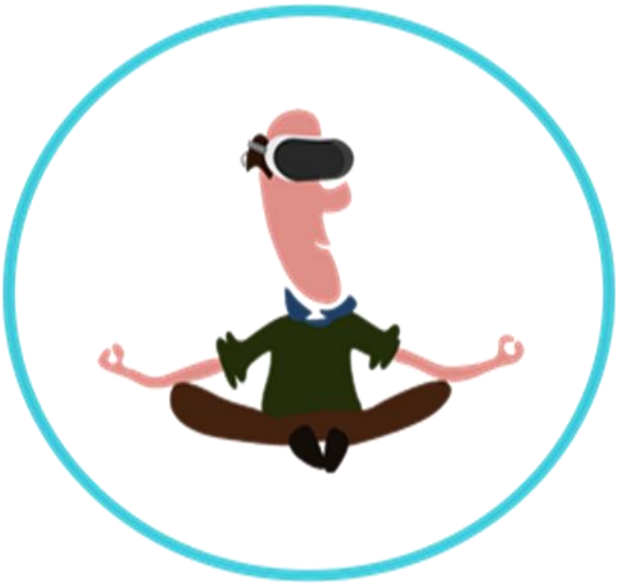
VIRTUAL REALITY RELAXATION

An effectiveness and implementation study with regard to VR- relaxation intervention: A mixed method approach



14 OKTOBER 2019

THERAPIELAND & UNIVERSITY OF TWENTE
Researcher: Melika Osmaily
Student number: s1854720
Supervisor University of Twente: C.h.c. drossaert
Supervisor Therapieland: Matthijs Spruijt

Abstract

Background: Burnout and sickness absence are increasing and require more attention to be tackled. The increasing work- related stress and exhaustion are examples of the root of these problems. To prevent further consequences like high costs and care for the employer and the government, measures must be taken to balance work and relaxation. Numerous interventions have already been developed with the aim of solving this current problem. At the same time the growing interest in medical and mental applications and Virtual Reality has become an opportunity by many health providers. Previous studies have shown that the use of these interventions can be beneficial in the healthcare. In contrast, there is still a lack of knowledge about the exact benefits and the methods of implementation. Therefore this research is conducted to gain more knowledge about the benefits of these interventions. In the current study we have examined the Virtual Reality Relaxation intervention, which is developed by 'Therapieland', with the aim of inducing relaxation, to analyze whether such interventions can contribute in the future to prevent burnout symptoms.
Goal: The aim of the study was to investigate the effectiveness of the relaxation intervention designed by Therapieland by examining whether differences in the degree of anxiety, positive mood and negative mood were measured . The expectation was to reach decreased anxiety and negative mood levels after performing the Virtual Reality intervention. The second aim of the study was to investigate which implementation factors may facilitate or hinder the intervention in the future.
Methods: A mixed- method design was used in the current study. Thirty employees (*N*= 30) of the Province Zuid Holland participated in the pre- post-test study. To measure the anxiety levels, the 'Zelf-beoordeling vragenlijst' (Dutch version of the State Anxiety Inventory) was used. The Positive affection vs. Negative Affection Scale (PANAS) was used to measure the positive and negative moods of the participants before and after the intervention. For the qualitative part of the study a semi- structured interview scheme was obtained on the basis of the 5- domains of the CFIR model of Damschroder and used in the qualitative part of the study. Fifteen of the thirty employees who participated in the VR-relaxation intervention underwent the semi-structured interviews on a voluntary basis.
Results: The quantitative part, results showed significant decreased levels of anxiety and negative mood levels after the intervention. The mean scores of the Negative Affection scale were decreased from (*M*=14.6) before the intervention to (*M*=11.5) after the intervention. The mean scores of the State Anxiety decreased from (*M*=36.2) before the intervention to (*M*=32.0) after the intervention. The qualitative part many barriers and facilitators have been recognized. Overall, the VR- Relaxation intervention was assessed positively by the participants of the study (Employees of the Provincie Zuid Holland). The VR- relaxation experience and the content elements have been appointed as factors underlying this experience. Some barriers including quality and lack of movement relate to the characteristics of the virtual environment. The most important implementation factors are found within the domain of inner setting, these are distance to reach the intervention and the existing culture in the organization. Furthermore, involvement of the management, attitude towards the intervention and promotion of the intervention were considered as important factors. These factors can facilitate the implementation if recommendations given by the participants can be applied in practice.
Conclusion: The current study was carried out to gain more knowledge about the effectivity of VR-relaxation intervention and the implementation of it, to contribute in the problem of work related stress. The current study indicates that Virtual Reality Relaxation can contribute to the problem of burnout and sickness absence by reducing the numbers of tension and negative moods during work. However, it is important when implementing such interventions, to consider facilitating and hampering factors and to meet conditions to minimize hampering and to maximize facilitating factors.

Table of Content

1. Background & theoretical framework

1.1 Prevalence & incidence

Employees assign to work- related stress as one of the primary reasons for illness (Broughton, 2010, pp. 1–3) . According to the national survey of work conditions 9.4% of work- related sickness absence is created by work (StatLine, 2019). The same research indicated that 16 % of employees between 15 and 75 experience work related stress and exhaustion at least several times in a month. These numbers are a result of the reports by Statistics Netherlands on the basis of figures from the Netherlands working conditions survey and the self – employment survey conducted by CBVS and the Netherlands organization for applied scientific research (StatLine, 2019). Another research in 2017 has shown that 23,9% of sickness absence, partly 14,7% and mainly 9,2% is caused by work (Volksgezondheidzorg.info, 2017). Besides, these studies emphasize that absenteeism and stress complains causes high costs. Employers in our country spend on average 33.10 euros in labor costs per hour worked (Centraal Bureau voor de Statistiek, 2014). Furthermore, this is accompanied by lack of productivity and the quality of work. The earlier mentioned consequences are a reason for investigation to address this social problem, to reduce the costs for the employers and to increase the quality of life for employees.

1.2 Burnout

Burnout appears in the setting of work and challenging social relationships (Riethof & Bob, 2019). It is often described and linked with existing diagnostic categories like stress- related disorders or a particular type of depression and anyone can be affected by it regardless of age or profession, but especially social professions with high emotional involvement (Riethof & Bob, 2019). Several consequences caused by burning out are: health problems , risk of tiredness or fatigue, disruption or self- destruction, lack of productivity, higher number of errors by employees and less quality of decision making (Riethof & Bob, 2019). Employees who are diagnosed with burn-out confirm the lack of productivity and lack of concentration. Additionally, the feeling of being exhausted continuously (fatigue) and increased need for sleep are barriers to be functional for these patients. It is important to recognize signals of work pressure and work related stress in an early stadium, to tackle consequences like absenteeism, high costs, burn-out and depression. In order to prevent the further consequences of stress and burn-out interventions are developed within the field of psychology with the aim to reduce stress levels and increase the quality of life. Given the increasing growth and interest in innovative solutions, this current study emphasizes on Virtual Reality interventions.

1.3 Virtual Reality Interventions

Nowadays, there is growing attention for usage of technology to solve mental health complications. Due to the growing interest in medical and mental applications and the growing interest in Virtual Reality, the need for practical knowledge on this topic is increasing as well . ‘’Virtual reality refers to immersive, interactive, multi-sensory, viewer-centered, three-dimensional computer-generated environments and the combination of technologies required to build these environments’’(Srivastrava, Das & Chaudhury, 2014, pp. 83-85). VR interventions have a number of advantages, they allow the recreation of real life situations in the virtual environment and provide interaction with this environment like in the real world (Baños, Botella, & Perpiñá, 1999). The Virtual Environment (VE) stimulates often two senses, the sight (3D images) and hearing by using sounds (Serrano, Banos, & Botella, 2016). Some studies include the use of smell, touch and taste to improve the sensory experience. For example, Dinh, Walker, Hodges, Song, and Kobayashi (1999) examined the possibilities of different senses with the aim to increase the Virtual Reality experience. They used stimuli associated with particular objects. They assumed that the use of different senses improves the sense of presence. Another study (Herrero, García-Palacios, Castilla, Molinari, & Botella, 2014) in the treatment of fibromyalgia evaluated the efficacy of the use of VR with the aim to induce positive emotions in the patients. Results of this study showed significant increasement in general moods, positive emotions, motivation and self-efficacy.

