims to form different thought patterns in its’ patients. Recent studies have shown great results from...
using VR in the treatment of phobias, paranoia and even patients’ suffering from chronic pain because of its’ ability to distract the user from the real world (Freeman & Freeman, 2016).

Evidently, there is a large field of application for VR.

In order to immerse a user in virtual reality, the prerequisites as well as the construction by the designer has to be adequate. The virtual world within the virtual reality is the first impression that the user is presented to and often delivers an impressive effect. At this point an immersion starts to take place but in order to keep this immersion the navigation and the interaction has to be sufficiently convincing and interpreted so that this perception isn’t lost (Abrash, 2014).

1.2 Purpose

The purpose of this thesis is to explore usage of VR for users situated in poor work environments. Today's debate on the negative consequences for young children’s development regarding preschool’s laboured climate seems to overshadow the preschool teachers wellbeing. Using immersion in a virtual world, I see an opportunity to relieve these teachers from their overwhelming work environment at appropriate occasions during their workday. I believe that this will result in a better psychosocial environment for the teachers.

1.3 Research Question

- How do you develop Virtual Reality in the purpose of aiding stressful preschool teachers during their workday?

1.4 Limitations

One of VR’s biggest issue today is that it can cause a bit of motion sickness. My prototype is intended to be very slow pace with easy interactions in order to avoid this issue which is due to the a disconnection between the vestibular system (sense of balance) and the visual system.

1.5 Intended Target Group

Nellie Östergaard
The target group I intend for this product is preschool teachers working average hours at a conventional preschool. Statistics show that this particular occupational group is heavily burdened in their work context that results in poor mental healths (Försäkringskassan, 2015).

2 Theory

The following text from this section will feature different theories I have taken into account during my design process. The content will be looking into different aspects of Virtual Reality and sound acoustics, as well as some psychology theories to connect with the issue mental health.

2.1 Virtual Reality

2.1.1 What is Virtual Reality?

Virtual Reality is a concept highly popular in the world of technology. Sherman and Craig (2002) describes it as a medium for communication. They continue defining Virtual as something being in essence or effect, but not in fact. The term Reality is more hard to define but they suggest to acknowledge it as a place that exists and that we can experience. A computer based Virtual World is the description of objects within a simulation (ibid). Furthermore, through viewing that world via Virtual Reality we are experiencing a interactive presentation through objects and interactions.

In order to use this technology we need a VR headset. This headset it placed on the users head, covering the user's eyes with a screen. The user can then move her head around for a full 360 view of the virtual environment, with a tracking device keeping check of the head movements. There is also VR headsets with complementary tools such as ones that provides the user with a bundles for each hand which can be used as a controller. In this study’s case, when I refer to VR headsets I imply a VR headset with no other tools beside the headset.

2.1.2 Immersion

Nellie Östergaard
There are two types of immersion, one is physical and the other one is mental. Physical immersion is what differentiates VR from other types of media. This type of immersion is achieved by providing responses to the users actions and presenting a world based on their location and orientation. The level of physical immersion is set from how well it can replace the real world stimuli with its’ own synthetic stimuli but also the number of its’ users senses it can deceive (Sherman & Craig, 2002). The mental immersion isn’t always critical for VR but in instances where the Virtual World is meant to make the user lose track of the real world for a moment it’s important. Sherman and Craig (2002) suggests that in order to deliver a meaningful experience for the user, elements such as sound and sight must be taken into great consideration to influence the level of mental immersion.

Slater and Usoh’s (1994) theory about realism relative to immersion discusses that VR doesn’t have to be completely believable in terms of magical components for it to be immersive. Instead they argue that aiming for total realism can be counterproductive since a crack in convincing realism could easily destroy the effect. The theory continues to explain that VR with unrealistic components can be a way of further transferring the user into the virtual world. This is achieved because of the exciting contrast between the real world and the virtual one.

2.1.3 VR Interaction Design
Bowman (1999) believes that the majority of virtual environment interactions fall into three different categories: viewpoint motion control, selection and manipulation. Depending on the task the user is to perform, there is one more suitable than the others.

The viewpoint motion control is what the headtracker monitors using the VR headset. Referring to a task where the user orients her viewpoint within the virtual environment. Since the viewpoint orientation is taking care of using the headtracking headset, the translation of this is what leads us to selection. Bowman (1999) continues to argue that the selection category is a task that involves the selection of one or more virtual objects for a purpose. Manipulation on the other hand refers to the modification of the attributes of virtual objects, such as position, color etc.

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Selection and manipulation is best designed when first defining its’ taxonomy (Bowman, 1999). This can be made by breaking down the tasks in smaller subtasks. The next step is describing the different techniques that could possibly be used to solve the subtasks. The result can look like this (see figure 1).

Figure 1: Taxonomy of Selection and Manipulation Techniques [Online]
https://pdfs.semanticscholar.org/c8ef/f5720853ac0e986df215db31c347f772595d.pdf
(Retrieved 2018-04-07)

2.3 Sound design

Hearing and sound is described by Schafer (1994) as touching at a distance, while he describes the sense of touch as the most personal of all the senses.

