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Virtual Reality as Anxiety Management Tool

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Abstract: Virtual Reality technologies have been established as an effective tool for the treatment of a variety of mental health disorders. Despite those positive results, it remains unclear whether these findings can generalize to the healthy population. In the current study, we assessed to what degree a virtual scenario consisting of a tropical beach can be successfully applied for the reduction of state anxiety and negative mood in healthy individuals. The study was performed on 50 volunteers aged 18 to 45 that were individually exposed to virtual reality. Before and after the virtual reality session, the emotional state of the participants was measured through questionnaires. Using linear mixed effect models, we obtained evidence for the effectivity of a single virtual reality session for negative state reduction, namely, we observed a decrease in state anxiety and negative mood. Additionally, a positive mood of participants increased after the session, however, no statistical evidence was obtained. The results confirm our hypothesis that state anxiety and negative mood can be decreased using a low-cost virtual reality device. Based on our findings, we suggest that virtual scenarios can improve the emotional well-being and the quality of life of the general population.

Keywords: virtual reality, natural scenarios, state anxiety, negative and positive mood, sense of presence.

Introduction

Virtual reality (VR) technologies are becoming increasingly involved in society and the process of human life. The area of mental health is not an exception in the 21st century trends, and VR has started to become a common tool for the study, prevention, assessment, and treatment of psychological disorders (e.g., Glanz, Rizzo and Graap, 2003; LaValle, 2023; Mancuso et al., 2023). In particular, VR technologies have been successfully applied to treat various mental health problems such as anxiety disorders (Carl et al., 2019; Opris et al., 2012; Parsons and Rizzo, 2008), eating disorders (Clus et al., 2018; Marco, Perpina and Botella, 2014), addictions (Segawa et al., 2020) or as a non-pharmacological analgesic procedure to reduce acute pain and anxiety (Kenney and Milling, 2016; Triberti, Repetto and Riva, 2014).

Nowadays, the most established use of VR is as an exposure-technique to treat anxiety-related disorders (Freeman et al., 2017). Research studies have shown its clinical efficacy to treat specific phobias (Garcia-Palacios et al., 2002; North, North and Coble, 1998), the Posttraumatic Stress Disorder (PTSD; Beidel et al., 2019; Rothbaum et al., 2003) or panic disorders (Botella et al., 2007), among others. Although various studies have comprehensively studied the possibilities of VR to treat anxiety disorders, it becomes challenging to translate these findings to a healthy population. We, therefore, conducted the study to assess to what degree a low-cost VR system can be used for decreasing state anxiety and negative mood in the healthy population. We argue that the application of VR technologies could substantially help in reducing the anxiety levels and in promoting a positive mood in healthy individuals.

In the rest of the introduction, a historical overview of the development of VR technologies will be provided. Then, the problem of human involvement in VR will be discussed. Next, an overview of the research on anxiety disorders by utilizing VR technologies will be presented. At the end of the introduction, the goals of the current study and the hypotheses will be listed.

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Historical overview

The modern VR started its early development in the 1950s and 60s accompanied by several key inventions. This included patenting the Sensorama in 1957 by M. Heilig. The goal of the Sensorama was to use the senses of the user including components such as odor generators and vibrating chairs while aiming to provide a complete multisensory experience (Heilig, 1962). Following this in 1961, the Headsight, the first supervisor of head-mounted displays that included motion tracking and dual monitor displays, was designed by Philco Corporation (Peddie, 2017). Sutherland (1965) designed the Ultimate display, that innovatively used the computer interface. This allowed users to interact using a simple virtual scenario in real time frame.

The formalization of VR occurred in 1989 with J. Lanier coining the term "virtual reality". At that point, VR has been extensively used in research and psychiatric treatment (Lanier, 1992). In the decades following that, VR started to be used by mental health professionals as an exposure method to treat anxiety disorders. The effectiveness of VR-based Exposure Therapy (VRET) was evaluated in the primary research with the focus on the treatment of acrophobia (Rothbaum et al., 1995). Based on this study, VRET was proved to be effective and that led to a number of follow-up studies on the use of VR-based therapy for the treatment of anxiety disorders and, in general, other mental health problems.

