

Effectiveness of Virtual Reality Therapy on Emotional Exhaustion and Quality of Work Life of Employees with Occupational Stress

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Abstract

Introduction: Stress directly correlates with job satisfaction and employee performance and affects people's health, safety, and quality of work life (QWL). The present study aimed to investigate the effectiveness of virtual reality therapy (VRT) on emotional exhaustion and the QWL of employees with occupational stress (OS).

Methods: This is a semi-experimental study with a pre-test and post-test design, control group, and follow-up. The statistical population included all employees with OS working in public organizations of Isfahan in 2021. The study sample consisted of 30 employees with OS, who were selected using convenience sampling and randomly assigned to the VRT and control groups. The VRT group attended eight 20-minute intervention sessions, whereas the control group did not receive any intervention. The participants completed the Emotional Exhaustion Questionnaire (EEQ) and Quality of Work Life Questionnaire (QWLQ) in three stages. The collected data were analyzed using repeated measures ANOVA in SPSS 26.

Results: The results indicated that the VRT reduced emotional exhaustion and improved the QWL of the employees with OS ($P < 0.001$), and these effects remained stable during the follow-up ($P < 0.001$).

Conclusion: In this research, we found that the QWL of the employees with OS improved by using VRT. Accordingly, organizations can improve mental health and reduce OS in their employees by holding VRT courses.

Keywords: Virtual reality, Quality of work life, Stress, Emotions

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Introduction

With the acceleration of global economic integration, competition among companies is intensifying, and rapid production ultimately increases the pressure on employees and causes various mental health problems (1). Stress is a state caused by an environmental change that is considered a damage, challenge, or threat to the dynamic balance of a person. In this state, a real or imaginary imbalance occurs between the person's ability to meet the needs and demands of the new situation (2, 3). Accordingly, occupational stress (OS) is also considered an imbalance between the needs of the workplace and the individual's adaptability (4). OS is an important organizational problem across the world (5). For example, the cost of OS in the United States and Europe is approximately \$ 300 billion and € 20 billion per year, respectively (6). Adequate

stress is naturally beneficial and can motivate people to work harder, while excessive and long-term stress negatively affects the physical and mental health of employees (7).

If the job stress is too much, it can reduce the quality of work life (QWL) of the employees by threatening the organizational goals (8). Today's organizations, with a strategic view of human resources, consider it as an intelligent and valuable asset and pay more attention to improving the quality of life in both work and family dimensions of employees (9). QWL refers to employees' satisfaction with the fulfillment of their needs through resources, activities, and results obtained from participation in the workplace. It is a concept that shows the balance between an individual's personal and professional life (10). QWL also contributes to the creation of job satisfaction, improved productivity, adaptation, and

effectiveness of the organization. Improving the QWL will reduce absenteeism, workplace accidents, job dissatisfaction, and job abandonment (11). Bakhshi et al. (12) demonstrated a significant correlation between QWL, occupational stress (OS), and burnout

The frequency of interaction with customers in service-related jobs, which require significant interactions between employees and customers, results in emotional exhaustion (EE) (13). EE is defined as a psychological response in the form of a non-personal reaction to the recipient of services and a feeling of decline in incompetence and success at work, or as a condition accompanied by poor work performance and mental health. Workplace anxiety is a common symptom of EE (14, 15). This state is often exacerbated when people are desperate or angry with themselves, such as when they feel they cannot serve customers or the organization with the same enthusiasm they had before (16). EE is related to the mental health, productivity, and performance of employees. Therefore, getting familiar with mental pressures, and recognizing, preventing, and overcoming EE play a significant role in improving not only mental health but also the effectiveness, productivity, and performance of the workforce (17).

VRT is fully acknowledged by the psychology community as a new approach to stress management and treatment. These 3D virtual worlds have no boundaries and can be created and manipulated according to the will, imagination, or needs of their designers (18). The two main features of virtual reality (VR) are immersion and presence. The sense of presence, in particular, is a critical factor that improves the learning outcomes and encourages learners to better explore relevant learning (19). VR technology can offer a new experience of being in another place in a moment and can be used as a relaxing tool to manage workplace stress (20). New studies revealed that nature-based experiences, such as being exposed to natural light, seeing live plants, and listening to the sounds of nature can improve OS and performance (21). The findings of El-Qirem et al. (22) showed the importance of integrating VRT as an effective intervention to minimize stress and anxiety and improve physiological activities.