At 20 hertz sound and touch have a meeting point. This is where lower frequencies of sound transform to tactile vibrations. When thoughtfully designed, an acoustic environment can impose a biological impact on the listener. One way of doing this is to use the resolving

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power of the sense receptors, meaning the required minimum distance between two receptors in order for them to be identified as two separate stimuli instead of one. In filmmaking they make use of this by using a frequency range of about 24 frames per second to discreetly fuse images and sounds together. This results in a continuous flow that immerse viewers and provides a low cognitive strain (Schafer, 1994).

A Soundscape is any acoustic field of study, for instance an acoustic environment (Schafer, 1994). It is events heard and not events seen. The main features of a soundscape consists of three different elements called keynote sounds, signals, soundmarks. Keynote can be described as the fundamental tone and isn’t necessarily heard consciously. It works as a background sound, one might say, but it very important to the overall soundscape. Keynote sounds is often made up by the context and geography of that particular landscape. For instance, this could be sound of birds chirping or water flowing. Signals is in contrast of Keynote always listened to consciously. It is the foreground sound and could can for example be the sound of a bell or a whistle. Soundmarks is a unique sound is explained as the communities own special sound. It is meant to be possess qualities that makes it especially regarded by that community. Soundmarks are not used in this particularly study because I didn’t see a purpose for it during my design process.

2.4 Stress

Situations that can cause stress is known as stressors. The experience of stressors can come from four different sources: The environment, social stressors, psychological and thoughts. The environmental source can be competing external demands to adjust to such as noise and crowding. Social stressors is induced from the different social roles we have, for example caregiver or employee. The expectations to live up to our social roles creates stress in forms of deadlines and demands of your time and attention. Psychological stressors are circumstances affecting our body. This can for instance be sleep disturbances, illness or aging. The final source, thoughts, is interpretation of situations in terms of perceptions created by our brain (Klinic Community Health Centre, 2010).
Factors relating to stress at work, is among others, too high demands and expectations (Arbetsmiljöverket, 2002). That is, if they are not brief and suitable to our capability, which instead can result in improved performances.

Long-lasting and intense stress can lead to a number of negative consequences for the recipient’s body and mind. Demanding task requiring very high concentration often leads to increased muscular tension. Poor ergonomic situations at work also intensifies the muscular strain. Mental and muscular stress can in combination reinforces each other at workplaces where an employee is exposed to both during their workday. Without proper work intervals this exposure can lead to a risk to the recipient's overall wellbeing. The chronic tension that occurs when stress is frequent, doesn’t allow the body to recover itself and therefore the risk illness and injury increase (Arbetsmiljöverket, 2002). Physical reactions to an extended exposure of tension and stress includes headaches and reduced muscle ability while mental reactions includes anxiety, insomnia and concentration difficultness. Other symptoms of stress overload shows in moodiness, constant worrying and inability to relax (Klinic Community Health Centre, 2010). The organisation which the employee is employed at does also receive their share of negative consequences from stressful work environments. Such environment leads to a high number of sick absences, incidents and competence loss to just name a few (ibid).

2.5 Restoration

Stephen Kaplan (1995) have shared his thoughts considering the power of restoration through nature and environments. One key in his theory is that by directing attention from what’s causing one to be stressful you can distract and relieve her problematic thought process. What he suggests is that through several components you can classify an environment as psychologically restorative and anti-stressful. These components includes:

Being away: By this he means that one should try being away from their everyday environment which is often an urban context. That is why directing attention to natural idyllic setting works best for this purpose.
Fascination: Environments with fascinating objects helps with distraction from stressful contexts. Many natural settings delivers “soft” fascinations such as snow and sunsets. These undramatic events requires effortless attention and simply delivers an opportunity for thought distraction.

Extent: This refers to a sense of being located in a large area. It doesn’t always mean standing in open fields of land. The important thing is that the design implies that the area is large.

One more thing that he mentions to help restoration is to avoid unnecessary effort. By running a single cognitive map, with very limited tasks and attention requirements, for a longer period of time you can create something ideal for restoration (ibid).

3 Related Work

This section will look into some of the existing design relating of the field that I am studying.

3.1 Lumen VR

Lumen VR is a de-stress interactive VR experience developed by Framestore inc. (2016). With the help of a neuroscientist advisor they wanted to make an VR experience for children undergoing surgery. The experience takes place in under five minutes and contains a virtual forest that comes to life when the users interacts with it (see figure 2).
Using a VR headset, such as a Google Cardboard, the user explores the environment and when gazing at certain objects it creates certain events. For example, it could be when gazing at a tree, it starts to grow. The headset follows the user's head movement, allowing it to track where the user is looking. To help provide assistance to know where the user is focusing, they implemented a dot which follows the user's focus point. To exit Lumen, the user simply gazes down and a menu with a choice to exit appears. The environment is non-realistic but still very beautifully made. There is a smooth audio track as background noise, very fitting to the theme. Certain sound effects take place when interacting with the environment.

