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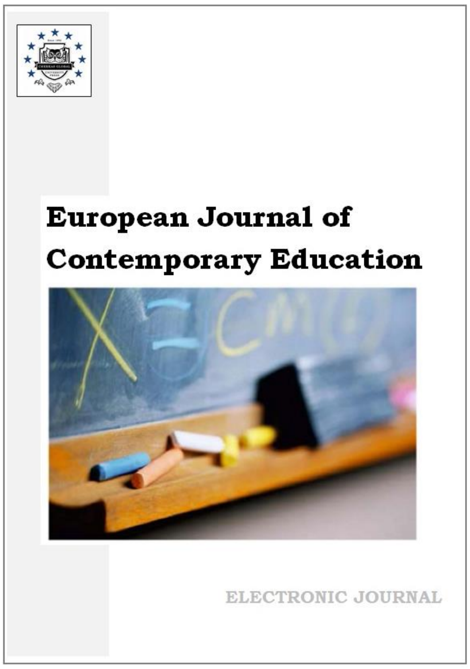


# Using Virtual Reality Techniques to Alleviate Cognitive Fatigue in Graduate Students Working while in College

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**Abstract**

Purpose: The purpose of this paper is to study the possibility of using virtual reality (VR) techniques to reduce cognitive fatigue (CF) in graduate students who work while in college.

Methods: A set of questionnaires standardised in Russia was used to assess CF and performance. The participants completed a VR program using a head-mounted VR headset. One stimulating and one relaxing scene, each lasting maximum 10 minutes, were played. The participants included 62 women and 24 men aged 22-53 years old who were graduate students studying psychology and pedagogy and working while in college. They participated in the study in the interval between the end of their working day and before the start of their evening classes.

Results: After first watching an exciting scene and then a relaxing scene, the participants in the experimental groups reported significant changes in their states relative to the control group. Acute CF, general fatigue, tiredness and monotony decreased. The women in particular reported a decrease in their level of psychological stress. Conversely, after watching a relaxing scene followed by a stimulating scene, men experienced a decrease in acute physical fatigue, tiredness and cravings. Women experienced a decrease in acute mental fatigue, acute physical fatigue, general fatigue and psychological stress.

Conclusions: A single immersive VR session experienced in the interval between the end of work and before the start of classes can decrease general fatigue and monotony in humans, as well as reduce acute mental fatigue or physical fatigue (depending on the sequence then a relaxing VR – scene).

**Keywords:** balancing study and work, cognitive fatigue, efficiency, functional state, virtual reality.

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## 1. Introduction

In the modern world, achieving success is often associated with having a busy schedule, which may include working while completing a college degree. Pursuing higher education is often a prerequisite for career growth, and master's degrees are highly sought after in Russia for this reason. People of different ages, including those who have reached retirement age, can take college classes to obtain a master's degree. Most graduate students work during the day and take college classes in the evening. This inevitably leads to fatigue, which, if left untreated, can lead to chronic fatigue syndrome. It is therefore urgent that we identify ways to reduce fatigue in graduate students working while in college. The exploration and use of the latest technological advancements, including virtual reality (VR), is especially relevant to this search.

### Cognitive fatigue and performance

Mental or cognitive fatigue (CF) is characterized as a decrease in cognitive resources which develops over time due to constant cognitive demands. It is defined as a decrease in activity, alertness, orientation and executive attention. Chaudhuri and Behan (2000) proposed that such fatigue occurs due to a malfunctioning within the basal ganglia affecting the striatal–thalamic–frontal cortical system. CF is an unpleasant phenomenon, affecting both physical (McMorris, 2020) and mental (Holtzer et al., 2020) performance. Like tiredness, it occurs because of intense or prolonged work. It causes a decrease in performance of and non-specific changes in physiological functions and in several subjective sensations, the amalgamation of which is described as a feeling of fatigue (Santos et al., 2016).