The problem of human involvement in virtual reality

An important question for the application of VR is the problem of human involvement in virtual scenarios. This involvement was found to be associated with the formation of a genuine emotional attachment of participants to virtual characters (Gould, Coulson and Howard, 2012). Slater (2009) discussed the Place Illusion (PI) and Plausibility Illusion (Psi) as the predictors of individuals' realistic perception of virtual environments. Continuing this idea, Pillai, Schmidt and Richir, (2013) framed the concept of the psychological illusion of presence while being in an alternative reality. This concept was understood as a continuous cognitive process that concerns perceived objects and phenomena while the mind functions and perceives in the same way as in the real world. The authors suggested calling it Self-Evoked Reality, an endogenously induced reality that is a component of the general model of reality. They adhered to the position that the psychological alternative reality can be interrupted leading to the person returning to the reality. Before this critical moment, most vivid sense of presence is experienced that is accompanied by corresponding emotional experiences. The idea of psychological VR and the possibility of it being interrupted indicate broad prospects for the treatment of mental disorders, psychological trauma, loss and other problems.

The ability to simulate real situations in a virtual environment drew the attention of the researchers to the possibilities of its use for the study, assessment, prevention, and treatment of mental health disorders. Since then, VR has been successfully applied to various mental health disorders (e.g., Fornells-Ambrojo et al., 2008; Freeman et al., 2010; Riva et al., 2004). These studies opened perspectives to determine the essence of the manifestation of thoughts of persecution, the possibility to separate the real world from the fantasy world in people with psychopathology. In this direction, VR has established itself as a implementation technique for a broader study of the causes and nature of the manifestation of certain symptoms, which allows adjusting the therapeutic lines of care for people with certain mental health problems.

Research on anxiety disorders and VR

For two decades various experimental studies have been conducted to study the effect of VR on the treatment of subclinical fears and anxiety disorders. In the first controlled application of VR for the treatment of psychological issues, VR therapy was successful in reducing the fear of heights (Rothbaum et al., 1995). The result was evaluated by indicators of anxiety, avoidance, attitude, and stress. Significant differences in the groups were found for all indicators, so the VR group improved significantly after treatment, but the control group did not change. Nowadays, a large body of literature validates the use of VR as an exposure technique to treat anxiety-related disorders. Note that recent review and meta-analytic studies have shown that VR can be more efficient than imaginal exposure and can have the same efficacy as in-vivo exposure (Carl et al., 2019; Meyerbröker and Emmelkamp, 2010; Morina et al., 2015; Morina et al., 2015; Parsons and Rizzo, 2008; Powers and Emmelkamp, 2008). In addition, the use of VR may increase treatment adherence by reducing the treatment desertion.

However, beyond the treatment of anxiety disorders through reducing negative emotions, VR has been also effectively used in inducing positive emotions. In a recent study that utilized VR technologies, positive emotions such as relaxation and joy have been successfully induced while an anxiety level was reduced in healthy population (Baños et al, 2008). With regard to a clinical population, a pilot study,

involving 25 patients with Generalized Anxiety Disorder (GAD), was conducted to assess the efficacy of a VR system designed to induce relaxation (Repetto et al., 2013). Initial results suggested the efficacy of VR and biofeedback devices in reducing stress and anxiety in a clinical population. However, the authors also suggested the need to use physiological data to modify specific features of the virtual environment in real time.

In recent VR applications, a variety of relaxation techniques have started to be used in conjunction with biofeedback devices. Thus, the anxiety treatment has been proposed to improve through the use of a biofeedback virtual reality system (VR), used both for relaxation and for the controlled effects of VR in psychiatric treatment (Anderson et al., 2005; Anderson, Rothbaum, and Hodges, 2003). Moreover, in a study developed within the EU-funded INTREPID research project, Riva et al. (2009) designed a mobile VR system with biofeedback techniques to improve the traditional treatments for GAD.

The feeling of presence and anxiety level

One of the principal mechanisms underlying the use of VR as an exposure technique is the feeling of presence. In the specialized literature, the construct of presence is usually considered the principal mechanism by which VR is effective as a psychological intervention tool (Alsina-Jurnet and Gutiérrez-Maldonado, 2010). The term "presence" is usually defined as the "sense of being there" as a part of a simulated environment (Steuer, 1992). One of the main results of this illusion is that a virtual scenario may evoke the reactions, emotions, and thoughts similar to the experience in a real world (Hodges et al., 1995).