VR assists people in the self-management of healthcare. Moreover, VR users can perform significantly better when virtual and real-world latencies are matched (23). Ioannou et al. (24) found that VR intervention had a significant effect on anxiety and depression. Kim et al. (25) reported that VR and biofeedback were able to significantly reduce stress and change physiological parameters,

including heart rate variability in highly stressed people. Martingano et al. (26) observed that VR improved emotional empathy. Frost et al. (27) found that virtual immersion in nature could significantly reduce negative emotions. The fact that no studies have been conducted about the effects of modern VRT on OS among employees in Iran shows the importance of the present research. Therefore, based on the issues outlined above, the main objective of the current study was to investigate the effectiveness of VRT on EE and the quality of work life of employees with OS.

Methods

The study method was semi-experimental with pre-test, post-test, control, and one month follow-up. The statistical population included all employees with OS in the public organizations of Isfahan in 2021. The study sample consisted of 30 employees with OS, who were selected using convenience sampling and randomly assigned to the VRT (n=15) and the control group (n=15). The VRT group attended eight 20-minute intervention sessions, whereas the control group did not receive any intervention. The inclusion criteria were employed in the organization, a low score on the Occupational Stress Questionnaire (OSQ), and willingness to participate in the research. The exclusion criteria were not being willing to participate in the research, taking parallel psychological or psychiatric treatment, and missing more than two treatment sessions.

Instruments

Emotional Exhaustion Questionnaire (EEQ):

The EEQ includes 9 items and the EE subscales developed by Maslach and Jackson (28). Participants rated their agreement on a five-point Likert scale ranging from 5, "completely disagree," to 1, "completely agree." The total score on the EEQ ranged from 9 to 45. Moalemi et al. (29) reported a Cronbach's alpha of 0.85 for the EEQ.

Quality of Work Life Questionnaire (QWLQ):

The QWLQ was developed by Walton (30). It has 34 items scored on a five-point Likert scale (1 "very little" to 5 "very much") and examines eight different dimensions of QWL: adequate and fair wages, safe and healthy environment, opportunities for continuous growth and security, legalism in the organization, human capabilities, social integration/cohesion, overall life atmosphere, and social dependence of work life. The minimum and maximum scores on QWLQ were 34 and 170, respectively. Khaksari et al. (31) reported a Cronbach's alpha of 0.88 for the QWLQ.

Procedure

Based on the screening results and inclusion/exclusion criteria, the participants were assigned to the VRT and control groups. A pretest was taken by all the participants. Then, the experimental group attended eight 20-minute weekly VRT sessions using the software prepared in this research and an independent virtual reality headset, whereas the control group did not receive any treatment. Table 1 summarizes the intervention sessions.

Statistical Analyses

The collected data were analyzed using mixed variance analysis together with repeated measures and the Bonferroni post-hoc test in SPSS-27.

Results

The chi-square test was used to compare the findings related to the demographic indicators. As shown in Table 2, there were no significant between-group differences in gender, marital status, and age of

the employees. Descriptive statistics (Table 3) also indicated that the mean post-test and follow-up scores of the VRT group in EE decreased compared to their pre-test scores, whereas their mean score for QWL increased compared to that of the control group.

The two assumptions of homogeneity of variances and normality of distribution of the scores were examined before performing mixed variance analysis. The results of Levene's test were used to examine the assumption of homogeneity of variance. The results for EE ($F=1.63$, $P=0.211$) and QWL ($F=1.39$, $P=0.248$) confirmed the homogeneity of the variance in the VRT and control groups. The Shapiro-Wilk test results confirmed the normality of the distribution of the scores for EE ($W=0.952$, $P=0.186$) and QWL ($W=0.946$, $P=0.132$). ANCOVA was used to investigate the intergroup effect by controlling the effect of the pre-test on the post-test and follow-up of the dependent variables. The results showed a significant between-group difference in EE ($F=243.36$, $P=0.001$) and QWL ($F=118.02$, $P=0.001$) after removing the pre-test effects.