Fatigue is a complex biological phenomenon which occurs depending on the time of day, workload, health and a lifestyle balance between free time and work (Caldwell et al., 2019). Prolonged activity in a state of fatigue leads to decreased immunity and accelerated biological aging of the body (Rybtsova et al., 2020; Berezina et al., 2020). Long-term life events associated with increased stress can also lead to the onset of chronic fatigue syndrome, a disease associated with a highly coordinated hypometabolic response to environmental stress, and short-term CF has been found to contribute to declines in performance (Schmaling, Patterson, 2019; Prins et al., 2006; Simon et al., 2020).

The level of work fatigue an individual experiences depends, to an extent, on his or her profession (Berezina, 2020). Physically demanding jobs, performed over long stretches of time, can contribute to severe fatigue and negatively affect human health (Holtermann et al., 2012). Increased fatigue also occurs in intellectually demanding jobs, jobs with extensive responsibilities and jobs which disturb the circadian rhythm, which results in accumulated sleep deprivation. It is known that fatigue causes workers to make more errors and renders them prone to accidents, some of which are lethal (Sadeghniiat-Haghighi, Yazdi, 2015).

The increased mental load associated with studying can also lead to fatigue and thus negatively affects health and overall efficiency. All over the world, university students are increasingly taking on paid work while attending school full-time. One recent study conducted in the Republic of Ireland found that more than two-thirds of undergraduate nursing students hold part-time jobs, working an average of 15 hours per week; many of these individuals are non-traditional students, have children or joined the workforce later in life. The authors mentioned that non-traditional students are more likely to feel the positive effects of incorporating education into their workday, including increased self-confidence, improved skills and a deeper understanding of field-related problems (Clynes et al., 2020; Hasson et al., 2013).

However, despite the positive social aspects and better future life prospects, the combination of work and study can lead to exacerbate fatigue (Manouchehri et al., 2017). In Australia, an online survey was carried out to gauge the problems of students who work while in college: more than 66 % of the respondents reported that the demands of work interfered with their college performance. They complained of increased fatigue and the difficulties caused by having to balance work and study. A lack of confidence in discussing health and safety issues with employers and unfair pay were also stressors (Thamrin et al., 2019).

### Restoring performance and alleviating fatigue.

A significant number of techniques have been developed to alleviate fatigue in people engaged in long, hard, stationary, or monotonous work. Traditionally, when organizing work hours to limit the risk of fatigue, a prescriptive approach involves setting maximum shift lengths to prevent the excessive accumulation of fatigue and the associated increased risk. This approach also sets minimum break times to ensure adequate rest and recovery time during and/or between shifts. Researchers have developed special approaches based on risk management, using formulas and various procedures to calculate and regulate fatigue (Honn et al., 2019). Researchers have also proposed specific training programs to reduce workers' fatigue, including advice on self-control, breaks, workstation setup and exercise. There are workout options for doing gradual resistance exercises in the gym, while other physical exercises can be performed in the workplace using elastic bands (Santos et al., 2016).

An interesting direction in the correction of functional states is the use of the latest VR techniques. Currently, VR techniques are widely used to help people with a variety of conditions. For instance, they can help reduce cancer patients' pain levels through immersion in a colourful virtual world, offering a distraction (Ioannou et al., 2020). VR techniques are also used to correct depressive and phobic states (Riva, 2020). Evoking positive emotions and reducing negative emotions in patients is the goal of immersive VR sessions (Pallavicini, Pepe, 2020). Stimulating virtual games are used in which participants find themselves not only in a new reality but also able to interact with it by moving their head or their arms (Cieślik et al., 2020).