Lumen VR has received excellent reviews but since this is an experience developed mainly for children, some adult users find it lacking in aspects such as depth and being too plain.

3.2 Relax VR
Relax VR is an application for VR that wants its users to unwind from their reality. It's available to download on many platforms and developed by a company called Now VR (n.d.).
The premise is that it lets you choose between a guided meditation or just listening to pleasant music to a 360 degree viewable background of actual nature photos. The guided meditation goes through breathing exercises which the user is supposed to follow, leading to a relaxed state (see figure 3).

The interactions in this application is made by gazing at certain icons. Just as the Lumen application, a VR headset allows the system to know where the user is gazing but here there is no dot for the user to know where his or hers focus is. By looking down the user can reach the menu. Music and meditations formats can be changed to fit the users taste and wishes.

The reviews of this app have been mostly satisfactory but some reviews complains that the music can be quite annoying and wish for more ambient sound effects instead.

4 Methods

This is a list of methods used in this project. These aided me during the process of investigating my research question:

*How do you develop Virtual Reality in the purpose of aiding stressful preschool teachers during their workday?*

4.1. Design Principles

I’ve used the principles of user-centered design in this study. In user-centered design it’s important to regularly involve the users in the design process because they always know their situation the best (Saffer, 2010). I have involved my users through interviews, observations and user tests. This is a way to figure out the user’s goals and in user-centered design goals are an essential part. These goals are often hard to define but consists of what the user wants to achieve and the designer then decides what it takes to accomplish it (ibid). The goal in this study have been to relieve my users from their stressful environment.

4.2 Project Plan

Nellie Østergaard
As my project plan I’ve been using the Double Diamond model. This is a model that’s used to structure the design thinking and the design process. The goal is to deal with challenges in four phases. Discover, define, develop and deliver, as seen below (see figure 4). The four phases can also be split into two stages in order to simplified (Nessler, 2016).

Figure 4: Double Diamond Model [Online]
https://cdn-images-1.medium.com/max/2000/1*plChYNkaj7TWsLPLmkB41A.png  (Retrieved 2018-04-03)

4.3 Ethical Principles
I’ve worked according to research ethical principles. Vetenskapsrådet (2002) suggest one to follow four general requirements during the process of a research study. These are the information requirement, the consent requirement, confidentiality requirement and the usage requirement. In short this means that the researcher is supposed to tell all participants of this study about the purpose, the participants will decide on their participation themselves, any personal information will be kept so that unauthorized can’t get a hold of them and that the gathered information about the participants will only be used for research purposes.

4.4 Literature Review

Nellie Östergaard
The initial phase of my design process consisted of research on the web for articles and products already on the market and visiting libraries for books. The aim was to explore the field I was studying and review existing design solutions.

According to Cooper et al. (2014) literature relating to the product or its domain should be reviewed during the first stages of the design process. This review includes everything from web searches for competing products to business and technical journal articles. The data collected then acts as a basis for questions in future interviews and after user data is compiled, use it to supply additional domain knowledge and vocabulary. I spent the first couple of weeks doing exactly this. Reading up on the Swedish preschool system and the current media frenzy about preschool teachers displeasement about their labour standards. After getting the information I needed from this I moved on to different topics such as stress, VR and designing for VR.

4.4.1 Results from Literature Reviews

Researching the field I read up on the Preschool revolt (Förskoleupproret) and discovered the massive movement around it. The size of the group of children at preschools have been a big media topic in Sweden and how it affects the quality of the children’s development. Many seem to think that the overall groups of children are too large and the assigned preschool teachers too few to be able to provide a functioning operation (Kihlbom, Lidholt & Niss, 2009). Most of the focus in this subject is targeted at the children’s welfare but with regards to the previous segment it heavily suggest that the preschool teacher’s welfare is a equally big issue. Not only was preschool teachers tired of having too many children in each department, but also that their resources was not enough to support a qualitative operation. For example, the majority preschools have a janitor with a vehicle provided for his work while they don’t and have to take buses or other transportations that includes lots of planning. Another thing is that most preschools are built during a time where the groups of children were of a much smaller quantity (Stroh, 2014). Meaning the spaces were teachers and children reside in are much to small for their size. Because the number of children is so high, there is less possibilities for each teacher to supervise each child. More and more altercations and accidents takes place and time have to be set aside into resolving these. All these factors

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together with many another led to burnouts and other health issues such as migraine and anxiety (Klinic Community Health Centre, 2010).

The literature results involving stress and VR design are discussed further in later parts of the text.

What I found when researching existing designs was that most products in VR that somehow connect with stress was extremely simple apps that immersed the user in a low-interactive virtual world. Mindfulness was a keyword that was constant in almost all related apps. Mindfulness can be described as to pay attention to our present moment experience (Shapiro & Carlson, 2009). The majority of their designs solutions consisted of two different factors in order to achieve their goal, relaxation or mindfulness in the user. Either they had an element of breathing exercises in order to lower one’s stress levels or to immerse the user in a beautiful environment, such as a forest or underwater. These two factor was either combined with each other or used one or the other.