Overall, based on the aforementioned literature it seems that these innovative interventions have become popular in our century and offer a lot of possibilities, but on the other hand, despite this large offer more research is needed to fulfil the limitations. A few examples are such as followed: Zinzow et al. (2018), emphasizes in his study concerning the implementation factors, the missing knowledge about the needed implementation factors to create a certain effect in interventions with Virtual Reality. Another review about Virtual Reality treatment in psychiatry mentioned another limitation, which is the difficulty of adjusting the Virtual Reality environment to the individual needs of the clients (Mishkind, Norr, Katz, & Reger, 2017). In addition, there is lack of knowledge on the subject of the added benefits of the Virtual Reality interventions, in terms of reduced stress, anxiety and negative mood levels. Besides this, virtual reality interventions have an innovative character, which is new to the adopter (an individual or an organization). Hence, health promotion programs, which encourage health behaviors and make an increasing use of these innovative interventions, need to be aware of any challenges associated with implementing these interventions. In this way, they facilitate the implementation and uptake of the intervention.

To fill the gap of knowledge whether an intervention can achieve effectiveness and which implementation factors involved facilitate the procedure, this study was designed. With the purpose to contribute in the existing knowledge about VR interventions by examining a Virtual Reality Relaxation programme in a mixed method study.

1.4 Virtual Reality Relaxation Intervention

The used intervention in this study, called: 'VR- Ontspanning' and known as Virtual Reality Relaxation in our study is a program developed by Therapieland. VR- Relaxation program is designed for adults from different groups, who need relaxation . The aim of the intervention is to cater to various groups such as young adults and adults who work or study and need relaxation, in order to keep balance between their daily activities. The program consists of relaxation environments (different nature areas) with three type of approaches (nature sounds, music and meditation). The relaxation program consist of Virtual Reality environments whereby the participants are able to expose themselves to a natural environment to induce relaxation. The program is online available and in this research installed on the Oculus Go, a Virtual Reality glasses, which does not need a computer to connect. The aim of the intervention is to let go thoughts and relax for a couple of minutes performing the VR- relaxation exercise. The intervention offers elements which can help the user to set free of tension. These elements are 360° videos of nature environments that can be observed with the eyes. Once the user has chosen an environment, different options are offered to perform the exercise, which are: relaxation with just the view of nature, relaxation with provided music or relaxation with a mediation with guidance (Therapieland, 2019).

Before the use of this VR- intervention or any intervention a systematic plan is required to achieve its aim. In the next paragraph a framework is discussed which is used in this study as the theoretical model to evaluate the implementation during this study.

1.5 Consolidated Framework For Implementation Research

The Consolidated framework for Implementation research provides constructs that have been associated with an powerful implementation (Consolidated Framework for Implementation Research, 2019). It can be used as a guide to systematically assess potential barriers and facilitators in preparation for the implementation of an intervention. It helps to identify important factors to influence the intervention's implementation. The domains of this framework, which may affect the intervention implementation are presented in the table below (Table 1).

Table1

The five domains of the CFIR

Domains	Definitions*
1. Intervention Characteristics	Characteristics of the intervention (e.g., relative advantages) that might influence the implementation.
2. Inner setting	Characteristics which include the planning and organization that might influence the intervention implementation (e.g., Climate, leadership engagement etc.)
3. Outer setting	Characteristics of the external environment that might influence the intervention implementation. (e.g., outdoor policy, government etc.)
4. Individuals involved	Features of people involved in the implementation that might influence the intervention implementation. (e.g., information and views about the intervention).

5.	Implementation process	It contains the plans or used strategies that might influence the intervention implementation.(e.g., reflecting and evaluating).

Note. Damschroder et al. 2009*

The CFIR was developed in 2009, from constructs as the 'Diffusion of Innovations Theory' from Everett Rogers. For many years E. Rogers (2003) studied the process of diffusion, beginning with a focus on individual adopters of new technology. The Diffusion of Innovations Theory (DIT) can be applied to any new behavior, but in the context of Intervention Mapping, the main focus lies on diffusion of a (new) health promotion program. Further explanation about this theory is outside the purpose of this study. Therefore this study focuses on the elaboration of the key domains of the CFIR.

1.6 Elaboration of the key domains of the CFIR

To understand the five domains of the CFIR, elaboration on these domains are given individually. Fist, the *Intervention characteristics* covers three subdomains, which can facilitate or hinder the uptake and implementation of an intervention: Complexity, relative advantages and adaptability. Complexity implies the effort required to make use of the intervention (VR- Relaxation). Damschroder assumes the easier the product or program is for the user, the more likely the intervention will succeed. Relative advantages are the benefits offered by the intervention, on short or long term. An example of this can be increasement in productivity or decreased numbers of sickness absence. Adaptability is focused on the extend that the intervention can be adapted to meet the local needs (Damschroder et al. 2009). The intervention needs to be easily adjusted into the daily structure of the organization.

The Inner setting, consist of the financial, political and societal setting within the organization. It contains the following subdomains: structural characteristics, culture, climate and readiness to adapt. Structural characteristics covers the social construction, age, development and size of an organization. The more stable the teams in an organization are, the higher the chance the intervention will succeed (Edmondson, Bohmer, Pisana; 2001). The norms and values within the organization form the organizational culture. Developers of new interventions should take these existing values and norms into account to make the interventions more attractive for the users.

The third domain of the CFIR model, *Outer setting*, involves *patient needs and assets*, *peer pressure*, and *the outdoor policies and motivations* (Damschroder et al. 2009). According to the literature, 'patients' needs and assets ' are based on the extent to which the user's needs are known and valued by the organization. Peer pressure in this case, can be described as the degree to which organizations have networks with other organizations, that influence the intervention. Networking with other organizations can be a facilitator, when stakeholders offer support to carry the implementation and an barrier if they create obstacles. Policy and regulation provides tools and guidance that may favor the implementation, on the other hand, the lack of written rules included in the policy may adversely affect intervention implementation.

The fourth domain, the *individuals involved,* includes knowledge and beliefs about the intervention. According to the model of CFIR, the acceptance and the use of the intervention has a higher chance, when

individuals have a positive attitude toward it and value the intervention. Beside this, self-efficacy, which includes believes in own abilities to perform the course of actions to reach implementation goals, is considered as an essential subdomain, divided in the category of the individuals involved in the CFIR model of Damschroder.

The final domain, *Implementation process* includes planning, engaging, executing and reflecting and evaluating. These are the four essential activities of implementation process. Damschroder (2009) mentioned in his study *' Fostering implementation of health services research findings into practice'*, that this phase is aimed to fulfill the purpose of building a plan and designing course of actions which promote an effective implementation. However the content of this plan will vary depending on the theory or model used to guide the implementation.

1.7 Research questions

The purpose of this study was to examine the effectiveness of the VR relaxation exercise examined in a work setting and to describe which implementation factors are essential to reach a high level of uptake. A mixed-method approach is conducted in this research to give answers for the following research questions:

- *To what extend has the VR-relaxation exercise shown differences in the scores of positive/ negative moods and the levels of anxiety, by employees of Province Zuid- Holland?*
- *Which implementation factors may facilitate or hinder the implementation of an Virtual Reality relaxation intervention intended for employees in practice?*

2. Method

2.1 Design & procedure

The study consisted of an one group pre-posttest research design followed by a semi- structured interview. The participants invited contributed first in the pretest, followed by participation in the intervention and filled in the second part of the questionnaire as posttest. The interview afterwards was aimed to examine the implementation factors in practice. As it was expected, research took place in the first two weeks of February 2019. The study has been performed in a room specially designed for relaxation by the Province Zuid Holland. The duration of each session was calculated to be approximately sixty minutes. Each participant was asked to schedule a block of time and date of participation. The room was reserved for the participant to perform the exercise without being disturbed. In the room material like the questionnaires, a chair, a table and the Oculus VR glasses were available as preparation to start the research. The chair was placed in the middle of the room to move free and safe. Once the participant entered the room, explanation about the research was given by researcher, followed by detailed instructions. A choice was made for an oral instruction instead of a manual to minimize the effort for participants. Participants were asked to read and sign the informed consent. After signing the informed consent the participants were asked to fill in the questionnaires that belongs to the pretest. The surveys were marked to prevent confusion. After completing the pre- test (see Appendix 1 & 2) the participant started the exercise with the VR glasses. The oculus VR glasses was charged and ready to use with the corresponding controller. Directly hereafter the post-test was filled in and the heart rate measurement has been performed. After this, participants were invited to participate in the interview on a voluntary basis.

2.2 Participants

By means of a voluntary response sampling method, employees were included when they met the requirements of the inclusion criteria: 1) minimum age of 18 years. 2) being an employee of the organization Provincie Zuid Holland. 3) participants included in this research were required to speak and write in Dutch because the intervention and the measurements included in the research, were offered in Dutch. The recruitment started from December 15th , and in order to increase the number of participants, reminders were set up two weeks before the research took place. The participants were employees of the 'Province of South Holland'[1], which is a client of 'Therapieland [2] the principal of this research. The employees (population of the study) were informed about the intervention, and requested to join the sample. The participants were allowed to sign up for participation in the study through an intake list. The group consisted of men and woman between 18 and 65 years old (Table 3). A total number of 30 participants has participated in the study (*N*= 30; 11 male; 16 female). There were no drop outs during the study.