The use of VR techniques can reduce fatigue caused by monotonous activities (Hirota et al., 2019), to restore performance and to improve and regulate emotional states. There are two approaches to using VR techniques to improve participants' emotional states. The first is 'relaxing VR', a technique based on classical relaxation methods such as progressive muscle relaxation, autogenous training, yoga and meditation. In this approach, participants are usually shown an environment which can help them feel safe (Villani et al., 2017). Relaxing virtual environments usually contain pleasant, peaceful landscapes such as islands, parks, gardens and other open spaces, which can reduce stress and anxiety (Annerstedt et al., 2013). The second approach, 'active VR', includes quests, competitions, races and puzzles. These programs are used to empower participants or help them regulate their emotions. For example, using a VR technique which simulated job interview situations showed that after five weeks of training, participants were able to better manage their emotions and felt less stressed (Riva, 2020). This approach is also used to treat stress-related disorders, including post-traumatic stress disorder, pathological grief and adjustment disorders. To achieve therapeutic outcomes, several emotionally charged virtual scenes are used in which participants are prompted to actively resist the world around them while undergoing both positive and negative simulated experiences (Baños et al., 2011).

The most effective VR technique is the combined approach, which incorporates different VR scenes. For example, Pizzoli proposed using personalised VR state correction techniques, which are developed using preliminary research on a subject's relevant life events to identify the distinctive perceptual features of personal memories and experiences (Pizzoli et al., 2019). These VR techniques combine both relaxing and stimulating VR programs. Maples-Keller and others used VR-based exposure therapy, which combines relaxing and stimulating VR scenes (Maples-Keller et al., 2017). Maples-Keller et al. (2017) noted that many such treatments include relaxation strategies during the introductory period (such as breathing relaxation or cognitive restructuring) and subsequent VR treatment strategies.

The purpose of this study is to evaluate the efficacy of using VR techniques to alleviate cognitive fatigue in graduate students who study and work. The scientific task test the impact of two different VR modes. The first mode was a stimulating VR programme, followed by a relaxing one. The second mode was a relaxing VR programme, followed by a stimulating one. We hypothesised that the first VR mode would reduce acute mental fatigue, while the second VR mode would reduce acute physical fatigue.

## 2. Materials and methods

The participants were 86 graduate students (aged 22-53 years old) who work during the day and take college classes in the evening. There were 62 women and 24 men.

The participants were randomly selected for either the experimental or the control groups. The first experimental group was formed, the second experimental group and the third group – the control.

The first experimental group included 36 participants (24 women and 12 men), who first watched the stimulating scene (3-5 minutes), followed by the relaxing one (3-5 minutes).

The second experimental group comprised 14 people (10 women and 4 men), who first watched a relaxing VR scene (3-5 minutes), followed by a stimulating one (3-5 minutes).

The third group was the control group; she included 36 participants (28 women and 8 men). The gender distribution in the sample corresponds to the distribution in the general population of teachers in Russia. The students were studying either psychology or pedagogy, and most worked in the field of education (schools, kindergartens, etc., or administrative work).

To diagnose the students' functional states, the following diagnostic methods (standardised in Russia) were used:

1. The differentiated assessment of states of reduced performance (DASRP) technique was developed by A.B. Leonova and S. B. Velichkovskaya. DASRP is a modified version of the BMS-II test developed by German psychologists H. E. Plath, G. Richter to assess the severity of work of workers of different types (Richter, 2000). The participants were offered several statements characterising feelings and sensations which they may experience during their work (for example, 'work gives me pleasure') and were asked to note the degree of each feeling and sensation as they experienced it. The DASRP technique includes 4 scales designed to assess declines in performance from different perspectives.

Scale #1: General fatigue. This is a condition caused by excessive stress, which manifests in a decrease in productivity.

Scale #2: Monotony. This is a functional state of reduced performance which arises in situations of monotonous work which involves repetitive, strenuous or onerous actions on a daily basis.

Scale #3: Satiety. This is a psychological state of reduced performance caused by monotonous, low-intellectual-content activity which does not interest or engage participants.

Scale #4: Psychological stress. This is a state of decreased performance due to an intense nervous overstrain, which can be caused by a wide variety of experiences.

