Relax Yourself - Using Virtual Reality to Enhance Employees' Mental Health and Work Performance

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ABSTRACT

This paper presents work-in-progress aiming to develop an actively adapting virtual reality (VR) relaxation application. Due to the immersive nature of VR technologies, people can escape from their real environment and get into a relaxing state. Goal of the application is to adapt to the users' physiological signals to foster the positive effect. Until now, a first version of the VR application was constructed and is currently evaluated in an experiment. Preliminary results of this study demonstrate that people appreciate the immersion into the virtual environment and escape from reality. Moreover, participants highlighted the option to adapt users' needs and preferences. Based on the final study data, the constructed application will be enhanced with regard to adoption and surrounding factors.

CHI'19 Extended Abstracts, May 4–9, 2019, Glasgow, Scotland Uk

ACM ISBN 978-1-4503-5971-9/19/05.
https://doi.org/10.1145/3290607.3312946

KEYWORDS

virtual reality, relaxation, immersion, mental health.

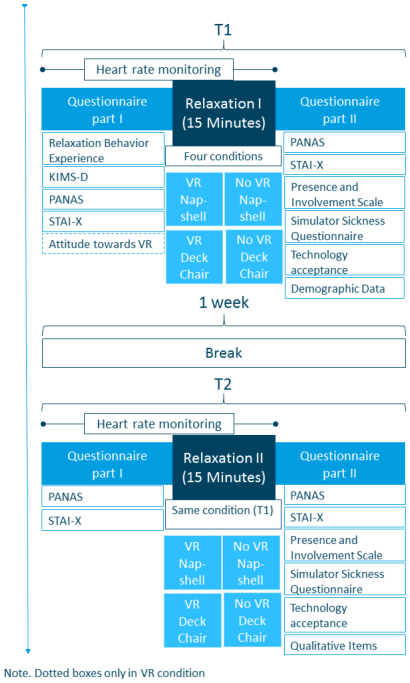

Figure 1: Overview of the applied method with the used questionnaires and their points of measurements divided into the two experimental sessions

INTRODUCTION

The present work aims to use virtual reality (VR) technologies to develop an immersive relaxation method helping to refuel energy after work phases of high concentration. Studies demonstrated that people are cognitively and emotionally overwhelmed by the increasingly digitized work and leisure world. According to the latest health report of the BKK [5], 31.4% of employees feel much more burdened by the digitization at the workplace. More than a half have incapacity to work due to mental stress [5]. Measures to counter this burden are of great importance not only for the employees, but also from a social and economic point of view. To tackle this problem, short relaxation and sleep phases in the workplace were found to be beneficial, since they have demonstrable positive influence on responsiveness and concentration [12], memory performance [8] and mood [3]. Beside those positive effects, it is still questionable how the relaxation can be integrated into today's daily work. Many large companies offer their employees sleep capsules (see Fig. 2). However, these are space-consuming, costly and do not completely isolate employees from their environment making deep relaxation difficult. In order to remove these restrictions, the present work aims to develop and evaluate a fully immersive, closed and portable VR-based relaxation environment, which not only gives users space to relax, but actively accompanies and guides them [1]. Prior research demonstrates, that VR applications can haven an relaxation effect, when they are combined with meditation [6] or breathing techniques [10]. However, it has not been investigated whether the mere observation of a virtual environment can enhance relaxation. The goal is to develop an immersive application that, on the one hand, actively adopts to the users' needs based on their physiological data and, on the other hand, is customizable to individual preferences. As a consequence, the presented VR environment can match the needs and preferences of the users and lead to a fast and efficient relaxation enhancing the users' mental state. A first version of the VR application has been designed and an experimental study is currently running to evaluate the assumed positive effects of this application. As this paper presents work-in-progress, the data collection is not completed yet. However, first insights demonstrate that the users evaluate the relaxation method positively and valuable insights for further developments are given. This evaluation study and its preliminary results are presented in the following sections.

EVALUATION STUDY

Method

Procedure and Sample. The current study was conducted as a 2 (VR vs. no VR) X 2 (Napshell vs. deck chair) between subjects design. As the used technology might underlay novelty effects, participants attended the respective condition twice within a fixed delay of exactly one week to measure adaptation and repetition. Up to now 41 participants provided complete data sets virtually equally distributed to the four experimental conditions. All participants were students, 10 of them were female and the

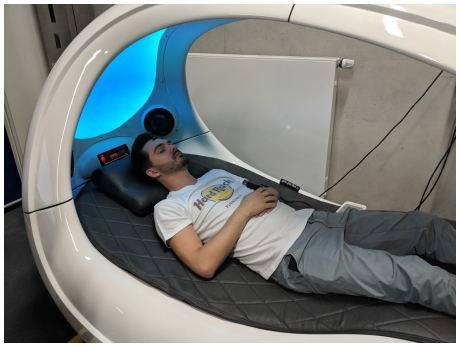

Figure 2: Example picture of the used immersive sleep capsule (Napshell)

average age was 21 (M = 21.39, SD = 3.73). After an introduction participants were briefly informed to be testing a specific relaxation method and asked to fill out the first part of a questionnaire. Secondly, the respective relaxation condition was executed for fifteen minutes. Participants were instructed to consciously relax on their own. After reaching the time limit, the instructor returned to terminate the relaxation phase and explain further proceeding. After that participants filled out a second set of questions. The overall procedure is presented in Fig. 1.