[1] Province South Holland (Province Zuid Holland). A client of Therapy land (Therapieland) who participated in this research. |https://www.zuid-holland.nl/

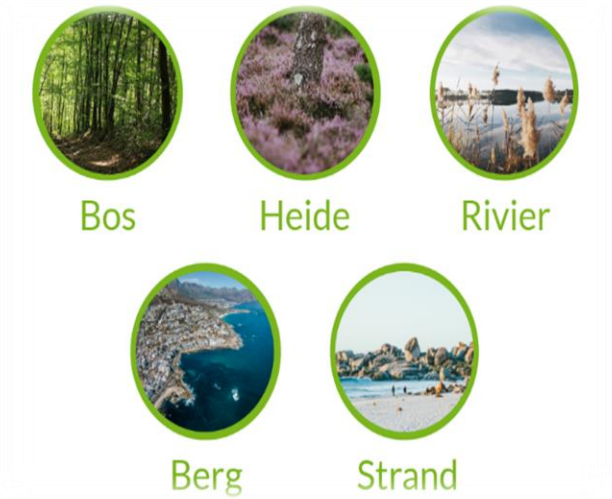
[2] Therapieland: The principal of this research and the creator of the VR relaxation program| https://www.therapieland.nl/

2.3 The intervention: the VR Relaxation exercise

To perform the exercise, the participants were asked to set the VR oculus and put these on the head (Figure 1) Previous to starting the study the VR oculus was already connected and synchronized by the researcher. The participant could directly enter the VR-relaxation environment. In this environment, as explained by the researcher, the way of controlling the system was possible by eye movements. By focusing three seconds on an option, participants could make a choice for the preferred environment (Figure 2) . For this exercise the participant was asked to choose one of the three options: the forest, the beach or the mountain. It was decided that participants would choose the same condition to make a more standardized group for comparison. By limiting the choice, the researcher aimed to prevent bias. In this way it can be assumed that, relaxation did not occur through meditation or through the offered music, but likely by the space and nature sounds. Once the exercise ended after five minutes, the sound and picture stopped.

Figure1. Virtual Reality Glass- Therapieland

Figure 2. VR- Relaxation scenario's - Therapieland



2.4 Instruments

2.4.1. Quantitative part: Pre- post Study

Demographic information

To cover the anonymity respondents filled out a respondent number instead of their name, followed by four questions about their demographics. The demographics were asked by four questions: 1. gender (male of female), 2. age, 3. education (MBO, HBO, WO or Else) was circled by highest obtained education and 4. department functioning at, which respondents could fill out as an open question.

Positive and Negative Affect Schedule

Positive and Negative Affect Scale better known as the PANAS scale test is a survey for self-reporting. PANAS was developed in 1988 by three American psychologists: David Watson, Lee Anna Clark and Auke Tellegen (Mackinon et al., 1999). The list consists of two parts, also known as voting scales. One scale measures the positive feeling and the other measures the negative feeling. Each section contains ten concepts, answers could be given on a 5-point Likert scale varied from *very little or not at all* (1) to *extreme* (5). (PANAS-scale-test, 2018). The aim of this survey is to measure emotions in the present moment.

The scale determines the relation between positive and negative emotions. The score of the scale is calculated by the sum of the ten concepts on the positive scale and the sum of the ten concepts on the negative scale. The scales ranges from 10 to 50. The weight given to the results of this scale is positive for answers on the positive scale and negative for answers on the negative scale (Mulder, 2018). PANAS is used in this research to examine the difference between the positive and negative emotions before and after the intervention.

State- Trait Anxiety Inventory

In addition, the State -Trait Anxiety Inventory (STAI), a self – reported inventory established by Spielberger (Spielberger, 1983) was used as the second survey in the quantitative part. The Dutch version of STAI , the self -assessment questionnaire (Zelf-Beoordeling Vragenlijst) is used in this study. The ZBV consists of two separate self-report questionnaires with which two distinct anxiety concepts can be measured: anxiety status (Anxiety state) and anxiety disposition (trait - anxiety). The Dutch version was established by van der Ploeg, Defares and Spielberger (1980). The Free University of Amsterdam has made a version possible to use in this research (2018). Additionally, this inventory was chosen because the scale measures feelings of unease, worry, tension and stress, which are defined as anxiety. The inventory consists of 40-items which measures the level of anxiety. For this research only the *state part consisting of 20- items* was used, because only this 20-items measure the level of stress and anxiety in the moment and the remaining 20 superfluous for the purpose of this study. The items can be described as emotional scenarios that can be scored on a 4-point Likert scale. The scale ranges from 20 to 80 , where the higher scores can be assumed as higher level of anxiety. The STAI has demonstrated good ($\alpha = 0.84$) to excellent ($\alpha= 0.90$) reliability in trait – and state-anxiety (Spielberger et al., 1983). Two examples of these items are: ‘I feel calm’ and ‘I feel tense’.

Hart Rate Variability

HRV which is the physiological measure for the variability in heartbeat interval is measured by photoplethysmography (PPG). By placing a finger gently on top of the sensor of a smartphone with the HRV application heartbeats were count. The blood volume pulse signal was tracked optically (Vesterinen et al., 2013). The results of this part go beyond of the scope of this study but, the data was collected for further research in the future.

2.4.2. Qualitative part: The semi- structured Interviews

Individual Interview

The interview includes open questions that aim to examine the experience of the respondents and measure the factors involved to contribute to a good implementation (Appendix 3). The questions are based on the CFIR model (Damschroder et al. 2009). With the CIFR model of Damschroder in mind an interview scheme has been prepared were divided in five categories (Table 2). The planned duration for the interview was estimated between 15-20 minutes. Based on the interview scheme (Appendix 3) respondents were invited to talk about their opinion regarding the VR intervention (VR-relaxation exercise) and the way it is implemented in Province Zuid Holland. The interview was audio recorded through the voice recorder and transcribed verbatim.

Table 2

Interview scheme

Domain from the CFIR	Example Question from the interview
1. The intervention	How did you experience the VR- Relaxation exercise? Did you feel that you were relaxed afterwards?
2. The inner setting	What do you think about the setting in which the intervention (VR- Relaxation exercise) is offered?
3. The outer setting	What should the developers take into account, when offering the VR- Relaxation exercise?? Do you have any suggestions about the implementation regarding the organization?
4. Individuals involved	Do you think that you would make use of the VR- Relaxation program, if implemented? How do you relax in daily life?
5. The implementation process	How can we improve the way that the intervention is offered?

Note: more detailed interview scheme is included in Appendix 3.

2.5. Data analysis

Quantitative part

The statistical analysis was performed by the Statistical Package for Social Sciences (SPSS V. 22). To explore in data descriptive statistics such as means, standard deviation an frequencies were used. The inferential statistics include the non-parametric test of Wilcoxon signed rank test, To examine differences in anxiety and mood from pre to post test. A non-paramedic test (Wilcoxon) was used because the data was not normally distributed. The reliability of both scales in this research has been confirmed with a Cronbach's alpha of 0.90 for the STAI inventory and a Cronbach's alpha of 0.76 for the PANAS questionnaire. The alpha coefficient of the 20 items of the STAI is (α= 0.90), suggesting that the items have a high internal

consistency. The PANAS scale has an alpha coefficient of (α= 0,76), suggesting that the internal consistency is acceptable.

Qualitative part

According to the qualitative part a number of twenty interview transcripts were converted into the program ATLAS. ti 8 for further coding and analysis. Because of lack of answers in some of the interviews and the reached saturation after 10-15 interviews, the 5 interviews with missing answers were not included in the analysis of coding. The coding process, has been deductive in the beginning, which means categorization based on the Consolidated framework for implementation was performed concerning these remaining transcripts (verbatims). By the first time reading fragments were highlighted. The fragments were divided into the five domains of the CFIR as followed: all opinions of the intervention divided into the *intervention's characteristics*. Answers given, about the factors within the organization were divided into the *inner setting*. All the fragments which related to higher up the organization, policy and political level were divided into the *outer setting*. *Individuals involved*, was appointed to all the answers about the characteristics of the employees. And the final domain *implementation process* was appointed to all the fragments about how to plan, promote and perform the intervention. Then, during inductive coding, which is on the subjective rating of the researcher, themes are devised that describe these fragments or quotations. In the following step subcategories were assigned to these quotations. In the result section a representation of these main and subcategories are given, followed by a quotation and explanation .

3. Results

3.1 Quantitative part: effectiveness study

The results of this section are based on the thirty respondents (*N*=30) for the PANAS (positive and negative affection) who participated in the study (Table 3). For the STAI inventory one of the respondents has not filled in the post test, therefore (*N*= 29)for the results of state anxiety inventory. Demographics are described in the table below (Table 3).

Table 3

Demographics: Age, Gender and Education.