Scores of up to 15 points were considered indicative of mild stress; scores ranging between 16–25 points were considered indicative of moderate stress (the fatigue and monotony scales); and scores within 17-24 points (the satiety and stress scales) indicated a high level of stress and/or fatigue.

2. Survey for acute mental fatigue. This technique is designed to assess the degree of mental fatigue which develops during one working day in people whose work is related to processing information. It contains 18 statements characterizing various manifestations of mental fatigue, including a decrease in general performance, specific impairments of sensations and perception, cognitive discomfort and changes in the emotional-volitional regulation of activity and social contacts. Scores of up to 9 points were considered indicative of negligible fatigue; scores from 10-15 points were considered indicative of mild fatigue; and scores from 16-28 points were considered indicative of moderate to severe mental fatigue.

3. Survey for acute physical fatigue. This technique is designed to determine the degree of acute physical fatigue which develops during one working day. The survey consists of 18 short statements which cover the direct symptoms of physical discomfort, mental instability and mental exhaustion, as well as emotional-motivational assessments. Scores of up to 10 points were considered indicative of negligible physical fatigue; scores from 11-17 points were considered indicative of mild fatigue; and scores from 18-25 points were considered indicative of moderate to severe fatigue.

4. The VR techniques were implemented using a stand-alone Oculus Quest 64 GB VR headset. Participants were shown two immersive VR videos intended to increase their personal interest in their evening classes. The first scene was a stimulating one, lasting 3-5 minutes. Participants were asked either to drive a vehicle along a changing route or to take part in a game which required them to hit moving targets, which in turn could hit them. The next video, which also lasted 3-5 minutes, was relaxing, pairing beautiful landscapes with calming music.

5. Statistics. A One-way Analysis of Variance (ANOVA) with sigma transformation was used to assess the reliability of the effect of VR on the participants' mental state. The effect of the VR was considered an independent variable. There were two groups: the first was the control group (the participants who were not exposed to VR) and the second was the experimental group of participants (those who were exposed to VR in the interval between the end of their work and the beginning of their classes).

The dependent variable was the difference in the participants' mental state (fatigue, monotony, satiety, psychological stress, acute mental fatigue, acute physical fatigue, chronic fatigue). Two evaluations for each participant from both the experimental and the control groups were obtained. The first evaluation was obtained before the start of a college class in the classroom. After that, the participants in the control group remained in the classroom to discuss the organisational issues of their studies, and 10 minutes later the class began. The participants in the experimental group went to a nearby auditorium and watched VR videos; afterwards they returned to the classroom and joined the class. The second evaluation was obtained in the classroom half an hour after the start of the college class with all of the participants (both the control and experimental groups).

### 3. Results

We evaluated the dynamics of the functional states of participants in the control and experimental groups before they started their college classes (first evaluation) and after the college class began (second evaluation). The results are presented in Table 1.

**Table 1.** Dynamics of the students' functional state before and after beginning their college class

| | Acute Mental Fatigue | General Fatigue* | Monotony* | Satiety* | Stress* | Acute Physical Fatigue |
|---|---|---|---|---|---|---|
| First evaluation in control group | 17.1 | 19.2 | 18.6 | 19.6 | 19.5 | 10.4 |
| Second evaluation in control group | 19.2 | 20.8 | 20.5 | 20.1 | 20.1 | 12.4 |
| First evaluation in first experimental group | 16.1 | 19.0 | 19.5 | 19.8 | 20.1 | 10 |
| Second evaluation in first experimental group | 15.3 | 18.5 | 18.6 | 19.1 | 18.3 | 11.2 |
| First evaluation in second experimental group | 24.4 | 22.3 | 20.0 | 21.5 | 23.5 | 14.4 |
| Second evaluation in second experimental group | 21.3 | 20.2 | 21.4 | 23 | 22 | 12.5 |

* DASRP

The first evaluation of fatigue, acute physical and mental fatigue, monotony, satiety and psychological stress for the control and experimental groups produced moderate scores (Table 1). The second evaluation of the participants in the control group showed a mostly insignificant increase in these indicators, but these remained in the range of moderate values. In the experimental groups, however, most of the fatigue values in the second measurement tend to decrease (that is, the subjects' condition improves), these scores were also in the moderate range. Differences in absolute values between the first and second evaluations for all parameters were not statistically significant. We further analyzed the data by comparing the differences in the dynamics of the functional states of the students in the experimental groups and those of the control group. The results of this analysis are presented in Tables 2 and 3.