The sense of presence in VR can be facilitated by the application of technologies including touch gloves, head displays, vibroactive platforms and synthesized sounds that together allow to simulate the users' sensorial channels and actively exploration of the virtual environment. In addition, some virtual reality systems are programmed to respond in real time to the actions of the participants. Due to this dynamic interaction the more natural and intuitive connection to the virtual reality can be experienced. The recent studies identified three main factors that comprise the "sense of presence" construct: realness, spatial presence, and involvement (Lessiter et al., 2001; Schubert, Friedmann and Regenbrecht, 2001).

The relationship between the anxiety level and feeling of presence in both clinical and non- clinical sample has been examined in various VR applications (Alsina-Jurnet et al., 2011; Krijn et al., 2004; Regenbrecht, Schubert and Friedmann, 1998; Robillard et al., 2003; Schuemie et al., 2000). Although in some of these studies the relationship between anxiety level and feeling of presence has been established (Schuemie and Bruynzeel, 2000), others failed to correlate these values (e.g., Regenbrecht, Schubert and Friedmann, 1998). One of the possible explanations of these contradictory results is the differences in the sample: while some studies use a clinical population, others draw conclusions on the healthy individuals. The mentioned limitations make it difficult to summarize the current findings. A continuing challenge is, therefore, to establish whether there is a relationship between anxiety level and feeling of presence in healthy individuals.

To summarize, many of the studies utilizing VR for the treatment of mental health problems were aimed to treat anxiety disorders. Thus, the results showed that VR use led to significant reduction in anxiety symptoms. Additionally, its effectiveness (or was more effective) was similar as compared to traditional exposure interventions. Moreover, it had a powerful effect the persons' day-to-day life. Despite those findings, it remains unclear whether VR technologies can affect the reduction of anxiety and negative emotions in the general population. Thus, the goal of the present study was to investigate with a non-clinical sample the efficacy of virtual experience for reducing negative state conditions and inducing positive ones.

In the current study, we have the following hypotheses:

1) State anxiety and the negative mood can be reduced utilizing a low-cost VR system.
2) Positive mood can be induced utilizing VR technologies
3) There is a negative relationship between levels of state anxiety and feeling of presence

Materials and Methods

Participants

The sample consisted of 50 participants (37 females and 13 males), students of Armenian-Russian University. The mean age of participants was 22.34 (SD = 5.28, age range = 18–45). All participants were healthy individuals with no history of neurological and psychiatric disorders.

Before their participation, they gave informed consent in the form of a written statement in

accordance with the Declaration of Helsinki. In this statement, they agreed that participation in the study was voluntary, individually conducted and had no negative consequences, that the data obtained in the course of this study would be processed anonymously.

Questionnaires

The following questionnaires were administrated:

• STAI (State-Trait Anxiety Inventory, Form X, S-Anxiety scale; Spielberger, 2010). A questionnaire that assesses state anxiety level. This sub-scale comprises 20 items (e.g., I am presently worrying over possible misfortunes) graded on a Likert scale from 0 (not at all) to 3 (a great deal).

• SUDS (Subjective Units of Discomfort Scale; Wolpe, 1990). Participants evaluate their level of anxiety on a scale of 100 points where 0 means no anxiety and 100 – extreme anxiety.

• PANAS (Positive and Negative Affect Schedule; Watson, Clark and Tellegen, 1988). A self-report questionnaire consisted of 20 adjectives which are related to 10 positive emotions (positive affect) and 10 negative emotions (negative affect). Participants were asked to define the degree they felt the emotions at the current moment using a five-point Likert scale where 1 was 'not at all' and 5 – 'extremely'.

• IPQ (Igroup Presence Questionnaire; Schubert, Friedmann and Regenbrecht, 2008). A questionnaire invented to evaluate the sense of presence in VR. This questionnaire consists of 14 items that need to be evaluated using a seven-point Likert Scale. Three subscales rating different dimensions of presence are included in IPQ. The Spatial Presence sub-scale reflects the sense of being physically inside the virtual reality environment, Realness sub-scale estimates the sense of reality attributed to the virtual environment, while the Involvement evaluates the attention devoted to the virtual reality environment. Additionally, a general item that estimates the "sense of being here" is included in IPQ.