	Participants (N=30)	**(%)**	***M*** ***±SD***
Age(min-max)	(21-64)	-	41.9 ±14.0
Gender	26		
Male	11	(36.7)	-
Female	16	(53.3)	-
Missing	3		
Education	30		
WO	10	(33.3)	-
HBO	15	(50.0)	-
MBO	3	(10.0)	-
Missing	2		

N= number of participants; M= mean age; SD= Standard Deviation; min=minimum age; max= maximum age

For respondents who used the VR relaxation exercise, negative affect levels were significantly lower after the exercise than before the exercise (Table 4). They also showed lower state anxiety levels after the exercise than before the exercise (Table 4).

Table 4

Pre- post test scores on the STAI and PANAS for the VR- relaxation participants.

	Ranges	**Pretest (T0)** ***M, (SD), Mdn***	**Posttest (T1)** ***M, (SD), Mdn***	***Z*-value**	***P*- value**
PANAS positive (*N*=30)	10-50	32.57 (5.05) -	29.34 (7.20) -	- 0.21	0.84
PANAS negative (*N*=30)	10-50	14.57 (4.52) 12.5	11.47 (2.54) 10.0	- 4.27	<0.001*
State-Trait-Anxiety (*N*=29)	20-80	36.21 (8.51) 35.5	32.00 (8.78) 29.0	- 4.08	<0.001*

*Note. Wilcoxon Signed Rank Test. *= significant difference between the pre-test and post-test p < 0.05*

3.2 Qualitative part: Implementation factors

In total a number of 181 quotations were selected and divided in the five categories of the CFIR model of Damschroder. These categories and subcategories are shown and explained below.

3.1.1 Intervention Characteristic

Regarding the first domain of the CFIR, which relates to the intervention itself, most of the respondents had a positive experience with the VR-relaxation exercise (Table 5). They described the exercise as very relaxing and most of them had the feeling of being in a different environment (feeling of presence) for a moment. As a response to the question how the feeling of presence arose, most of the respondents pointed out the nature sounds and images. Furthermore, participants expressed being satisfied with the given instructions. They have not experienced any obstacles to perform the exercise. Finally, some of the respondents indicated that VR-relaxation had similar elements in comparison with relaxation methods respondents used every day. As an example, they indicated that they seek relaxation in nature, which is comparable to the images offered in the VR-relaxation exercise. However, the respondents did not only mentioned positive opinions about the VR, they also indicated that some elements had room for improvement in the future.

As areas of improvement, respondents named that there is a lack of movement in the VR (Table 5). They explained this in terms of: '*getting bored after a few minutes'* or '*searching for new images'*. In addition, some indicated that they needed guidance and that they could of focused better, if they were guided in the exercise. Some have indicated that they could not surrender to the exercise and were still aware of the reality. Finally, a small number of respondents indicated that the image quality was not experienced as optimal, the images provided in the exercise are not HD. Therefore, the viewer does not feel she or he is in de nature. This has negatively influenced the user's experience.

Table 5

The experience of the respondents about the- VR Relaxation

The intervention characteristic General opinion	**Subcategory**	**N**	**Citations**
Advantages	Positive experience	11	"The enclosed space, and the matching sounds, water, etc. The atmosphere that the image evokes gives you the feeling of relaxation and being on holiday."
	Nature images and sounds	7	"Yes, it's nice especially the sounds, the sounds of nature, they actually make it relaxing."
	Instructions were sufficient	3	''Yes, the instructions were very clear .. I only found that I didn't know when the exercise would be finished."
	Comparable to methods used by participants	2	"Well, the VR is of course a different world, but sometimes I also put my headphones on at home, and then I'm secluded too, so I see similarity in that."
Disadvantages	Lack of movement in the VR	6	" I have noticed that if I look too long at the still image, I am searching for things that do move. "
	Missing guidance in the VR	3	" I found it more pleasant last time, because you had a voice that guided you through a meditation, I had chosen for waves, you heard the nature sounds of the sea. And then a lady who gave instructions, such as: "breathe in ...

			breathe out". And then I found it more pleasant compared to this time. So a combination of guidance, meditation and natural sounds. "
	Quality of the VR can be Improved	5	First of all, I think the image quality can be improved a little. They are all sorts of static images, so you sit somewhere and you think. I would like to move or walk in this VR environment.
	Aware of the reality	2	'' You are consciously relaxing, but you know that you are still at your workplace.''

Note. N= number of participants who mentioned something about the subcategory.

3.1.2 Inner setting

Regarding the experience of the respondents about the elements within the organization (Table 6) many barriers were mentioned by the respondents of this study. The first and the most important one, which was noticed by fourteen respondents (N = 14) is the distance to the intervention. The distance for the employees to reach the building where the VR- relaxation was performed was too long. It takes at least 10 to 15 minutes to reach the destination. The next barrier experienced by the user during the study to participate in the intervention is time management, which is divided in two subcategories: the scheduling and the structure of the day of employees. The results indicate that, for the employees work has priority, making it difficult to plan any form of relaxation in their schedule. This is why some have indicated that they will only use relaxation if it is scheduled in their agenda. In addition, they have indicated that the structure of the day and their work obligations do not allow them to make free time for something else, such as relaxation. Some have mentioned that even during lunch breaks there is no time to put work aside and that sometimes meetings are scheduled. These two subcategories were seen as facilitators when the exercise was scheduled and structure was given. Elaboration on this is given in the discussion section.

Another factor within the organization which can be considered as a barrier is the existing culture at the organization. This includes the opinions of the employees about each other and ideas and mindset about work attitude. As described by the respondents of this study, there is a culture in which hard work is seen as a norm and relaxation is not taken seriously. In addition, the added value of relaxation is not visible yet.

The last factor within the organization is the setting. This factor is divided in three different subcategories. First, the offered setting to perform the relaxation, which is considered as nice and sufficient to reach the goal. Next, the availability of the room where VR relaxation can be performed, which means that there must be an arrangement set in place to reserve the room so it can be occupied to perform the exercise. Respondents suggest a planner to sign up and to book the room. At last safety, which is seen as a subcategory of the setting, is an important factor to create a safe environment to perform the VR relaxation. Respondents mentioned that the room to perform the VR relaxation needs to be free of objects to be sure that you cannot harm yourself.

Table 6

The experience of the respondents about the factors within the organization

Inner setting **Main Topics**	**Subcategory**	**N**	**Citations**
Distance to the intervention	Distance to the intervention must be achievable	14	'' I would really like to have a place relatively close to my workplace where I can just sit and relax. And of course you can also walk further, and maybe I should just do that, but then the daily routine takes over again, because consultations and such are just blocked in your agenda of course .. and then I am not powerful enough to say no! I won't do that. And again , I will not afford it to come and relax.''
Time management	Scheduling	12	''It must become a sort of regularity in the daily routine.'' ''It must be planned in your calendar. If it is planned you can plan other appointments around it. Like I knew today that I would have this, so you can prepare for that.''
	Structure of the day	7	'' I think that the bustle of the day and the full agenda is the most important thing to prevent someone from participating in such an intervention.''
Setting of the intervention	Setting as it is offered to perform the VR - relaxation	5	"I liked that there was a swivel chair and that there are plants. This way it looks like a vital space. "
	Availability of a room to perform the exercise without being disturbed	10	''Yes, you have a small room or a small kitchen on every floor. A meeting room, with those swivel chairs, you have everywhere of those rooms, so designing a whole floor for it is not necessary.''
	Safety	3	''At a certain point I did take the glasses off and saw that I was completely turned. In such a case it is important that there are no objects around the swivel chair. In this case it was well furnished.''
Culture	Culture between the employees	10	'' When I look at my own department, that is my direct field of work. there it is clearly a culture where you see that the manager is already planning a consultation during the lunch break or eating behind the desk.'' ''If the company says we all have to relax more, then we have to break taboos that relaxation at work is not a standard .'' ''By doing it more often and by discussing it more often, we can break through culture.''

Note. N is the number of respondents who have shared an opinion about this topic.

3.1.3 Outer setting

Next domain of the CFIR model, which covers the influence of the management and policy is divided into the employers involvement and the importance of meetings, that can improve the uptake of the VR-relaxation intervention. Respondents believe that communication from the top of the organization to the employees is necessary. Organizing meetings to clarify expectations is suggested to facilitate the intervention uptake (Table 7). The reasoning behind this is that a role model can break taboo and when this model is powerful and authority the impact will be greater.