4.5 Ethnography Interviews

I’ve conducted a technique called ethnographic interviews, which is described as a combination of immersive observation and directed interview techniques (Cooper et al., 2015). Within this technique, or study, there is a method referred as contextual inquiry. This method is currently very popular in the user-centered design industry since it has been found to be a sturdy basis for qualitative research (ibid).

Ethnographic interviews are conducted after a first representation of users is hypothesized. This is derived data from literature reviews. When that have been set, it serves as a outset for gathering users and potential users to be interviewed. By answering Cooper et al. (2014) custom questions I came up with my users hypothesis:

- What different sorts of people might use this product?
  Preschool teachers of all types working at an average preschool in Sweden.

- How might their needs and behaviors vary?
Older preschool teachers might have a greater need of de-stressing because of their additional psychological stressors in forms of aging and higher probability of health issues.

- *What ranges of behavior and types of environments need to be explored?*
  The environments that need to be explored is preschools and the behaviors that needs to be examined is the preschool teachers workday behavior.

### 4.5.1 Conducting Ethnographic Interviews

The preschool I visited is located in a village south east of Sweden. It consist of three departments containing different age groups of children. In total there was ten teachers present during my time there, nine of them women and one man with various ages from mid twenties to almost retirement age. Each department was responsible of around 30 children each. My preparations for conducting ethnographic interviews at the preschool consisted of a list of questions I had come up with from my previous literature research (see appendix I). I made an assumption that while observing I would come up with more impulsive question to add to my interview questions list. This was based on Cooper et al. (2015) method regarding combining observations with interviews in the context of my target group.

The day started out with me arriving at the preschool in the morning and introducing myself to all the teachers. After that I acted as a fly on the wall for the first hours. Carefully observing the teachers and their behaviours. Some question was asked spontaneously if I discovered behaviors or situations I wanted clarification on and wanted a short and mediate answer, serving as my *early interviews* (Cooper et al., 2014) (see appendix II). After identifying patterns and mannerisms I collected more questions from the observations to be asked later during the day together with the prepared interview questions. This functioned as my *middle interviews* (ibid). I asked for a couple of minutes of their time and sat down with each of the teachers at the end of the day. I only focused on one of the departments for my sit-down interviews. The department I chose was the one with the youngest children that had 4 teachers assigned to it. These teachers were all female and ranging from an age of 37 to 59. This seemed to me be the most stressful of the three departments. The interviews was recorded on my phone so I would not waste time on writing down everything that was said.

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After the interviews was completed I gathered all my collected findings at home and organized it to try to pinpoint the most essentiell of it all.

4.5.2 Results from Ethnographic Interviews

Important extractions from the interviews and observations organized and summarized:

- The sound volume at the premise was very high and constant even when being located in the staff room
- Breaks have to be taken in shifts since this young children can’t be left alone for more than a few minutes
- The departments are very small regarding their physical space
- The teachers find it difficult to disconnect from work mentally during their breaks
- Many teachers try to relax after work with podcasts, going for walks or watching series on TV
- All interviewed teachers feel tired and tense both physically and mentally after most days at work
- They also report that it was a simpler time when they first started as preschool teachers. Now there are many more rules to follow as well as more judgement and opinions from both the parents and the society
- The staff room is very simple and uninspiring (see figure 5)
4.6 Prototyping

Prototypes can be explained as a designer’s way to express how the finished design could look and work. These prototypes could be made in a fast way using very simple materials like paper, with very limited features and interactions. If this isn’t suitable for certain projects high-fidelity prototypes can be made instead. This type of prototype is supposed to mimic how a finished product would look and work (Saffer, 2010).

Because of the nature of my study and the importance of immersion, the prototypes of this design process was only made in high-fidelity. In the purpose of testing the prototype in the first stages, pre-made objects and textures were downloaded and implemented. Working only as temporary elements in the initial prototype, this was a fast and convenient solution to a high-fidelity prototype to know if the design is heading in the right direction. When I got results indicating what worked and what didn’t, I spent more time and effort on creating my own objects and textures for the following prototype.

4.6.1 Preparation

Nellie Östergaard
After exploring the field, my target group and literature, I collected my data in order to try to define ways to solve the problems I had found so far. Starting off I decided that I wanted to make an application since most people in Sweden have a smartphone these days and it would be easy to bring into a workplace. As my VR headset, the choice landed on Google cardboard. This is a very affordable and practical headset that’s easy to use. The virtual world was created in a program called Unity, a game development platform.

All my participants from the observations implied that the short 10 min breaks was the least relaxing break time compared to their lunch break because all the children are required to have recess outside during after their lunch. That is why I figured that the VR experience would be most suitable in the shorter breaks in the staff room.

The aim was to create a Virtual Reality that provides an interesting, explorative and immersive experience for the user. To achieve this I investigated elements such as sound and different interaction possibilities inside the Virtual World. Two keywords came up while going through the design process; ease and natural. These keywords was represented what I wanted to convey from my finished design.