Hardware

The virtual scenario was displayed by a standalone VR glasses (Pico Interactive Goblin VR) with a resolution of 2560 × 1440 pixels, 92º field of view, and a screen refresh rate of 70 Hz (<20 ms) (see Figure 1).

Figure 1. Standalone Pico Goblin VR headset

Software

RelaxVR (https://www.relaxvr.co/): An App that combines the exposure to different 360º videos of natural environments (including beaches, forests, rivers, waterfalls, among others) with guided meditations, and soothing music to accompany the visual and meditative experience.

For the present study, researchers used the video of a beach located in Tasmania (Australia) (see Figure 2) with an embedded Russian narrative consisting of a 5-minute breath awareness technique. Note that the breath technique was specifically designed and recorded for the present study.

Figure 2. A screenshot of the virtual beach used in the present study

Procedure

A within-subjects design with two evaluation moments (pre- test and post-test) was used. The duration of each experiment was approximately 30 min, and all participants did it individually. Before starting the exposure to the virtual scenario, the STAI (S-Anxiety), the SUDS, and the PANAS were administered. Afterwards, the participants were immersed in the tropical beach for 7 minutes. Finally, after the exposure, the STAI-S, the SUDS, the PANAS, and the IPQ were administered.

Statistical analysis

To statistically evaluate the differences in the participants' scores, we constructed Linear Mixed-Effects models (LME models; Bates and DebRoy, 2004) in R (R Core Team, 2013). To obtain p-values we used lmerTest R package based on Satterthwaite's method (Kuznetsova, Brockhoff and Christensen, 2018). Additionally, to evaluate the relationship between variables, we computed the Pearson's product-moment correlation (Lee Rodgers and Nicewander, 1988).

Results

Exposure to natural virtual scenarios can be used to decrease State Anxiety?

To assess the influence of the Virtual Reality on participants' anxiety level, the values on State Anxiety Level (as measured by State-Trait Anxiety Inventory for adults; Spielberger, 2010) were inspected (Figure 3). Given large differences in mean values and standard errors between two groups, a Linear Mixed Effect model (LME) with Condition (before and after the VR session) as a fixed effect and Participants as a random intercept was constructed to evaluate the differences statistically. The results of the statistical analysis provided evidence for the effect of the VR session (for all the estimates see Table 1) meaning that the State Anxiety level was significantly decreased by means of VR session ($t = -8.55$, $p < 0.001$). The model results indicate that before the VR session participants on average had a score of 19.48 while after the VR session the average score decreased to 12.06.

Additionally, the values on the Subjective Units of Distress Scale (as measured by SUDS; Wolpe, 1990) were compared before and after the VR session (for average values see Figure 3). Given large differences observed in average values, a Linear Mixed Effect model (LME) with Condition (before and after the VR session) as a fixed effect and Participants as a random intercept was constructed. The results of the statistical analysis provided evidence for the effect of the VR session (Table 1) on the values of SUDS ($t = -7.44$, $p < 0.001$). The model results indicate that before the VR session participants on average had a score of 28.8 (a score of 30 - "mild anxiety distress") while after a single VR session the average score decreased to 12.16 (a score of 10 – "alert and awake"). Overall, these results provide evidence for the effectiveness of the VR session for decreasing state anxiety in the sample of University students.

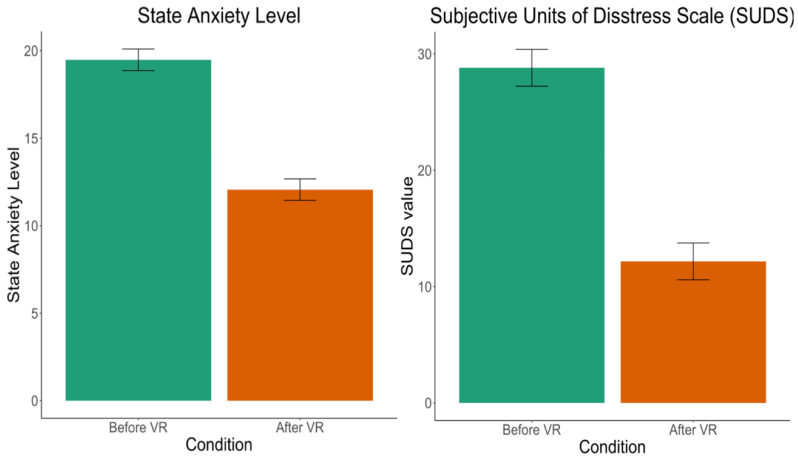

Figure 3. The mean values along with the standard errors per participant (Morey, 2008) are presented for State Anxiety Level and Subjective Units of Distress before and after the VR session