Table 7

The experience of the respondents about the influence of management and policy

Outer setting **Main topics**	**Subcategory**	**N**	**Citations**
The employers involvement	Expectations from the top	5	'I think it is important to involve managers and higher levels in the organization, so people maybe dare more!''
	Communication from top to down	6	'' we must be informed from above that there are opportunities such as 'vitality center' to relax.''
Meetings	Set up meetings to discuss expectations and added value of the Intervention	2	''You have departments, desks here in the organization, and you have teams, discuss with those teams the sickness absence .. are there people perhaps short or long-term sick?''
	Set up agreements about the balance between work and relaxation	3	'' I think it is important that we all discuss this more. And that managers also ask interested employees questions. I think it could start with that.''
			'' And then in such an initial conversation you can start thinking how can we solve the problem of sick absentees together?''
			''Nobody asks why we plan the meeting during the lunch break, we do not speak about those thing here in the organization.''

Note. N is the number of respondents who mentioned an opinion about the topic.

3.1.4 Individuals Involved

The fourth domain concerns individuals involved, which include the characteristics of the individuals that influence the intervention implementation (Table 8). The domain is divided in determinants as attitude, personality and behavior. Most of the respondents do not even think about relaxation or the added value of it, especially at work. On the other hand, they miss the awareness of the benefits of relaxation. Regarding personality, some employees are easily distracted, which has resulted in minimal experience of the VR. Others have indicated that they do not experience stress and therefore do not need relaxation at work. Sixteen of the respondents have indicated that they take their own measures to relax, which are not always comparable with the relaxation offered in this study.

Table 8

Characteristics of the individuals involved which can affect the use of the intervention's implementation

Individuals involved Determinants	**Subcategory**	**N**	**Citations**
Attitude	Attitude toward the VR-Relaxation	17	'' I don't think to myself, I am going to take the VR glasses for a moment and relax. I don't think I'll give myself that time.''
	Lack of awareness about relaxation	2	'' I am not sufficiently aware of it and that's why I don't make use of it while it is nice and relaxing to do.''
Personality	Easily distracted	2	''Even when I am trying to relax in the VR environment, my mind wanders off to the things I have to do such as shopping, writing a piece etc.''
	Stress levels	2	"I don't feel the stress that much to feel the urge to use anything, I go for a walk or relax in my weekend, in that way I don't reach the peak of tension.''
Behavior	Daily relaxation methods, which includes: lunch, train, cycling, walking, talking, meditation, music and watching soap series.	16	'' Yes, very different. Sometimes it is just a short walk to the coffee machine or to have a conversation with someone.''
			'' I consciously cycle from home to work ... I now have cycle d 20000 km before May.''
			''I try to walk recently, walking and trying to organize thoughts a bit.. when behaving like this, you soon find out that relaxation is very important. But I am not a person that participates in Yoga and meditation, we have colleagues like that too.''

Note. N is the number of respondents with the selected determinants.

3.1.5 Implementation Process

The last domain in the CFIR, includes characteristics of the design and process, which improves or hamper the intervention's implementation (Table 9) . Regarding the answers given by the respondents of this study these are divided into four main factors. Visibility of the intervention, which is the most important one may improve the implementation if well executed. At the moment respondents have been informed through the intranet and information meetings about the VR relaxation, but they believe that this can be improved and offered through different channels.

Regarding the trialability and the need of a systematic plan, respondents believe that the experience increases the chance to make use of the intervention. Beside this, a systematic plan is required to have a structure for carrying out tasks and to know with whom. Finally, it is important to investigate the need of the intervention, before designing one and to coordinate a systematic plan once it is decided to implementing the intervention. Respondents believe that developers can improve the implementation by this two subcategories.

Table 9

Factors which include the implementation process

Implementation process **Main factors**	**Subcategories**	**N**	**Citations**
Visibility of the intervention	Promotion Using different channels: - Intranet - Flyers & Posters - Meetings	12	''It must be clear on the intranet, maybe a photo has to be added, etc. I am more visually oriented, so I would personally notice that.'' ''Well, let me be honest, I often think it is a bit unclear. It was by coincidence that I was walking somewhere and got into conversation with a colleague about VR, otherwise I wouldn't notice it.''
Trialability	Make it possible to use before implemented	5	''Well, you should know, I really benefit from it. But to realize that, you should try it a few times by yourself**.''**
Systematic Plan	A plan is required	6	'' When developing new things, careful consideration must be taken to the way of use and what it is intended for. In this case, for example, a system must be devised where you can book space to perform the exercise.'' ''Yes, but by a plan I also mean who is going to do what and with whom, for example, having conversations about sickness absence. So not only the use of VR glasses, but also identify the problem.''
Primary investigation	Investigate the need of an intervention	3	'' You should check in advance how much need there is. Because not everyone will need to relax in the same way.''

Note. N is the number of respondents who mentioned opinion about the implementation process

4. Discussion

4.1 Effect study

The purpose of the current mixed-method study was to examine the effectiveness of the Virtual Reality Relaxation Intervention and to investigate the most important implementation factors that facilitate or hinder the implementation process. Participants involved in the study scored lower on levels of negative mood and anxiety after performing the VR- relaxation than before. This occurrence was in line with the expectation which was that respondents would be more relaxed afterwards. Comparing these results to earlier research (Shah et al., 2015), which investigated the effect of VR- based stress management program on people with mood disorders similar results were shown. Results have shown that participants who attended the VR - destress program reported significantly lowered objective stress (skin temperature), subjective stress depression and anxiety.

To look critically at these outcomes, it can be said that a moderator effect cannot be excluded. That means that we cannot rule out the possibility that another variable could have caused and / or influenced the effect arisen. The decreased levels of negative mood and anxiety can be caused by the absence of work related tasks, focusing on breathing or any other variable. Beside this, the PANAS positive affection did not show any increasement on the positive affection (mood) scale. In fact, these values has also decreased. An explanation for this result can be that the VR- relaxation was designed to reduce tension and not necessarily to improve the positive mood levels or generate happy feelings . Because of the lack of a control group, it was not possible to compare the test subjects. In the last paragraph of this chapter limitations of the study are discussed and recommendations are given for the future researchers.

4.2 Implementation Study

Comparing the results to the findings of the literature, it seems that the *Consolidated Framework for Implementation Research* (Damschroder et al., 2009) is a good model for investigation of the facilitating and hampering factors in a implementation process of an intervention. At the beginning of this study there was a doubt about which model would be the most applicable for use. But given that the model of Damschroder et al. (2009) can be used more broadly and is originated from various models, including Diffusion Innovation Theory of Rogers (2003), the choice was made to set up the interview schedule from here. The obtained results by the interviews, from the respondents (employees of the Province Zuid Holland) were largely assigned to the five domains of this framework. In the following paragraph the main findings are interpret and discussed to be able to answer the research question about the implementation factors.

4.2.1 The intervention

Categorizing the findings of the intervention itself to advantages and disadvantages, four categories are seen as advantages and four as disadvantages. Elaboration is given in here: Regarding the intervention characteristics most of the respondents have experienced the intervention positively, which supports our findings of the quantitative section (results of the surveys). The respondents have indicated that nature sounds and images are seen as positive elements. It can be assumed that nature sounds and images has a positive effect on their mood and created a more relaxed feeling. This is in line with results of the study of a resent research(Bratman, Hamilton, Hahn, Daily, & Gross, 2015), where participants who walked into a nature setting were compared with participants who walked into a civil setting. According to this study participants involved showed decreased levels of self-reporting reflection and neural activity in general prefrontal cortex. Reflection was in their study linked to depression and other mental illnesses.

A point with regard to the aforementioned what should be mentioned in our discussion is that respondents in this VR-relaxation study indicated that there is room for improvement in image and sound quality. For future implementation of similar interventions, it is advisable to improve the image (sight) and sound (hearing) material and if possible add more and incentives that increase the sense of presence. The studies of Dinh, Walker, Hodges, Song, and Kobayashi (1999), in which touch and smell was included support these findings. Because based on the literature and the findings of this study, it can be assumed that: the higher the feeling of presence will be in the intervention, the more chance it will make to succeed.

In the category of advantages, instructions given by the researcher and the comparable relaxation methods are considered as a facilitator by the employees. The comparable elements, the clear instructions are seen as facilitators and would increase the usage of these relaxation interventions. Although these results are not generalizable because of the sample size and the fact that this study has recruited respondents from an organization, these results are similar to another study that confirms these results. This study which examined the facilitating factors in the implementation of VR- based therapies in pediatric rehabilitation, aimed to increase the intended use. The results of this study have shown that by improving facilitating conditions the ease of use, the self- efficacy and the perceived behavior control increased significantly (Banerjee-Guénette, Bigford, Glegg, 2019).

Disadvantages with regard to the intervention itself are : lack of movement, missing guidance , the quality of the VR and the awareness of the environment, these are seen as barriers for the implementation. Regarding the lack of movement, participants mentioned that this missing elements caused insufficient experiencing the sense of reality. Therefore, it is suggested to add elements that make movement in the VR- environments possible. The quality of the content which is discussed before has an effect on the feeling of presence (the feeling of being in the VR- environment). Developers of new interventions can increase the chance of uptake and improve the implementation process by meeting the conditions shown in this study.