Tables 2 and 3 represent the results for the first experimental group, who watched the stimulating scene first followed by the relaxing one.

**Table 2**. The first and second evaluations of fatigue parameters in the female participants after watching stimulating then relaxing videos

| Parameter | Experimental Group† | Control Group† | F | *P* |
|---|---|---|---|---|
| Acute mental fatigue | 1.45833 | -2.55172 | 6.5945 | .01320 |
| General fatigue* | 0.87500 | -2.06897 | 9.0345 | .00410 |
| Monotony* | 0.87500 | -1.68966 | 9.0486 | .00408 |
| Satiety* | 0.91667 | -1.00000 | 1.8446 | .18039 |
| Stress* | 2.458333 | -0.965517 | 10.654 | .00196 |
| Acute physical stress | -1.00000 | -2.21739 | 1.0046 | .32350 |

* DASRP

† Average difference between the first and second evaluations

The data presented in Table 2 indicate that all of the fatigue parameters increased in the female graduate students in the control group. Negative values mean that the first evaluation values were lower than those reported during the second evaluation. The second evaluation revealed that the values for the fatigue parameters reported by the experimental group following VR training decreased, as represented by the positive values of the differences (Table 2). The values for acute mental fatigue, DASRP fatigue (decreased performance), feelings of monotony and psychological stress were statistically different between the experimental and control groups (P < 0.05). There were no differences in evaluations of satiety and acute physical fatigue between the experimental and control groups ($P > 0.05$; see Table 2).

**Table 3.** The first and second evaluations of fatigue parameters in male participants after watching stimulating then relaxing videos

| Parameter | Experimental Group† | Control Group† | F | *P* |
|---|---|---|---|---|
| Acute mental fatigue | 1.666667 | -0.500000 | 8.3342 | .00982 |
| General fatigue* | 2.833333 | 0.000000 | 7.1017 | .01578 |
| Monotony* | -0.00000 | -2.50000 | 3.8028 | .06692 |
| Satiety* | 0.500000 | 1.000000 | 50233 | .48756 |
| Stress* | -0.333333 | 0.500000 | 43902 | .51599 |
| Acute physical fatigue | -0.66667 | -1.00000 | 22857 | .64538 |

* DASRP

† Average difference between first and second evaluations

The dynamics of the fatigue parameters for the male graduate students were similar to those of the female students. They also experienced more fatigue during their college class, but in the male control group some of the fatigue parameters had improved by the time of the second evaluation. Psychological stress and satiety decreased, while fatigue levels, as determined by the DASRP method, did not change. Nevertheless, VR training significantly improved the fatigue parameters in the experimental group compared to those of the control group. The acute mental fatigue and DASRP fatigue were statistically different between the experimental and control groups ($P < 0.05$), although there were no differences between the control and experimental groups in the evaluations of feelings of monotony, psychological stress, satiety and acute physical fatigue ($P > 0.05$).

In the second experiment we used the same VR scenes, but participants watched a relaxing scene first, followed by a stimulating one. The results are presented in Tables 4 and 5.