### 4.6.2 Sound

The importance of distraction from surrounding sound stressors was an big factor extracted from the field studies. One could think that the staff room would be enough to distance oneself from the noise outside. This was proven wrong because of the high number of children and their very high pitched voices. This stressor would classify as an environmental stressor according to the Klinic Community Health Centre (2010). This led me to implementing a constant sound element into the VR design, draining out the real world noise. The results from the field studies showed that a high number of teachers interviewed currently relaxed by listening and paying attention to podcasts or TV and these preferences was kept in mind. To use audio as a way to reach a more relaxing state. On top of this there is different sound signals in the Virtual World functioning as navigation and interaction helpers which will be discussed further later in the text.

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I took in consideration the resolving power of the sense receptors when designing the soundscape. Meaning, I tried to accurately time sound and image events to create a continuous flow for the users. Because the teachers I interviewed during my fieldwork often relaxed at home with tv series to watch, I decided on having a movie audio track (no copyright) as my keynote of the environments. These audio tracks are developed to be complemented with other sounds and often designed with the resolving power of the sense receptors in mind. The previous design example, Relax VR, had many reviews complaining about the annoyance of their background music. I was careful not to make the music too overpowering and keeping it as a background to thoughtfully complement the environment and experience.

The keynote of the whole Virtual World was very slow pace, stretching over every segment of the experience. Starting of as an initial feel for the user to get a grasp of the environment he or she is to be immersed in. But as explained before, a keynote can also be perceived unconsciously. As more sound elements is incorporated, this keynote is supposed to blend in with the background and not focused on. Events within the environment is to be alerted to the users using sound signals, along with visual cues. Using a three dimensional soundscape I can direct the user to where I want their focus to be.

4.6.3 Environment

The amount of children, the safety risks and aim for a qualitative education led the teachers into having a hard time to rewind from work. Both during breaks as well as when they are at home. This type of stress is of the type social role stressor (Klinic Community Health Centre, 2010). The teachers workday involves very high demands from their role as a caregiver as well as their role as an employee. My field work showed that this stressor resulted in problems such as trouble sleeping at night because of anxiety leading to a constant tired state.

Another find from the field work, regarding the observations, was the lack of room for the teachers to move within. The departments felt very limited and crowded. When asking the teachers about this particular problem they explained that this enhances the sound issue since every noise can be heard through each room. Some even described the situation as

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claustrophobic. Similar to the noise stressor, this is also an environmental stressor (Klinic Community Health Centre, 2010).

Combining the issues of high expectations in their social roles and environmental limitations, I decided to design environments which would give a perception of having a lot of free space. Resulting in a completely different atmosphere from the preschools’ in order to optimize restoration, in line with Stephen Kaplan’s (1995) theory. Aiming towards an environment that suggested a dreamlike surrounding with a fluent and slow pace walkthrough.

The initial screen, when first putting on the VR headset, places the user in a room that functions as a menu (see figure 6). Here, the user is presented with two objects which represent two different environments which can be selected to experience. After choosing one or the other they are transported to the selected environment and can begin to explore it.

The two choosable VR environments I put together was space themes because of its’ ability to explore with lights in forms of stars and the feeling of depth and liberty. Another reason for this type of theme was because this environment doesn’t require a lot of objects for it to present itself as a good representation of space. The dangers of designing a lot of objects for an environment could lead to a loss of immersion if not all the objects look and acts as intended (Slater & Usoh, 1994).

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4.6.4 Navigation and Interaction

Designing in VR means that interactions have to be thought of in a different way from more traditional interactions. The Google cardboard headset would be the only instrument used with the VR, not allowing any buttons or other tools to help for interactions. Navigation was designed with an outset from the headtracking function. Viewing the environment with a 360 degree viewable space but not being able to travel in any direction. By using raycasting to detect the users’ line of sight it can be function as a selection interaction. Raycasting operates as a virtual light ray that is pointing from the user’s orientation and can select objects by intersecting with them with the ray (Bowman, 1999).

Because of the different compositions of the start screen compared to the two later choosable worlds, I made two different interaction techniques taxonomy. Inspired from Bowman’s template on interaction techniques (1999). Although there aren’t a lot of difference between the two, there are some distinctions. Below is is my initial taxonomy for the initial start screen containing a menu to choose between two worlds (see figure 7).

![Figure 7: Initial Taxonomy for Start Screen](image)

Both the previous design examples Lumen Vr and the Relax Vr implemented an extra menu reachable when virtually located beyond the initial screen. I found this to be a useful arrangement and imitated this in my design. By looking down while being located in one of

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the two choosable worlds, you can access a text reading “Back To Start”. It triggers by gazing at it, allowing the user to reach the first menu (see figure 8).

![Figure 8: Back Option](image)

All choices by the users are implied by looking at different objects as a way of selecting that particular object. Tracking the users’ head allows the system to determine where she is looking. Using this, the user can focus on one of the objects and the system can assess which one based on the tracker with the help of the raycast.