4.2.2 Inner Setting

Regarding the inner setting many barriers are shown. The most important subcategories are Distance to the intervention and the Existing culture. Distance to the intervention, was considered as an hinder, because of the effort required in terms of time and length. As mentioned in the earlier domain literature appointed the importance of ease of use and facilitating conditions. Good implementation must take this into account to meet the requirements from the practice. Another barrier shown is the existing culture at the Province House. Employees mentioned the lack of recognition and awareness about the importance for the intervention. This in line with individuals readiness for change by Damschroder (2009), the fact that the existing culture does not stimulate the use of the intervention can be seen as not being ready for the intervention uptake. The existing culture has ensured that even the employees who do see the added value feel burdened to use relaxation methods, otherwise they do not meet the standards.

These two factors with regard to the domain of inner setting were seen as important barriers within the implementation of the VR- relaxation intervention. Therefore it is recommended to shorten the distance (minimize the effort needed by the end user) and take measures to make change in the existing culture possible. See recommendations for more elaboration (table12).

4.2.3 Outer setting

According to the CFIR model of Damschroder (2009) 'Outer Setting' relates to the 'users needs', ' peer pressure' and ' the external policies and incentives'. Comparing these concepts with the results of this study some similarities are shown. Results have shown the necessity of a clear communication about the opportunities regarding relaxation and activities to balance effort (work) and relaxation. In addition, the employees want to know what exactly the expectations from management are in regards to this topic. The results indicate that employees believe that clarifying expectations from management can be achieved by organizing meetings. In view of these results, it seems that the meetings where the expectations can be discussed about the possibilities, can be seen as a confounder between users (employees) and one of the most important implementation factors in the outer setting, mainly policy and regulations. Communication also relates to the key concept of diffusion (Rogers, 2003), which is the process by which an innovation is communicated. Unfortunately, we have not found any literature to support the exact findings with regard to this domain.

The degree to which these factors do or do not occur in an implementation plan is related to the involvement of the employer. Therefore, based on the results, it can be mentioned with caution that as the employer becomes more involved within the field and ensures that the expectations are clearly incorporated in the policy, an intervention is more likely to be accepted. It is therefore difficult to classify this as a facilitator or impeding factor, because the extent to which this occurs determines whether this factor acts as a barrier or a facilitator. In future research with regards to VR- interventions and implementation factors involved, it is advisable to also involve employers in the research to be able to have a better insight to what is required in dealing with stress management and absenteeism. This will provide a better employer – employee relationship and a positive work environment.

4.2.4 Individuals involved

Our study emphasizes that if individuals have a positive attitude towards the intervention and understand the added value of it, this will result in a higher chance that they accept and use the intervention, this is in line with the Theory of Planned Behavior, which emphasizes on the relationship of attitude and the expected outcome (Ajzen & Icek, 1991) . Regarding the VR- relaxation intervention used in this study it seems that individuals (employees) lack awareness of the importance of relaxation and do not think about the consequences of stress. Because of the missing awareness and the current attitude (which is not very active) this subcategory is seen as a barrier. In contrast, when the respondents were informed beforehand about the intervention, they showed interest and all of them participated in the VR-relaxation intervention with a more open attitude. On this basis, it seems that there is interest and a positive attitude when the participants are aware of the presence of such interventions. Attitude can be influenced by stimulating the use of intervention and creating awareness, which will facilitate the implementation .

Furthermore, employees also make use of other relaxation methods, therefore it is advisable to investigate whether the intervention fits the target group before designing any intervention. The VR- relaxation has elements that correspond with other relaxation methods but also differs to a few activities that employees undertake to promote relaxation.

4.2.5 Implementation process

According to the literature the implementation process is the last domain of CFIR, which involves factors to promote the use of the intervention. It is important to have a good planning to execute and reflect on the intervention, but also evaluating on the process, (Damschroder, 2009). An intervention plan needs to be designed in a way that covers all these elements, which will promote the use of the intervention. These are in line with the results from practice. Employees confirm that visibility of the interventions exists through promotion using different channels such as flyers, intranet and meetings that can stimulate the use of the intervention. Promotion is seen as a facilitator as offered in this study, but can be improved in the future by using more channels and rehearsing. Recognition of the existence of such interventions among employees will lead to more awareness.

4.3 Strengths, limitations and recommendations

The study has shown a number of strengths and limitations which will be discussed in this paragraph. Firstly, this current study contains a mixed-methods approach. The mixed- method approach allows the researcher to interpret the findings in a way that data complement each other. Qualitative research provides clarification, where the quantitative part lacks depth and the quantitative part is more significant, where qualitative research lacks objectivity. Semi- structured interviews offer the opportunity to obtain more in- depth information about the topics important for the study and allow the researcher to win more information than questionnaires provide. Secondly, all invited employees for the study (N= 30), participated in the study and no drop out were seen, which reinforced our sample and the findings of the current study. The last strength of this study regards the measures taken to cover the anonymity, it was a challenge to anonymize the data. Therefore, the researcher had assigned a research number to all the participants and imported the data with this numbers

into the excel file. To guarantee the security of the files, these files have been given a password. The original data has been securely preserved in the client's archive at Therapieland.

On the other hand the present study contains some limitations as well. Regarding the design of the study and the methodological issues a moderator affect cannot be excluded. The lack of a control group and the experimental design does not allow the study to assume with certainty that the decreased levels are a result of the intervention. In a future study, it is advisable to include a control group to compare the results of the pre-test and the post-test in different conditions. Secondly, the presence of only one researcher involved in coding procedure is seen as a limitation, because of the missing inter rater reliability. A second assessor should be included in a future study to increase the reliability. Next, the current study was carried out on employees of one particular organization (Provincie Zuid Holland). Therefore the results of the study are not generalizable. Similar studies are required with a more varied sample (employees from different organizations) to compare results and obtain generalizable conclusions about the topics included in this VR-relaxation study. Lastly, the study obtained results only during a particular period of time. The missing repeated measures in the study do not allow the study to create any conclusions about long-term effects. Therefore it is required to conduct a research with follow- up measurements.

In the table below (Table 12) recommendations from the results of the participants interviews are given to improve the effectiveness and implementation of the Virtual Reality Relaxation Intervention in the future.

Table 12

Recommendations from practice based on the interview results of the study.

CFIR Domain	Recommendations
Intervention characteristic	- It is recommended to include more movement, guidance and provide a higher quality of the videos.
Inner setting	- It is suggested to make more , but smaller spaces available, scattered over the Province House.
Inner setting	- It is recommended for practice to plan the relaxation in the agenda if possible. Applying this might increase the chance the use of the intervention.
Inner setting	- In order to break through the current culture, it is advisable to be more open and to discuss the added value of change at the workplace.
Inner setting	- It is recommended that the VR space meets a number of requirements, which are: safety, availability and relaxing layout.
Outer setting	- It is recommended to involve the management and set up meetings to discuss the use and the plan.
Individuals involved	- It is recommended to increase the knowledge of the individuals by organizing meetings.

Implementation process	- It is recommended to use different type of channels, with the purpose to reach a large number of your audience

6. Conclusion

The current study was started to fill the gap of knowledge about the benefits of VR- relaxation intervention and to investigate the important facilitating and hampering factors involved in the implementation of a VR-relaxation intervention.

An overall conclusion for the current study is that the VR- relaxation intervention was experienced positively by the most of the participants and lowered the levels of state anxiety and negative mood. Therefore, it can be assumed that the use of VR- relaxation may help in measures that are taken to prevent or tackle the problem of imbalance between work and relaxation. However, the VR- relaxation is not working for everyone at the same level. Beside this, an implementation plan before implementing the intervention is necessary to meet the needs of the users on different domains as described by CFIR model of Damschroder (2009). In sum the most important subdomains divided in the five categories of the CFIR model are focused on quality of the intervention, inner culture and facilitating conditions, change in attitude and a good promotion plan to make the intervention visible for a high number of individuals.

More research is needed to investigate external factors which can affect the levels of stress to develop an effective prevention intervention. The contribution of this research can stimulate the use of VR- relaxation use, but further research is needed to show whether the effects remain visible on the longer term.

Reference

A. Parent-Thirion, E.F. Macías, J. Hurley, G. Vermeylen. European Foundation for the improvement of living and working conditions. Fourth European Working Conditions Survey [Internet], European Foundation for the Improvement of Living and Working Conditions, Dublin (UK) (2007)[cited 2010 Aug 23]; 139 p. Available from:http://www.eurofound.europa.eu/pubdocs/2006/98/en/2/ef0698en.pdf

Ajzen, I.; Fishbein, M. (1975). "A Bayesian analysis of attribution processes". Psychological Bulletin. 82 (2): 261. doi:10.1037/h0076477.