Table 1.
The results of LME models for effect of the VR session on State Anxiety Level and SUDS

Model: State_Anxiety_Value~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	19.48	1.2	16.14	<0.001***
After VR	-7.42	0.87	-8.55	<0.001***
Model: SUDS_Value~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	28.8	2.79	10.32	<0.001***
After VR	-16.64	2.24	-7.44	<0.001***

Can exposure to Virtual Reality be used to decrease Negative Mood and facilitate a Positive Mood?

First, the participants' basic emotions were assessed with The Positive and Negative Affect Schedule questionnaire (PANAS; Watson, Clark and Tellegen, 1988). Based on participants' responses the mean values were calculated along with within-subject standard errors (Figure 4). The visual inspection of both positive and negative affect values allowed observing differences before and after the VR session.

To test these differences statistically, LMEs with Condition (before and after the VR session) as a fixed effect and Participants as a random intercept were constructed. The results of the statistical analysis provided evidence for the effect of VR session (Table 2) on Negative Affect meaning that the level of Negative Affect can be significantly reduced by means of VR session ($t = -5.95$, $p < 0.001$). The model results indicate that before the VR session participants had on average a score of 17.44 while after the average score decreased to 12.88. For Positive Affect, participants' scores increased after the VR session, however, no statistical evidence was obtained ($t = 1.24$, $p > 0.05$).

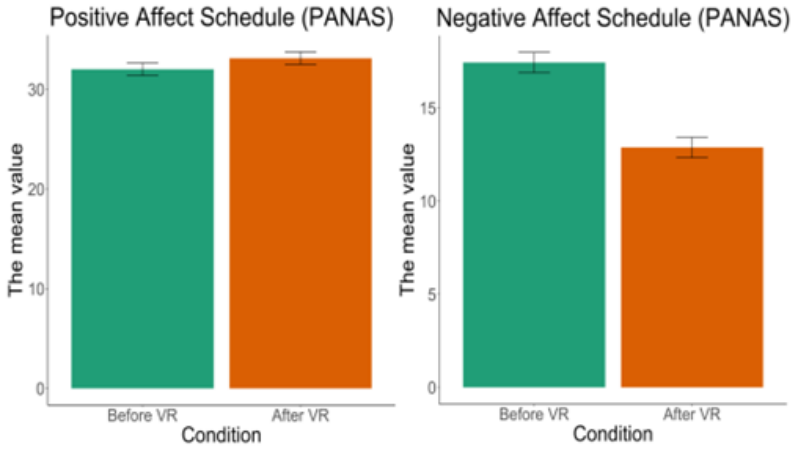

Figure 4. The mean values along with the standard errors per participant (Morey, 2008) are presented for The PANAS questionnaire before and after the VR session

Table 2.
The results of LME models for effect of VR session on Positive and Negative Affect Schedule

Model: Positive_Affect_Value ~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	32.02	1.09	29.29	<0.001***
After VR	1.1	0.88	1.24	> 0.05
Model: Negative_Affect_Value ~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	17.44	0.81	21.41	<0.001***
After VR	-4.56	0.77	-5.95	<0.001***

Is there a relationship between State Anxiety Level and the Feeling of Presence?

The feeling of presence was measured by the IPQ questionnaire (Igroup Presence Questionnaire; Schubert, Friedmann and Regenbrecht, 2008). The following values from the IPQ questionnaire were analyzed: IPQ total score, the values for the four IPQ subscales: Involvement (INV), General Presence (GP), Spatial Presence (SP), Realness (REAL). The mean values for these subscales were visually inspected and are presented in Figure 5A. The participants had the highest values for Spatial Presence and the lowest for General Presence.