Events triggered by the user in the Virtual Reality is designed so that they are explorative and perhaps not so obvious. By exploring the environment and different objects the user discovers a gradually more lively environment than from the start. Similar to the previous design example Lumen VR, each event delivers an aesthetic and appealing performance containing sound effects, visual aspects or both. With hopes that this would deliver a fascinating environment.

As previously stated, sound will be a big navigational helper in the environment. Reduce or enhance sound volume works a way directing the user to what is important and in focus at the given moment. Trying to create easy and natural movements when shifting focus from one part to another was created by implementing fading effects as well as visual cues to hint the user on where to direct her attention. The taxonomy I made for interaction techniques for the two choosable environments is shown here (see figure 9).

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Because of the teachers’ feelings of high expectations and pressure I settled on not having breathing exercises in the Virtual Reality. Previous design examples from my first research showed implementations of different types of breathing exercises but from the data of my fieldwork I concluded that this would not be suitable. I felt that the environment would lose the sense of a natural setting if instructions in breathing would be presented within it. The feeling I wanted to convey with my design was ease and natural. These objectives could be jeopardized if elements of performance would be implemented.

4.7 User Testing

After a prototype is built it’s time to test it. User tests are conducted to quickly generate a lot of information about how the users perceives a prototype. These tests can be described as structured interviews that is focused on specific functions. Using this the designer can instantly see if the users apprehend and understands the design in the way it’s intended (Kuniavsky, 2003).

4.7.1 First User Test

The test of the first prototype was conducted on five preschool teachers, four of them in the same work team (the department with the youngest children) and one from another department with slightly older children. The age of these five people was between 40-59 years of age, all female, and the test took place in a secluded room of their workplace when

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each of them had time to spare from their workday (see figure 10). The secluded room is meant the be used as a room for meetings but was according to teachers very rarely used. The preparations consisted of bringing a Google cardboard with me as a headset as well as downloading the created VR on my mobile as an app using a program called Xcode.

![Figure 10: Teacher Testing the First Prototype](image)

The environments tested out was the two space themes and the start screen operating as a menu. The experience started with the user, located in the start screen, choosing between two objects representing two different scenes to be immersed in. Each object spinning slowly to indicate that they are important and dynamic. By looking at an object for 5 seconds straight they would be transferred to that objects particular environment. When located in the selected environment different events will take place. These events takes place if the user is looking at specific objects but some also take place without choice to creating a lively and dynamic atmosphere. After 8 minutes the environment would fade back to the start screen to indicate that the time was up. These 8 minutes represented the amount of time of a short break. If the user wanted to go back to the start screen before the time was up they could do so by looking down in these environments where a small menu is located.
Lastly, I asked questions about their experience of using the prototype and their opinion on how it would function within their workday. I classified this interview as my Later interviews (Cooper et al., 2014), since it was meant to clarify my previous assumptions (see appendix III).

4.7.2 Results From The First Prototype

All my participants found it difficult to figure out if an object was correctly looked at from the VR headset. From the start screen there was no feedback to the user if one of the two choices had been selected if they user stared at one of them. There needed to be some kind of feedback in this section for future prototypes.

The second issue that was found from user testing was that the two scenes, which the users can choose between from the start screen, was too similar to each other (see figure 11 & 12). The participants felt that there should be more of a difference so that there is a new experience when switching between them. The different events in these environments had a positive impact but some felt that there could be even more events taking place.

The small menu located in the two choosable worlds was not hard for most of the participants to find when exploring these worlds. Although there were two people who didn’t use this smaller menu used to take one back to the initial screen, there was no trouble regarding the interaction in this element for those who did.

Another feedback was that the Google Cardboard VR headset was causing some discomfort ergonomically. This headset was used as the hardware aspect of my prototype which is made from cardboard material. The use of this during time intervals longer than a couple of minutes caused discomfort in the way it’s placed on the users face.

The fifth and final feedback from the prototype was that the sound elements was comfortable to listen to. Participants described it as very beautiful, relaxing and a nice change from the constant screams and crying from the children. Because the other aspects of the experience
was in parts confusing and insufficient their perception of the prototype as a whole was divided. The process of putting my users into a relaxed state was compromised by states of confusion and a somewhat deficient experience.

A side note is that I could not see a significant difference in answers between the teachers from the younger department in contrast to the teacher from the older department.

### 4.7.3 Iterations

The first prototype had a lot of pre-made elements incorporated to save time. Moving to the second prototype meant that I had to start making these elements of my own and making them more suitable for my particular VR environment. After getting critique from the first prototype I knew what I had to change and the parts that I wanted to get removed.