Ajzen, Icek (1991). "The theory of planned behavior". Organizational Behavior and Human Decision Processes. 50 (2): 179–211. doi:10.1016/0749-5978(91)90020-T.

Arbeid kost in Nederland gemiddeld 33 euro per uur. (2016, 24 februari). Assessed at 14 October 2019, from https://www.cbs.nl/nl-nl/nieuws/2014/49/arbeid-kost-in-nederland-gemiddeld-33-euro-per-uur

Banos, R. M., Botella, C., & Perpina, C. (1999). Virtual reality and psychopathology. *Cyberpsychology and Behavior*, 2(4), 283-292

Batholomew LK, Bartholomew, C.M. Markham, R.A.C. Ruiter, M.E. Fernández, GJ Kok, GS Parcel. Planning Health Promotion Programs: An Intervention Mapping Approach, 4th edition. Jossey-Bass, 2016. ISBN: 978-1-119-03549-7

Bratman, G. N., Hamilton, J. P., Hahn, K. S., Daily, G. C., & Gross, J. J. (2015). Nature experience reduces rumination and sub general prefrontal cortex activation. Proceedings of the National Academy of Sciences, 112(28), 8567–8572. https://doi.org/10.1073/pnas.1510459112

Broughton, A. (2010). Work-related stress. Assessed at 15 October 2019, from https://www.eurofound.europa.eu/publications/report/2010/work-related-stress

Brownson RC, Tabak RG, Stamatakis KA, Glanz A. Implementation, dissemination, and diffusion of public health interventions. In: Glanz K, Rimer BK, Viswanath K, editors. Health Behavior: Theory, Research, and Practice 5th ed. San Francisco, CA: John Wiley & Sons; (2015). p. 301–26.

CBS Statline. (2018). Retrieved on 14 October 2019, from https://opendata.cbs.nl/statline/

Campbell, J.L., Quincy, C., Osserman, J., & Pedersen, O.K. (2013). Coding In-depth Semi structured Interviews: Problems of Unitization and Intercoder Reliability and Agreement. Sociological Methods & Research, 42(3), 294-320. DOI: 10.1177/0049124113500475

Damgrave, R. (2017). *Enhancing the effectiveness of design tools in synthetic environments.* Enschede: Universiteit Twente.

Dalati S., Marx Gómez J. (2018) Surveys and Questionnaires. In: Marx Gómez J., Mouselli S. (eds) Modernizing the Academic Teaching and Research Environment. Progress in IS. Springer, Cham

Damschroder LJ, Lowery JC. Evaluation of a large-scale weight management program using the consolidated framework for implementation research (CFIR). Implement Sci. 2013;8:51

Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci. 2009;4:50

Dedoose Version 7.0.23. Web application for managing, analyzing, and presenting qualitative and mixed method research data. Los Angeles, CA: Socio Cultural Research Consultants, LLC; 2016

Dinh, H. Q., Walker, N., Hodges, L. F., Song, C., & Kobayashi, A. (1999). Evaluating the importance of multi-sensory input on memory and the sense of presence in virtual environments. *In Proceedings e virtual reality annual international symposium* (pp. 222-228).

Green, L., and others. "Inferring Strategies for Disseminating Physical Activity Policies, Programs, and Practices from the Successes of Tobacco Control." American Journal of Preventive Medicine, 2006, 31(4 Suppl), S66–81

Greenhalgh T, Robert G, Macfarlane F, Bale P, Kyriakidou O: Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Q* 2004, 82: 581-629.

Heidi M. Zinzow, J. O. (2018). Virtual Reality and Cognitive-Behavioral Therapy for Driving Anxiety and aggression in veterans: A pilot study. *ScienceDirect*, 296-309.

H. M. van der Ploeg, P.B. Defares, C. D. Spielberger (1980). Een nederlandstalige bewerking van de Spielberger State- Trait Anxiety Inventory: STAI-DY. *Swets & Zeitlinger B.V. , Lisse.*

Herrero, R., García-Palacios, A., Castilla, D., Molinari, G., & Botella, C. (2014). Virtual reality for the induction of positive emotions in the treatment of fibromyalgia: a pilot study over acceptability, satisfaction, and the effect of virtual reality on mood. *Cyberpsychology, Behavior, and Social Networking*, *17*(6), 379-384

Mackinnon, A., Jorm, A. F., Christensen, H., Korten, A. E., Jacomb, P. A., & Rodgers, B. (1999). *A short form of the Positive and Negative Affect Schedule: Evaluation of factorial validity and invariance across demographic variables in a community sample*. Personality and Individual differences, 27(3), 405-416.

Mishkind, M. C., Norr, A. M., Katz, A. C., & Reger, G. M. (2017). Review of virtual reality treatment in psychiatry: evidence versus current diffusion and use. *Current Psychiatry Reports*, p. volume:19.

Mulder, P. (2018). *PANAS scale test*. Retrieved (2018, December 15) from toolshero: https://www.toolshero.nl/psychologie/persoonlijk-geluk/panas-scale-test/

Oldenburg, B., Taylor, B., O'Neil, A., Cocher, F., & Cameron, L. D. (2015). Using new technologies to improve the prevention and management of chronic conditions in populations. *The annual review of public health*, pp. 483-505.

PANAS scale test voor het meten van emoties | Toolshero. (2019, 2 augustus). Accessed at 15 October 2019, from https://www.toolshero.nl/psychologie/persoonlijk-geluk/panas-scale-test/

Province Noord-Holland. (2018, October 8). Retrieved from Province Noord-Holland: https://www.noord-holland.nl/Over_de_provincie/Organisatie

Priyanka Banerjee-Guénette, Sarah Bigford & Stephanie M. N. Glegg (2019): Facilitating the Implementation of Virtual Reality-Based Therapies in Pediatric Rehabilitation, Physical & Occupational Therapy In Pediatrics, DOI: 10.1080/01942638.2019.1650867

Riethof, N., & Bob, P. (2019). Burnout Syndrome and Logotherapy: Logotherapy as Useful Conceptual Framework for Explanation and Prevention of Burnout. *Frontiers in Psychiatry*, 10 (382) doi: 10.3389/fpsyt.2019.00382.

Rogers, E. M. Diffusion of Innovations. (3rd ed.) New York: Free Press, 1983

Shah, L. B. I., Torres, S., Kannusamy, P., Chng, C. M. L., He, H.-G., & Klainin-Yobas, P. (2015). Efficacy of the Virtual Reality-Based Stress Management Program on Stress-Related Variables in People With Mood Disorders: The Feasibility Study. Archives of Psychiatric Nursing, 29(1), 6–13. https://doi.org/10.1016/j.apnu.2014.09.003

Serrano, B., Banos, R. M., Bottela, C. (2015). Virtual Reality and stimulation of touch and smell for inducing relaxation: A randomized controlled trial. *Computers in Human Behavior*, 55 (2016), 1-8

Srivastava K., Das R. C., & Chaudhury, S. (2014). Virtual reality applications in mental health: Challenges and perspectives. Ind Psychiatry. doi: 10.4103/0972-6748.151666

Spielberger, C. D. (1989). *State-Trait Anxiety Inventory: Bibliography* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.

Soi, C., Gimbel, S., Chilundo, B., Muchanga, V., Matshinhe, L., & Sherr, K. (2018, December 13). Human papillomavirus vaccine delivery in Mozambique: identification of implementation

performance drivers using the Consolidated Framework for Implementation Research (CFIR). *Implementation Science*, p. 13:151.

Therapieland. (2019). Retrieved on 14 October 2019, from https://www.therapieland.nl/virtual_reality/

Thomas, D.R. (2003). A General Inductive Approach for Qualitative Data Analysis. American Journal of Evaluation, 27(2), 237-246. DOI: 10.1177/1098214005283748.

Vesterinen V, Häkkinen K, Hynynen E, Mikkola J, Hokka L, Nummela A. Heart rate variability in prediction of individual adaptation to endurance training in recreational endurance runners. Scand J Med Sci Sports 2013;23(2):171–80.

Ziekteverzuim | Cijfers & Context | Huidige situatie | Volksgezondheidenzorg.info. (2019). Retrieved on 14 October 2019, from https://www.volksgezondheidenzorg.info/onderwerp/ziekteverzuim/cijfers-context/huidige-situatie

Wilson, V. (2014, June 19). Research methods: sampling. University of Saskatchewan, Saskatchewan, Canada.

Webb, E. J., Campbell, D. T., Schwartz, R. D., & Sechrest, L. (1966). Unobtrusive measures. Chicago: Rand McNally.

Appendix1. State-Trait Inventory

Een Nederlandstalige bewerking van de Spiegelberger State- Trait Anxiety Inventory

STAI-versie DY-1

Naam:…… Sekse:…… datum:…….