Experimental Conditions. In the VR condition the Oculus Go standalone VR-headset was used and a VR application was realized with the Unity 3D engine in conjunction with the Oculus Mobile SDK. As [1] showed that nature scenes foster relaxation and it was aimed to find an environment with constant movements, moving clouds are presented in the VR environment. The scene required the implementation of two layers. First was the Skybox, a static set of six pictures forming a cube so that they surround the environment. The second layer consisted of particles spawning at random, moving along the horizon and fading away after a random time set within a specific range. The second pivotal aspect of the relaxation method was audio. Ten songs were repackaged into the resources and accessed via an array, acting as a playlist that is executed by the Unity 3D audio manager. In the no VR condition, only the audio tracks have been used in the exact same order and length of the VR condition. Moreover, participants lay either in an immersive designed sleep capsule (Napshell see Fig. 2) or on a regular deck chair.

Measures. Respondents reported their attitude towards VR. Therefore, the attitudes toward science scale by [2] was adapted. We assessed mood by using the German version of Positive and Negative Affect Schedule (PANAS) by [7]. As a second state measurement of mood, respondents reported on the state dimension with the State-Trait Anxiety Inventory (STAI-X) [9]. Participants' experience within the VR experience condition was measured by the presence questionnaire (PQ) by [13]. The items regarding spatial movement were omitted due to relaxation setting without movement. The scale contains two factors, presence and involvement. A further measurement to assess participants' experience within VR was the simulator sickness questionnaire by [4]. Participants reported their experience regarding specifically visual related sickness symptoms. To measure respondents' general acceptance of the used technology we adapted a scale based on the Unified Theory of Acceptance and Use of Technology (UTAUT) [11]. The adapted measurement contained usage intention, perceived usefulness, perceived ease of use and perceived enjoyment.

Moreover, participants were asked for a qualitative evaluation of the relaxation method. To anticipate participants' deeper feelings and thoughts about the tested relaxation method, they had the chance to state their perceived advantages, disadvantages and desirable improvements for the relaxation method. For all qualitative statements, participants were instructed to write down their answers in

Table 1: Coded categories of participants' qualitative statements regarding advantages and disadvantages and its number of codes.

Coded Categories	Number of Codings for each sub-category			
	VR		No VR	
	Napshell	*Deckchair*	*Napshell*	*Deckchair*
Adavantages of the relaxation method				
Improved Well-Being, Concentration and Relaxation	4	1	4	6
Escape fromreality	4	2	0	0
Easy and ubiquitously usable	2	2	2	4
Fast relaxation effects	2	1	3	2
Adoptable to own needs and preferences	0	3	1	0
Surrounding Factors (reclining position, music…)	0	0	2	0
Cost-efficient	0	0	0	2
Disadvantages of the relaxation method				
No disadvantages	2	4	1	4
Surrounding Factors (light, music)	0	0	3	0
Costly	2	0	0	0
Losing Sense of time	0	1	0	0
Private surrounding needed	0	0	2	2
High technical effort	3	0	0	0

detail in the end of the questionnaire. In addition, people were asked whether they felt asleep during the relaxation phase or not.

Results

To analyze the qualitative statements an inductive category development was used, where based on participants' statements a coding scheme with 18 main codes was build. Using the coding scheme all statements have been coded by a trained rater. The categories existing in this coding scheme are listed in Tab. 1 and 2.

As the data collection of the laborious lab study is still ongoing, the present paper focuses on descriptive data and qualitative results of the participants' statements. The descriptive values demonstrated that participants overall had a positive attitude towards VR technologies (M = 3.93, SD = 0.58) and that merely no feelings of simulator sickness (M = 1.35, SD = 0.38) occurred. Moreover, the mental state seems to be less negative after the relaxation phases. When the data collection is finished, inference statistical analyses have to be conducted, in order to receive generalizable results. Thus, the qualitative results are further described, to gain beneficial insights in participants' feelings during the method and users' evaluation of it. Please refer to Tab. 1 and 2 for a detailed overview of the number of codings for all four experimental conditions.