Table 1: A summary of virtual reality therapy sessions

Session	Content	Topics
1	Acquainting the participants with VRT	Acquainting the participants with VRT, relaxation training and pretest presenting the pre-test
2	Acquainting the participants with and teaching them VRT	Practicing breathing skills, thought-stopping techniques and the rational invalidation of thoughts, presenting assignments and answering the related questions, understanding VRT hardware and learning how to use it
3	Running the software	Running virtual reality simulator of sea and beach
4	Running the software	Running virtual reality simulator of forest and waterfall
5	Running the software	Running virtual reality simulator of nature
6	Running the software	Running virtual reality simulator of sea and beach for the second time
7	Running the software	Running virtual reality simulator of forest and waterfall for the second time
8	Running the software	Running virtual reality simulator of nature for the second time

Table 2: Demographic variables of the participants

Variables		VRT group	Control group	P
Mean (SD) age (years)		36.72 (8.65)	38.61 (7.55)	0.529
Marital status	Single	4 (26.67%)	7 (46.67%)	0.200
	Married	11 (73.33%)	8 (53.33%)	
Gender	Male	6 (40.0%)	9 (60.0%)	0.193
	Female	9 (60.0%)	6 (40.0%)	

Table 3: Mean (SD) of emotional exhaustion and quality of work life in experimental and control groups

Variables	Phases	VRT group	Control group
		Mean (SD)	Mean (SD)
Emotional exhaustion	Pre-test	36.53 (3.96)	34.73 (3.15)
	Post-test	22.20 (2.88)	35.06 (2.89)
	Follow-up	21.13 (2.69)	35.13 (2.87)
Quality of work life	Pre-test	85.26 (6.73)	88.06 (4.04)
	Post-test	123.46 (6.63)	87.66 (4.49)
	Follow-up	125.46 (6.27)	87.53 (4.50)

Table 4: Repeated measurement results for the effects of time and interaction time and group

Variable	Source	SS	df	MS	F	P	η^2
Emotional exhaustion	Time	1055.00	1.09	963.41	172.50	0.001	0.86
	Time \times group	1165.08	1.09	1063.94	190.50	0.001	0.87
	Error	171.24	30.66	5.58			
Quality of work life	Time	7514.42	1.02	7311.65	224.32	0.001	0.88
	Time \times group	7884.28	1.02	7671.53	235.36	0.001	0.89
	Error	937.95	28.77	32.559			

Table 5: Results of pairwise comparison of the emotional exhaustion and quality of work life

Variables	Phases	Mean difference	SE	P
Emotional exhaustion	Pre-test - Post-test	7.00	0.53	0.001
	Pre-test - Follow-up	7.50	0.55	0.001
Quality of work life	Pre-test - Post-test	-18.90	1.29	0.001
	Pre-test - Follow-up	-19.83	1.28	0.001

The results also indicated a significant between-group difference in the follow-up scores of EE ($F=283.44$, $P=0.001$) and QWL ($F=143.05$, $P=0.001$) after removing the pre-test effects.

Further, to examine the persistence of the therapeutic effect, the repeated measures ANOVA and post-hoc test were used for the intergroup factor in the measurement stages. The results of the repeated measures ANOVA confirmed the difference between three inter-group measurements for the EE ($F=172.50$, $P=0.001$) and QWL ($F=224.32$, $P=0.001$) variables. Table 4 shows the mutual effect of time with the group in EE and QWL.

The Bonferroni post-hoc test was used for the pairwise examination of significant differences between the measurement stages of the dependent variables. Table 5 shows a significant difference between the mean pre-test, post-test, and follow-up scores of EE and QWL ($P<0.001$). Therefore, it can be said that VRT reduced the feeling of exhaustion and improved the QWL of the employees with OS. In addition, the effects of VRT persisted during the follow-up.

Discussion

The present study aimed to investigate the effectiveness of VRT on EE and the QWL of employees with OS. The results indicated that the VRT intervention in both post-test and follow-up stages reduced the feeling of exhaustion and improved the QWL of the employees with OS.