I realised my attempts at designing very simplistic resulted in my users having trouble grasping some of the interactions. Trying to solve this issue I started to create more feedback to the user when choosing between the two environments in the start screen. I thought about implementing a solution similar to the Lumen VR app with a dot following the users focus point but I decided that I didn’t want an experience based on being that precise. My solution to this was to implement a slow constant rotation in the two objects but when selected the object rotates faster. To indicate the release of the selection the object goes back to the slower rotation speed when not in focus. This new change also functioned as a clear introduction to the gazing interaction as a way to indicate what to select. An indication technique that would persist throughout every scene for the user.

The initial taxonomy for my interaction techniques regarding the start screen had now changed (see figure 13).

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The other iteration was to create a more diverse set of environments. I kept the one scene which had received the best feedback from the previous prototype and started to iterate the other one. The goal was to keep in mind the same keywords of ease and natural but create a new type of atmosphere. The added environment for this prototype now consisted of a snow context. The low light theme was kept but instead of a space background, this one had snow falling persistently during the experience and sky lanterns appearing and rising into the sky when gazing at them. In the space scene I added more dynamic light and star events, hoping it would please my users.

To solve the issue regarding the discomfort of the VR headset I obtained and put extra foam on selected hard edges to provide a more comfortable use of this prototype.

4.7.4 Second User Test

The second prototype was more refined since implementing the feedback from the first prototype. Both the visual parts and practical parts had been created and modified in order to create a prototype that’s as close to a finished product as possible (Saffer, 2010).

All the same participants from the first prototype test was recruited again. I wanted to get a clear view on how the changes were received based on the previous ones since these people
had been acquainted with the first prototype. This way they could base their opinion on a previous reference.

This time around I wanted the tests to take place in the staff room and not in a different secluded room as the previous test, to notice how the users real environment affects the VR experience. The google cardboard continued its’ use as the VR headset. The amount of participants was now four people, all working in the same department. Similar to the previous test, the participants took the test when having a couple of minutes to spare during their workday. The preparations consisted of bringing the modified Google cardboard as well as my mobile containing the updated version of the VR app. Except for the change of room, the VR session approach was identical to the first prototype to test out the changes. I’ve uploaded a video of how a quick walkthrough could look like for a better portrait of the whole VR experience and its’ sound elements (see appendix IV). As a small side note, the quality of the sound in the recording is not favorable and some small sound elements are not easy to register when watching.

An interesting event during one of the participants user test was that we were interrupted by another teacher wanting to use the computer inside the staff room. This teacher also brought a child with her in order to print out a paper for him.

**4.7.5 Results From The Second Prototype**

The feedback from the new prototype was considerable more positive concerning the previous issues from the first prototype. Participants felt that the experience was more seamless now than before.

The new snow scene was well received and a good fit with the rest of the scenes, referring to the start screen and the old kept space theme environment (see figure 14). Another option to change scenery resulted in a greater fascination for my users. They explained how the different scenes left different kinds of impressions and exploring each of them was more interesting this way. One participant suggested to incorporate even more types of scenes so to have even more options depending on mood.

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The added feedback elements for the start screen provided a much better understanding for the users of her actions. All the participants felt that they understood the process of choosing different objects in this prototype.

After the VR session the interviews conducted revealed that the participants found that this new improved prototype was more satisfying and fascinating. There was one teacher complaining that it felt strange sitting in the staff room with the headset on when other people entered the room. This was the same teacher who had the other teacher and child walk in during the session. This implies that this space, the staff room, is not ideal for relaxation and disconnecting from work and that perhaps the secluded room used in the first prototype test is more fitting.

When asking about how they felt about going back to the department after this session four out of five expressed that they felt more at ease with it and more energetic. The fifth person felt indifferent. One of the four encouraged teachers explained how she felt more optimistic because the music and explorative nature was interesting and pleasant. Another described it as a refreshing event where she could change the hectic pace of the preschool to a more calm atmosphere.

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Due to lack of time I did not perform a third prototype test. If I had more time to modify the prototype I would have added another choosable environment and the user test would have taken place in a secluded room similar to the first user test.

5 Discussion

This chapter contains a discussion of the study at hand. First, viewing it holistically and reflecting on it in retrospect. The text covers the findings during the process of this study. It’s concluded with a segment on future work.

5.1 Discussion

The research question this thesis aimed to answer was “How do you develop Virtual Reality in the purpose of aiding stressful preschool teachers during their workday?”.

Reading about Virtual Reality being used as a psychological medical treatment caught my attention because of its’ remarkable results. I was fascinated by how easily the human mind can be tricked using the right methods and techniques. My curiosity in this led me to base the whole paper on this particular subject.

The thing about technology is that it’s often thought of as another stress factor in our everyday life. For instance a smartphone delivers a direct method to communicate demands, expectations and a feeling of constant surveillance. I decided to explore technology as a way to relieve the user of stress factors and the methods I have used in my design process trying to explore this topic has worked well. The literature studies gave me valuable insights about the field which I could use in my preparations for the upcoming interviews and prototypes. Through ethnographic interviews I was able to get a first hand look of how the work environment and my target group cooperated. Using my findings from this I conducted user tests to test the derived theories on my users which lead to valuable insights.