To assess whether there is a relationship between state anxiety and the feeling of presence, Pearson's product-moment correlation between the values of State Anxiety (as measured by the State-Trait Anxiety Inventory for adults; Spielberger, 2010) and the total IPQ score was calculated. A negative weak correlation was obtained between State Anxiety Level before VR and IPQ total score, r(48)= - .28, p < .05. When comparing State Anxiety Level after VR and IPQ total score similar tendencies were observed: r(48)= - .38, p < .01. The visual representation of values for these two variables (Figure 5B) indicates a large spread of values and together with the current findings does not provide grounds for concluding that there is a correlation between anxiety level and the total score of the feeling of presence.

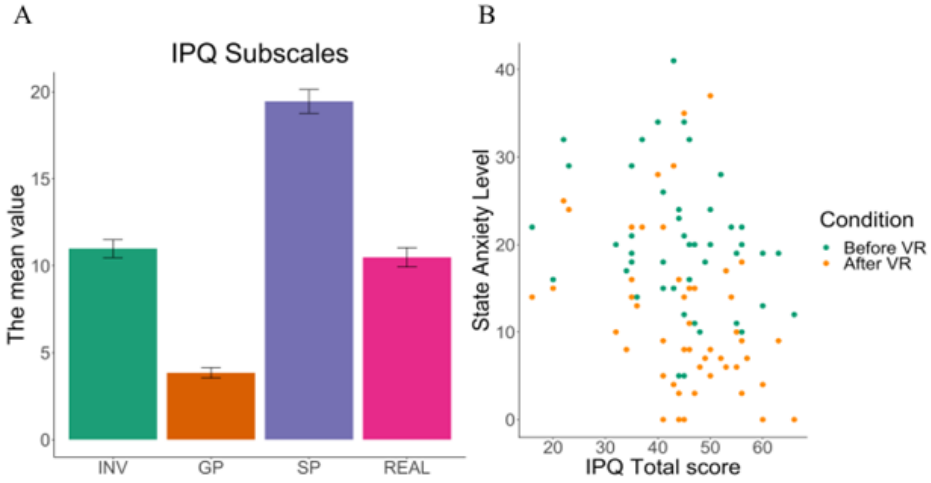

Figure 5. A. The mean values and standard errors are presented for four different IPQ Subscales: Involvement (INV), General Presence (GP), Spatial Presence (SP), Realness (REAL). B. State Anxiety Level plotted along with IPQ total score before and after the VR session

To further investigate the connection between the state anxiety and feeling of presence, the correlations between four subscales of IPQ and State Anxiety Level before and after VR were computed. The correlation values (r) along with p-values are presented in Table 3. When comparing IPQ values with State Anxiety scores, significant negative correlations were found between General Presence score and State Anxiety before (r(48)= - .43, p < .05) and after VR session (r(48)= - .47, p < .001). Additionally, weak significant negative correlations were found between State Anxiety score after VR session and the following IPQ subscales: Involvement Score (r(48)= - .38, p < .05) and Spatial Presence score (r(48)= - .29, p < .05). Marginal negative correlation was found between STAI score before VR session and Spatial Presence score (r(48)= - .27, p = .05).

Table 3.

The results of correlation analysis between feeling of presence (IPQ) and State Anxiety Level before and after VR

Model: Positive_Affect_Value ~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	32.02	1.09	29.29	<0.001***
After VR	1.1	0.88	1.24	> 0.05
Model: Negative_Affect_Value ~ (before/afterVR)+ (1 | Subject)				
	Estimate	Std. Error	t value	p value
(Intercept)	17.44	0.81	21.41	<0.001***
After VR	-4.56	0.77	-5.95	<0.001***

*** - correlation significant at level of 0.001, ** - correlation significant at level of 0.05, * - marginally significant

Discussion and Conclusion

In the current study, we aimed to reduce the anxiety level and negative mood and to induce a positive mood in healthy individuals that were exposed to a virtual scenario consisting of a tropical beach. The study was performed in an individual form. To estimate the impact of VR technologies on the psycho-emotional state, the questionnaires were administrated on state anxiety level, subjective units of distress, and positive and negative mood. Additionally, the feeling of presence of the participants was assessed. The challenge was, therefore, to evaluate whether a single VR session can lead to the reduction of anxiety level and negative mood and induction of positive mood.