The findings on the effectiveness of VRT in improving EE are consistent with those reported by Bodet-Contentin et al. (32). To explain this finding, it can be said that VRT provides an opportunity to simulate nature scenes, immerse the user in its

environment, and distract people's attention from the stressful factors resulting from the treatment. Natural environments have a considerable restorative potential compared to other environments because they require greater activation of involuntary attention. These restorative effects of nature scenes can increase relaxation, reduce mental fatigue, and improve cognitive performance and attention (33). By putting employees in a situation with less stress, but similar to the real world, VRT provides conditions so that a person can easily operate in the situation and present his/her behavior and speech freely and not be afraid of blame. Perhaps the main advantage of VRT is that employees know that the computer-generated environment is not real, but their brains and body believe that it is real. Therefore, people in real life can more easily face difficult situations, are able to try new treatment strategies, and transfer this learning to the real world (22).

Since EE is associated with feelings of helplessness and despair, VRT can simulate less-stressing real-world conditions, where an employee can easily operate and present his/her behavior and speech freely without being afraid of being reproved by colleagues and managers. Perhaps it is the greatest advantage of VRT that although people know the environment created by the computer is not real, their brains and bodies still believe they are (34). Therefore, VRT facilitates control over emotions that enable dealing with negative emotions and feelings of helplessness and improve EE in employees through such techniques as imaging.

These findings are consistent with those reported in the study by Ioannou et al. (24) regarding the effectiveness of VRT in improving the QWL. To explain this finding, it can be said that VRT exposure

training can improve occupational well-being and QWL of employees proportional to their OS. VRT is one of the technologies that has come a long way in safety education and may add a variety of benefits compared to traditional training programs. Virtual reality allows companies to train employees to perform safety measures and high-risk operations in a safe and controlled environment. Moreover, VRT is a new technology that provides high-quality 3D images on its sensor. The sensor only relies on body movements and voice commands, which makes it more attractive for the user. Therefore, virtual reality has provided this opportunity, so that employees can focus on the task completely without any intermediary, regardless of their surrounding conditions in the simulated environment. By using sedation of employees suffering from OS before every exposure to VR, their anxiety level will decrease, which can improve the quality of work life (23).

In particular, VRT exposure training can enhance the ability and capability for mental imaging of work situations, which allows a better understanding of OS by obtaining enriched mental imagery. In other words, it enables the employees to obtain a broader psychological and occupational perspective (24). VRT can induce effects similar to those of real nature. Natural experiences, such as exposure to natural light, seeing live plants, and hearing nature sounds have a positive effect on improving OS and even occupational performance (34). In other words, it can be very encouraging by relieving workplace stressors and increasing the balance between professional and personal life, which is a key element in the QWL. Virtual simulation of real life facilitates confrontation with difficult situations and allows for using new strategies and transferring this learning to the real world, which provides an opportunity for employees to experience relaxing conditions.

Limitation

One of the most important strengths of this study was the attractiveness of VRT sessions for the participants. Thus, during the treatment sessions, burnout and fatigue were not observed in the participants. The short duration of treatment sessions compared to other psychotherapy interventions can also be considered a strength of this treatment program. Among the limitations of the study is that it was performed on the employees of a public organization, which necessitates greater caution in the generalizability of its results. Lack of access to software and hardware facilities and their high costs were other limitations of the present study. Moreover,

it used a self-report questionnaire to measure the OS of the employees, so it is recommended that other tools should be used to assess the stress levels of employees such as the use of heart rate and blood pressure.

Conclusion

Based on the findings of our study, VRT reduces the feeling of exhaustion and improves the QWL of employees with OS. In addition, it has persistent effects. Overall, VRT exposure therapy has the potential to greatly increase the provision of treatment for mental health disorders. Therefore, organizations can improve mental health and reduce the OS of their employees by holding VRT courses taught by experienced psychologists.

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Ethical Approval

The written consent was obtained from all participants. The Ethics committee of Islamic Azad University-Isfahan (Khorasgan) Branch approved the present study (code: IR.IAU.KHUISF.REC.1399.128).

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