5.2 Conclusion

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What I found during the course of this project was that perhaps the most important factor to
distract the preschool teachers from the stressors of their work surroundings was sound and
location. I imagined the preschool being quite noisy with young children often being loud by
nature but I did not expect it being as loud as it was. With the departments being so small
regarding space there was basically impossible finding a spot where it was silent. The
solution to this was to add more sound but to use it as a distraction by draining out the
screechy sounds of their surrounding environment.

My study also implied that the staff room was not the most ideal location when using the VR
application. The secluded meeting room used in the first user test had less chance of
interruptions in forms of other people interfering with the experience. If the teachers on break
wished for a break time with social interactions with colleagues they could use the staff room
but in the purpose of using the VR, the meeting room is more fitting.

When designing the virtual environments I tried to take different psychological theories in
consideration. Environments that gave an impression of being very large and open, together
with enough fascinating events made the VR compelling enough to distract the user during
the 8 minutes of the user test.

Working with the interactions within the VR I discovered new ways of thinking of its’
construction. Using only the headtracking device and no buttons, the selection and release
aspect was hard to figure out but by implementing enough feedback to the user made it more
comprehensible. With the help of taxonomies I could more easily organize and review the
different interactions. Using the taxonomy as a template when making changes made the
process of development more effective.

5.3 Self-Critique
Looking back on the process of developing this product I can reflect on a couple things I
could do better in the future. First of all, the teachers which I had gathered to participate in
my user testing was not of any kind a diverse group of people. Each was a female working at
the same preschool and all close in age. This gave me data that can or can not be very specific
for this particular context and these particular people. In other words, perhaps a not very broad study.

Another thing I wanted to critique myself on is that I should have included more time in creating the VR prototypes. I did not have a lot of experience in code and I had to spend too much time learning and fixing the required code for this project. Although this was very educational, in retrospect I should have counted on having to spend more time on it. Planning more time for the code aspect could have led to a more refined product as a whole.

### 5.4 Future Work

VR outside the world of gaming is slowly starting to get the attention it deserves. As the technology develops and possibilities for more immersive interactions and environments is producing, I expect the market for VR in the purpose of addressing mental health most definitely to flourish.

Besides from preschool teachers, occupational groups such as nurses also suffers from high absences because of mental health issues. Occupations struggling with poor work environments does not only have a negative impact on the individual but also the company they are employed at. In the future I see an opportunity to further explore different types of occupations with high stress contexts and how technology can be used to relieve some of this stress to benefit both the individual and the company they work for.
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**Figures**

**Figure 1.** Taxonomy of Selection and Manipulation Techniques [Online]
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**Figure 2.** Lumen VR [Online] http://framestorevr.com/lumen/ (Retrieved 2018-03-20)

**Figure 3.** Relax VR [Online] http://www.relaxvr.co/ (Retrieved 2018-03-20)

**Figure 4.** Double Diamond Model [Online]
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**Appendix**

**Appendix I: Sit-down interview questions**

1. *How long have you been working as a preschool teacher?*
   - *How would you describe the biggest differences regarding your work from now to when you first started?*
   - *What are the consequences from working in this line of work?*

2. *Are all children present during the whole day?*
   - *When is the group of children at its’ largest?*

3. *How would you describe the work environment when all children are present?*

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4. **What kind of resources do you have to your disposal to operate your job as an preschool teacher?**

5. **What is required from you and your colleagues to be able to handle these type of workdays?**

6. **What do you do on your breaks?**
   - What do you talk about?
   - How many teachers are you during breaks?
   - What do you think about your staff room?
   - How would you describe the feeling after a break?

7. **How do you most often feel when coming home from work?**

8. **Do you bring work home with you?**
   - What do you do to disconnect from work?

9. **How well do you manage a smartphone?**
   - Do you bring it to work?

### Appendix II: Questions during observation

1. **Is there any kind of regulations about the maximum amount of children there can exist per department?**

2. **What is your opinion on the sound volume here?**

3. **How does the types of breaks (lunch, smaller breaks) for you teachers differentiate except for the amount of time?**

### Appendix III: Questions user tests

1. **How do you feel about going back to work after this experience?**

2. **Did you find this experience easy to grasp and navigate around?**
   - Why?
   - Why not?

3. **What did you think about the interactions?**

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4. Did this experience affect you in any way compared to how you felt before it? 
   - How?

5. Is this something you can imagine yourself using everyday? 
   - Why?
   - Why not?

6. How do you feel about the atmosphere within the experience?

7. Is there anything else you would like to share your thoughts about?

Appendix IV: Link to video

https://vimeo.com/268488495

Technical specifications

The application was made in a program called Unity. I chose this because I had previous experience in working with the program and it was relatively easy to adapt a creation into VR. Using another program called Xcode I could download what I had created in Unity into my mobile. The mobile is an Iphone SE and was chosen because it was compatible with the Unity program and the VR headset. By clicking on the application, displayed in the mobile interface as any other application, you are instructed to place the mobile horizontal in your VR headset and from there the experience begin. These programs and tools were used in both prototypes.

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