Toelichting: Hieronder vindt U een aantal uitspraken, die mensen hebben gebruikt om zichzelf te beschrijven. Lees iedere uitspraak door en zet dan een kringetje om het cijfer rechts van die uitspraak om daarmee aan te geven hoe U zich *nu voelt*, dus *nu op dit moment.* Er zijn geen goede of slechte antwoorden. Denk niet te lang na en geef Uw eerste indruk, die is meestal de beste. Het gaat er dus om dat U weergeeft wat U *op dit moment* voelt.

	Geheel niet	Een beetje	Tamelijk veel	Zeer veel
1. ik voel me kalm	1	2	3	4
2. Ik voel me veilig	1	2	3	4
3. Ik voel me gespannen	1	2	3	4
4. Ik voel me onrustig	1	2	3	4
5. Ik voel me op mijn gemak	1	2	3	4
6. Ik ben in de war	1	2	3	4
7. Ik pieker over nare dingen die kunnen gebeuren	1	2	3	4
8. Ik voel me voldaan	1	2	3	4
9. Ik ben bang	1	2	3	4
10. Ik voel me aangenaam	1	2	3	4
11. Ik voel me zeker	1	2	3	4
12. Ik voel me nerveus	1	2	3	4
13. Ik ben zenuwachtig	1	2	3	4
14. Ik ben besluiteloos	1	2	3	4
15. Ik ben ontspannen	1	2	3	4
16. Ik voel me tevreden	1	2	3	4
17. Ik maak me zorgen	1	2	3	4
18. Ik voel me gejaagd	1	2	3	4
19. Ik voel me evenwichtig	1	2	3	4
20. Ik voel me prettig	1	2	3	4

Appendix 2. The PANAS Survey I

Enquête Ontspanning VR (A)

In te vullen voor het gebruik van de bril:

Naam:

Geboortedatum:

Geslacht: M/V

Afdeling:

Opleidingsniveau:

a. MBO

b. HBO

c. WO

d. Anders, nl.:.....

Instructie.

Hieronder zie je een 20-tal gevoelens/emoties. Kan jij aan de hand van de scorekaart aangeven hoe jij je op dit moment voelt? Denk niet al te lang na en geef je eerste indruk. Er zijn geen goede of foute antwoorden.

Schaal & scorekaart

1	2	3	4	5
Heel weinig of helemaal niet	Een beetje	Matig of gemiddeld	Veel	Extreem

In hoeverre voel jij je op dit moment……..?

#	Score	Gevoelens/emoties
1		Geïnteresseerd
2		Terneergeslagen
3		Opgewekt, uitgelaten
4		Ontdaan, bedroefd
5		Sterk

#	Score	Gevoelens/emoties
11		Prikkelbaar, geïrriteerd
12		Alert
13		Beschaamd
14		Geïnspireerd
15		Nerveus, gespannen

6		Schuldig
7		Angstig
8		Vijandig
9		Enthousiast
10		Zelfverzekerd, trots

16		Vastberaden, vastbesloten
17		Aandachtig, attent
18		Rusteloos, gejaagd
19		Energiek
20		Bang

Appendix 2. The PANAS Survey II

(the original one from toolshero)

PANAS vragenlijst template

Gebruik deze template om de PANAS Scale test te doorlopen. De scores kunnen je helpen bij het opstellen van persoonlijke doelen of het identificeren van aandachtsgebieden. De tekstvelden in deze template zijn aanpasbaar. Ook kun je de velden leegmaken en het template printen om hand-outs te creëren.

- Voor meer informatie over de PANAS Scale test, bezoek: https://www.toolshero.nl/psychologie/persoonlijk-geluk/panas-scale-test/

Tijdsspanne

Er zijn verschillende tijdspanne mogelijk op basis waarvan je de PANAS vragenlijst kunt invullen. Selecteer een van de opties welke je zult toepassen op de test.

- Momenteel (hoe je jezelf op dit moment voelt)
- Vandaag (hoe je jezelf vandaag hebt gevoeld)
- Afgelopen dagen (hoe je jezelf de afgelopen dagen hebt gevoeld)
- Afgelopen week (hoe je jezelf de afgelopen week hebt gevoeld)
- Afgelopen weken (hoe je jezelf de afgelopen weken hebt gevoeld)
- Afgelopen jaar (hoe je jezelf de afgelopen jaar hebt gevoeld)
- Over het algemeen (hoe je jezelf over het algemeen voelt)

Schaal & scorekaart

1 Heel weinig of helemaal niet	2 Een beetje	3 Matig of gemiddeld	4 Veel	5 Extreem

Vul de scorekaart hieronder in, gebaseerd op de geselecteerde tijdsspanne.

#	Score	Gevoelens/emoties
1		Geïnteresseerd
2		Terneergeslagen
3		Opgewekt, uitgelaten
4		Ontdaan, bedroefd
5		Sterk
6		Schuldig
7		Angstig
8		Vijandig
9		Enthousiast
10		Zelfverzekerd, trots

#	Score	Gevoelens/emoties
11		Prikkelbaar, geïrriteerd
12		Alert
13		Beschaamd
14		Geïnspireerd
15		Nerveus, gespannen
16		Vastberaden, vastbesloten
17		Aandachtig, attent
18		Rusteloos, gejaagd
19		Energiek
20		Bang

Resultaat berekenen en betekenis

Begrippen met een positief effect Tel de scores van de vragen 1, 3, 5, 9, 10, 12, 14, 16, 17 & 19 bij elkaar op. De totaalscore zal tussen de 10 en 50 liggen. Hogere scores betekenend hogere niveaus van het positieve effect.

Begrippen met een negatief effect
Tel de scores van de vragen 2, 4, 6, 7, 8, 11, 13, 15, 18 & 20. De totaalscore zal tussen de 10 en 50 liggen. Hogere scores betekenend hogere niveaus van het negatieve effect.

Totale score van de <u>positieve</u> emoties:

Totale score van de <u>negatieve</u> emoties:

Appendix 3. The interview structure (questions)

Interviewvragen Virtual Reality- onderzoek Provincie Zuid Holland

Intro toelichting interview: als het goed is heeft u zojuist de VR- oefening uitgevoerd en de daarbij behorende vragenlijst ingevuld. Ter aanvulling op dit onderzoek willen wij graag een kort interview houden met als doel uw ervaring en mening in kaart te brengen. Uiteindelijk willen wij aan de hand van dit onderzoek een antwoord vinden op de vraag hoe de implementatie van de VR- ontspanning oefening wordt ervaren en in hoeverre deze VR-ontspanning programma kan bijdragen aan gevoel van ontspanning?

Vraag 1: Intervention

Hoe heeft u de VR – ontspanningsoefening ervaren? (tijdens het interview wordt hierop doorgevraagd.)

In welke mate heeft de oefening kunnen bijgedragen aan uw gevoel van ontspanning?

Vraag 2: Intervention (Vergelijkende vraag Virtuele blootstelling vs. Andere ontspanning methoden)

Wat zijn voor u manieren om te ontspannen?

Hoe ervaart u deze oefening ten opzichte van andere ontspanningsoefeningen?

In hoeverre komt deze oefening overeen met de oefeningen / manieren die u uitvoert om te ontspannen?

Vraag 3: Inner setting & intervention (Setting oefening)

Wat zijn momenten dat u gespannen bent op werk en behoefte heeft aan dergelijke oefeningen ter ontspanning?

Wat zou een goed moment zijn voor u om de VR-ontspanning oefening uit te voeren?

Waar? Hoe vaak en in welke setting zou u van de VR- ontspanning oefening gebruik willen maken?

Heeft u in deze setting de oefening ongestoord kunnen uitvoeren? Zo niet , wat heeft u hiervan afgehouden?

Wat vond u van de gegeven informatie en instructies?

In hoeverre heeft u het gevoel dat u tijdens de oefening aanwezig was (verplichtingen en gedachten loslaten)?

Vraag 4: Individuals involved & implementation process (aanvaard en gebruik programma)

Bent u van plan om deze VR-programma of een vergelijkbare programma ter bevordering van ontspanning op werk vaker te gaan gebruiken?

Ziet u drempels om van deze oefening gebruik te kunnen maken? Welke zijn dit?

Vraag 7: Outer setting & implementation process (Opmerkingen & Suggesties)

Heeft u nog verdere vragen en/ of suggesties die het inzetten van de VR-programma in de werksetting kunnen verbeteren?

Vraag 8: Intervention(Effectiviteit)

In hoeverre denkt u dat een dergelijk VR- programma op het werk kan bijdragen aan uw ontspanning?

Einde interview:

We zijn ten einde gekomen van dit korte interview. Ik wil u vriendelijk bedanken voor uw deelname aan dit onderzoek. De resultaten van dit onderzoek worden na afloop met u werkgever gedeeld. Deze worden naar verwachting in april beschikbaar gesteld.