To explore the possibility of state anxiety reduction by means of VR, the values for state anxiety were compared before and after the VR session. The results of the statistical analysis provided evidence regarding the efficacy of VR on the state anxiety reduction reflected in both STAI (S-Anxiety) and SUDS values. For STAI (S-Anxiety), before the VR session participants on average had a score of 19.48 while after the VR session, an average score decreased to 12.06. It is worth mentioning that both before and after the VR session participants were not characterized "high" levels of anxiety or stress (Arnaiz and Guillén, 2013; Gevorgyan, Berberyan and Berberyan, 2022; Knight, Waal-Manning and Spears, 1983) because of the fact that the sample was composed of a healthy population, namely, a group of university students. For SUDS, before the VR session participants on average had a score of 28.8 while after the VR session, an average score decreased to 12.16. Overall, these results provide evidence for the effectivity of VR sessions for decreasing the levels of anxiety. These results add to the body of the literature on the effectivity of VR use for the treatment of anxiety disorders (Diemer et al., 2014; Freeman et al., 2017; Gorini and Riva, 2008; Maples-Keller et al., 2017; Wiederhold and Wiederhold, 2005) suggesting that VR can be also used to reduce state anxiety in a healthy population. This finding is consistent with the previous studies on anxiety reduction in students by means of VR (Camara and Hicks, 2020; García-Batista et al., 2022; Harris, Kemmerling and North, 2002).

To assess whether the feelings and emotions of participants can be manipulated due to a single VR session, the resulting values of PANAS questionnaire were compared before and after the VR session. The results of the statistical analysis provided evidence for the effect of VR session on the negative affect reduction. Thus, before the VR session participants had on average a score of 17.44 while after the VR session, an average score decreased to 12.88. For positive affect, participants' scores increased after the VR session, however, no statistical evidence was obtained. We explain this data by the possible lack of a necessary balance between positive and negative emotional states: a decrease in negative effects will not always automatically lead to an increase in a person's positive feelings.

To explore the relationship between the state anxiety and feeling of presence in VR, the Pearson's correlation between the resulting values was computed. The results suggest no relationship between the total IPQ score and state anxiety level. One of the possible explanations of the current findings is that our participants in general were not characterized by a "high" anxiety level that is often associated with the feeling of presence (e.g., Regenbrecht, Schubert and Friedmann, 1998). Another explanation of the absence of a relationship is that the virtual environments applied in this study were rather relaxing (a virtual scenario consisting of a tropical beach) than stressful (Alsina-Jurnet et al., 2011).

Although VR is not yet extensively used in the clinicians' daily practice, it has been demonstrated to have tremendous potential for the diagnosis and treatment of mental health problems (Freeman et al., 2017). There is every reason to believe that virtual reality will move from the category of experimental diagnostic methods to everyday practice: using VR, you can create real life situations that standardize psychological examination, making it more reliable. Despite the skepticism of representatives of the "traditional school", VR will be distributed in psychotherapy, as there are already scientific studies that confirm the effectiveness of its use. The question of how exactly VR facilitates the clinical change is still open: a discussion is ongoing with the first view that immersion into VR has significantly affected the emotional state of the personality and the alternative view that this was rather driven by personal features that affect the dependency on it.

Virtual reality has postulated itself as a new effective technique that can be applied for the study, diagnosis, prevention, and treatment of various mental health issues. Additionally, its application has recently been extended to reducing negative states in healthy individuals. The current results allow us to conclude that VR can be effectively used to improve the mental well-being and quality of live, in general. Altogether this would lead to promotion of the harmonious development of the personal as well as its potential (Berberyan, 2021). In future, to enable wider application of VR, systematic research should be carried on issues including methodology, technical equipment, preparation of participants for entry into the virtual environment before the start of the study to exclude mental health risks. This would contribute to

the development and implementation of this unique latest technology in the theory and practice.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, A.S.B.; methodology, A.S.B., H.S.B. and I.A.J.; software, A.S.B. and I.A.J.; formal analysis, A.S.B. and H.S.B.; resources: A.S.B., writing—original draft preparation, A.S.B.; writing—review and editing, A.S.B., H.S.B. and I.A.J.. All authors have read and agreed to the published version of the manuscript.

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