**Table 4.** The first and second evaluations of fatigue parameters in female participants after watching relaxing then stimulating videos

| Parameter | Experimental Group† | Control Group† | F | *P* |
|---|---|---|---|---|
| Acute mental fatigue | 3.70000 | -2.55172 | 10.468 | .00256 |
| General fatigue* | 2.40000 | -2.06897 | 10.208 | .00286 |
| Monotony* | -0.60000 | -1.68966 | .77300 | .38497 |
| Satiety* | -0.90000 | -1.00000 | .00722 | .93273 |
| Stress* | 1.900000 | -0.965517 | 13.957 | .00063 |
| Acute physical fatigue | 1.80000 | -2.21739 | 7.5558 | .00988 |

* DASRP
† Average difference between first and second evaluations

In the female students, the effect of the VR scenes when the relaxing one was shown first was less pronounced than when the scenes were reversed. The VR training significantly improved the fatigue parameters (acute mental fatigue, DASRP fatigue, decreased performance, and psychological stress) of female graduate students in the experimental group compared to those in the control group. The other fatigue parameters (feeling of monotony, satiety, acute physical fatigue) were the same in the women included in both the experimental and control groups.

**Table 5.** The first and second evaluations of fatigue parameters in male participants after watching relaxing then stimulating videos

| Parameter | Experimental Group† | Control Group† | F | *P* |
|---|---|---|---|---|
| Acute mental fatigue | 0.500000 | -0.500000 | .86022 | .37552 |
| General fatigue* | 1.000000 | 0.000000 | 1.6667 | .22575 |
| Monotony* | -5.00000 | -2.50000 | .59952 | .45668 |
| Satiety* | 1.00000 | -4.50000 | 16.463 | .00230 |
| Stress* | -0.500000 | 0.500000 | .32129 | .58333 |
| Acute physical fatigue | 1.00000 | -1.00000 | 6.0000 | .04983 |

* DASRP
† Average difference between first and second evaluations

In the male students, the effect of the VR scenes when the relaxing one was shown first was less pronounced than when the scenes were reversed. The values for satiety and acute physical fatigue were statistically different between the experimental and control groups ($P < 0.05$). The other fatigue parameters were the same in the control and experimental groups ($P > 0.05$) (Table 5).

## 4. Discussion

Improving the educational environment for all categories of students is an urgent task. Graduate students who study and work find themselves in a difficult situation because of prolonged CF, which can interfere with effective learning (Koteneva et al., 2020). We studied the effect of VR training on the functional state of graduate students who work while in college. The participants of the experimental groups were immersed in VR programs for 10 minutes before the start of their college class. They watched two VR scenes. The stimulating scene was used to encourage participants to physically participate in the VR experiments. The other VR scene was relaxing. The students in the control group stayed in the classroom and discussed organisational issues with the teacher while the experimental groups viewed the VR scenes. Once the VR programme was complete the participants in the experimental groups joined the class. The first evaluation of the fatigue parameters for both the experimental and control groups was performed before the start of the class; the second evaluation was performed in the classroom during the college class.

The values for most of the fatigue parameters increased in both women and men in the control group during the college class. We used method for assessing fatigue: a classic survey. Method showed that the participants in the control group experienced an increase in fatigue during the college class, which can be explained by the fact that most of the subjects came to class immediately after work, without no rest in between. Interestingly, the participants' mental fatigue increased while their physical fatigue did not change. This can be explained by the fact that most of the participants' employment consisted of stationary mental labour—most of them work in the field of education during the day, and in the evening, they go to their graduate classes, which also require mental activity. In other words, we assume that the reason for the decline in participants' performance is cognitive rather than physical fatigue.

The VR training was designed to contrast with the participants' daily routines. Most of them lead a 'sedentary lifestyle': during the day their work requires attention and perseverance, then they go to evening classes. The commute is about one hour long. We assumed that the fatigue they experience was not associated with increased physical activity but with monotony. Therefore, to restore them to their peak working capacity, these individuals need an adventure, which in this study was presented in the form of a VR programme. The first scene was either a variant of a spaceship race, where the pilot performed aerobatics, or a snowball game, where the participant had to hit moving figures with snowballs and dodge snowballs. The participants were permitted to choose which scenario they preferred. The stimulating video allowed the subject to 'shake things up', to participate in an energetic activity which required them to move their bodies and arms. The second scenario was a relaxing scene which was designed to calm the participants down if they were overly stimulated from the first video. Most of the participants of the experimental group returned to their classroom in high spirits.