VR Environment. Participants appreciated the overall positive effect the relaxation method and mentioned a positive influence on their well-being, concentration and relaxation. Further on, participants in the VR condition named the possibility to escape from reality, while this has not been mentioned from those who used audio only. This escape from reality was described to enhance the relaxing effect. This feeling was additionally more often stated from participants using the Napshell during the experiment than from those lying on a simple deck chair. Additionally, participants stated that the method is easy and ubiquitously usable and has fast relaxation effects. Moreover, participants saw the possibility to adopt both, the visual elements of the VR environment and the audio cues to the users' needs and preferences, which will make the method even more effective.

While two people did not see any disadvantages of the VR and Napshell condition, even four people of the VR and deck chair condition stated to see no disadvantages. One named disadvantage was the expensive investments needed to use the tested relaxation method. Moreover, people seem to still be afraid of the technical effort that is associated with the VR environment. However, these disadvantages were all mentioned by people in the VR and Napshell condition, while participants that used the VR environment with a deck chair only mentioned that they lost their sense of time.

As derived from statements regarding the method's advantages, people want to adapt the method to their own needs and preferences. Therefore, this was mentioned as a beneficial improvement of the method. Moreover, different visual and audio cues are desired, which also matches the call for

Table 2: Coded categories of participants' qualitative statements regarding desirable improvements and its number of codes

Coded Categories	Number of Codings for each sub-category			
	VR		No VR	
	Napshell	*Deck-chair*	*Napshell*	*Deck-chair*
Improvements for the relaxation method				
Surrounding Factors	6	2	2	3
Light	0	0	0	2
Headphones	1	1	1	0
Private surrounding	0	0	1	1
Improved VR Technology	4	1	0	0
Massage function	1	0	0	0
Different audio or visual cues	2	4	4	1
Adaption to preferences an needs	2	1	1	1
No improvements needed	0	1	1	3
Call for additional visual cues	0	0	1	1

the possibility to customize the VR environment. Several surrounding factors have been mentioned, that are valuable to be improved. Most of it refer to the used hardware (headset and headphones). In addition, a massage function of the Napshell was mentioned. Although no inference statistical analyses are applicable yet, the data indicate that all participants, who stated to be fallen asleep, stemmed from the VR condition (n = 3), while no participant that used the audio only seemed to be fallen asleep.

No VR Environment. Again, participants stated to feel positive outcomes regarding their well-being, concentration and relaxation. The simple design of this method was appreciated, since participants, compared to the VR condition, stated more often that the method is easy and ubiquitously usable and has fast relaxation effects. In the condition where only headphones (audio) and a deck chair were used, participants stated the cost-efficiency to be beneficial. In the no VR condition participants focused more on other surrounding factors and things such as the reclining position or the relaxing music got highlighted. A bunch of people stated that the tested method has no disadvantages, while the number of codes was again higher in the deck chair condition compared to the Napshell condition. As described above, people rely more on other surrounding variables, for example that the light was too bright or the music matches not their needs. Besides the surrounding factors, that have been mentioned, people called for an adaptation of their own needs and preferences and stated that the music needs to be improved. Moreover, participants seem to wish for a more private surrounding and that this method cannot be used in every environment, when they use the relaxation method. Also, since participants in this condition had only audio cues, it was mentioned that additional visual cues would be beneficial. Some participants stated that no improvements are needed.

CONCLUSION AND FUTURE WORK

Participants' statements showed, that the immersive effect of the VR application helped people to relax faster. Users highlighted the possibility to escape from reality and connected it with a positive outcome on their relaxation and well-being. On the opposite people in the no VR condition stated that a more private surrounding is needed. Thus, the VR technology helps people to forget their surrounding and relax in various environments. Moreover, most participants either wished for customizable content or different visual and audio cues. This highlights the importance of an adaptive and customizable system, since users call for an application that matches their own needs and preferences. Moreover, due to the VR technology other surrounding factors like light or the reclining position seem to be overwritten. An expensive sleeping capsule might therefore not be necessary to foster a state of relaxation. The results of the qualitative statements overall support our assumptions that the VR application can help people to relax easier and in various environments. Based on these results and on the data of the final sample, the VR relaxation application will get refined. Therefore, further

Figure 3: Example of visually embedded physiological data (live view) into the VR application

AKNOWLEDGEMENTS

Research within the Research Institute of Positive Computing is funded by the Ministry of Culture and Science of the German State of North-Rhine-Westphalia

VR environments need to be developed, to be able to match the users' needs and the adaptation to the users' physiological data needs to be embedded. These physiological data should be visually embedded into the application (see Fig. 3), so that users can concentrate on their data, which might also enhance the relaxing effect. In addition, future studies need to test, whether customization by the users or an active adoption by the application itself is more effective.

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