The second experimental group was offered a classic sequence of VR scenes which many authors have used to reduce stress: in this case the first scene was relaxing while the second was stimulating (Maples-Keller et al., 2017). In this group, a decrease in fatigue was also observed, but the change was less pronounced than that of the first experimental group. However, in this group there was also a decrease in acute physical fatigue, which was not evident in the first experimental group. It is most likely that the beautiful landscapes and relaxing music gave the subjects an opportunity to simply relax, which is more effective in terms of reducing physical fatigue.

## 5. Conclusion

Our research has confirmed our hypothesis. Indeed, a single immersive VR session experienced in the interval between the end of work and before the start of classes can decrease general fatigue and monotony acute in humans, as well as reduce mental fatigue or physical fatigue (depending on the sequence then a relaxing VR - scene). If the subjects are offered first an exciting and then a relaxing VR scene, then their acute mental fatigue and monotony will decrease, and if they are offered first a relaxing and then an exciting VR scene, then physical fatigue will decrease.

**Limitations**

The VR techniques we used can reduce CF, but only in people who work while in college. Our participants' work is pedagogical or clerical in nature, and they are all working on degrees in humanitarian subjects. We have not tested the efficacy of our techniques on people who work in different fields and who study scientific and other subjects. In addition, our analysis of the participants' level of CF was conducted after a single VR session; we have not studied the efficacy of the prolonged use of VR techniques.

**Advantages of our results**

We propose to present to the subjects not only separately watched or relaxing VR scenes (the effect of which is already known), but to give their various combinations. In our study, it was shown that the combination of a watched a relaxing VR scene to a greater extent reduces acute mental fatigue, and the combination of a relaxing a watched VR scene reduces physical fatigue. You can explore the effects of three VR scenes, for example relaxing, then exciting, then relaxing again. Perhaps this combination can reduce both physical and mental fatigue.

It will be promising to use our results for people struggling with increased stress.

It will be promising to use our results for people struggling with increased stress, as well as people combining several activities. Our subjects combined work during the day and study in the evening. The VR scene combinations we've studied help them reduce fatigue between work and study. However, there are other types of combinations of activities: work during the day and work in the evening, study in the afternoon and work in the evening, or work in the afternoon and family affairs in the evening. It would be helpful to develop VR programs to reduce fatigue between two different activities.

We studied the reduction of fatigue in people of mental labor who combine teaching work with teaching pedagogy or psychology. It will also be helpful to use combinations of VR videos which are effective for people who work in different fields (for example, manual labour). You can look for options for combining VR scene to help reduce physical fatigue in persons engaged in manual labor and combining it with study or some other activity.

We studied the effect of a single presentation of a VR scene. Such presentation can be useful in individual cases, on such and such important days for the subject: before the exam, or after a particularly difficult work. It is also promising to find modes of using VR scenes for prolonged use. If the effect persists with frequent use, then our proposed VR scene combinations can be offered for permanent use. It is important for people who are combining the two activities to be able to reduce fatigue every day.

**Authors' note**

This study was reviewed and approved by the Institutional Review Board of the Moscow State University of Psychology and Education and was conducted as anonymous poll in accordance with the Federal Law of the Russian Federation No. 152-FZ (27/07/206) and the Data Protection Act 2018, United Kingdom. The anonymity was that the subjects did not tell the experimenter their names and surnames, each subject was recorded under the number assigned to him in the experiment.

**Declaration of conflicting interests**

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

**Author contributions**

T.B. developed the methodology and lead the project, performed experimental work and statistical analysis, and wrote the manuscript. A.T. performed experimental work and wrote the manuscript. A.L. provided conceptual input and contributed to the discussion of the results. A.K. provided conceptual input and contributed to the discussion of the results.

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