Evaluation of the Effectiveness of Physical Education Lessons through the Mobile Application Programs on Students' Healthy Behaviors during the Pandemic

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Abstract
Objective: The aim of this study was to investigate the participation of students in physical activity to increase physical health through the application.
Design: The method of the present study was pretest-posttest.
Participants: The statistical population of this study consisted of students of Urmia University who had chosen the physical education unit virtually according to the corona pandemic. 165 students were selected by convenience sampling and then randomly divided into intervention and control groups.
Intervention: The intervention included a physical activity program in 10 workouts with body weight using a mobile application for 20 days, which was presented to the intervention group. The control group simply performed their usual programs in the physical education classes offered to them through the LMS system.
Main Outcome Measures: Students in both groups completed questionnaires on physical activity, basic psychological needs, subject vitality, depression, headache, and sleep disturbance in three stages: pre-test and one and two post-test.
Results: The results showed that physical activity through the application increased satisfaction with the basic psychological needs related to workouts. Depression, physical health problems, headaches, and sleep disturbances also decreased. The results in the control group showed that physical activity, and subjective vitality significantly reduced, while depression, headache and sleep disturbance increased.
Conclusions: It is suggested that in order to promote the physical health of students in physical education units, physical activities be performed using a smartphone with the approach of supporting basic psychological needs.

Keywords: Physical activity, Mobile phone, Headache, Sleep disturbance.

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Introduction

The World Health Organization (WHO) declared this disease a pandemic on March 11, 2020. This organization reported that this disease affects people of all ages.[1,2] It threatened the physical and mental health of people more than before. The imposed restrictions prevent people from

communicating and enjoying everyday life, resulting in a sedentary lifestyle for most people.[3] A significant increase has been reported in the incidence of physical problems, headaches, and sleep and mental health problems, such as anxiety, depression, and traumatic stress in people worldwide.[4,5] These conditions and the sudden change have affected the lifestyle of young people, especially students, as active and energetic people.[6,7] Several studies have indicated that the corona pandemic has significantly affected the educational process, academic progress, and physical and mental health of the students.[8] Based on these studies, the rate of people suffering from depression has had an upward trend since the beginning of the coronavirus and has spread widely among students.[9,10]

Depression is one of the problems affecting these students. It has been associated with sadness and lack of interest or pleasure in previous valuable and enjoyable activities. It can disrupt sleep and appetite and negatively affect people's immune systems and health. It results in tiredness and reduced concentration.[11] E-learning and the significant increase in the use of mobile phones and electronic devices after the spread of this disease have increased physical problems and discomforts, such as sleep disturbances and headaches among students.[12,13] (Since adequate sleep is essential for healthy functioning, reduced sleep time and disturbed sleep causes daytime drowsiness. Shortage of sleep and waking up in the early and late stages of sleep significantly affect learning capacity, academic performance, and neurobehavioral performance.

Sleep is a basic human need for health and physical regeneration to protect people from natural fatigue during waking hours. Many studies have revealed that the excessive use of mobile phones in these conditions has been associated with physical and mental problems and bad sleeping patterns. These behaviors cause disturbances in the circadian rhythm, decreased quality of life, and reduced productivity during the day.[14] It can also cause headaches with varying severity among people. They are considered disturbances caused by independent pathological mechanisms rather than disturbances such as migraine or tension headaches.[15] This type of headache is directly associated with psychosocial factors (anxiety, nervousness, depression, and emotional stress), demographic characteristics (gender and age), and sleep disturbance (insomnia and interrupted sleep). It can also disrupt the learning and performance of students and cause dissatisfaction and reduced psychological well-being. Therefore, physical activities are vital in creating physical and mental health during this pandemic.[16]

Regular physical activity is a significant part of a healthy lifestyle.[17] It has been considered a factor that increases mental health and well-being, especially during the corona pandemic.[18] The present study examined the role of physical activity on the psychological indicators of basic psychological needs, mental vitality, depression, headache, and sleep disturbance in students during this pandemic. According to the Self-Determination Theory (SDT),[19] all human beings have three basic psychological needs, and meeting these needs provides the conditions for improving psychological well-being and reducing negative psychological symptoms, regardless of gender, age, race, cultural and economic characteristics, and stressful situations.[18,19]

According to Ryan and Deci,[20] the need for self-determination indicates a sense of will and self-approval in one's behavior. The need for competence suggests the need to interact effectively with the environment and experience opportunities to express or develop capacities. The need for communication refers to situations in which people feel connected to others and have a sense of belonging. Based on this theory, meeting these needs leads to higher levels of behavior determination, the behavior that comes from the true self of people. Meeting these basic psychological needs facilitates personal growth and perfection. In contrast, a lack of meeting them leads to negative consequences such as inflexible behaviors, feelings of psychological insecurity, physical exhaustion, and psychological injuries such as depression.[18,21,22]

Self-determination theory claims that physical activity and exercise can effectively improve the satisfaction of a person's psychological needs when these activities provide conditions for experiencing a sense of pride from them.[23] If a person experiences their basic psychological needs met while performing physical activities, their inner motivation to act on physical activity and its continuation increases. Finally, it brings mental vitality and well-being to the person. Ryan and Frederick[24] defined mental vitality as "the experience of having positive energy in oneself." This concept includes both physical and psychological factors. When people have high mental vitality, they feel energetic. It can be considered the most general characteristic of a completely active person.[19]

Several studies have shown that mental vitality in performing physical activities is positively associated with other well-being indicators (such as life satisfaction and self-esteem) and negatively associated with disease indicators (such as emotional and physical exhaustion, stress, and depression).[25-27] Ryan and Frederick[24] stated that people's voluntary engagement in activities increases their energy and mental vitality. Saini et al.[28] indicated that mental vitality could effectively control and reduce stress during the Corona pandemic.

Previous studies have revealed that mobile applications can be a valuable and potentially effective tool to encourage people to perform behaviors related to a healthy lifestyle, such as physical activity. Nowadays, smartphones and other wearable technologies such as smartwatches and bracelets have become an integral part of people's lives, so they may be very suitable for interfering in people's daily activities. In this regard, several studies have referred to the effect of installing a pedometer[29] and fitness applications,[30] social networks,[31] and different games.[32] They have reported that many people are willing to use these applications to manage their health, but half cannot do according to these goals.

Although technology may enable people to maintain their social lives during the corona pandemic, using phones might harm people's physical and mental health. It is crucial to find a solution to reduce the negative impacts of the online lifestyle for students due to the current pandemic, the increase in sedentary lifestyles, more use of mobile phones, and the emphasis of several studies on examining and controlling its negative impacts. Therefore, the present study aims to investigate the effects of physical activity in general physical education classes using the 30-day fitness challenge application to reduce the negative impacts of long-term use of the phone, such as

headaches and sleep disturbance, to increase the indicators of satisfaction with basic psychological needs and mental vitality during corona pandemic among students in online education systems.

Material and Methods

Participants and procedure

The present study was conducted quasi-experimental research by a pretest-posttest design with an experimental group and a control group. All participants were students of different fields (agriculture, engineering, humanities and …) of Urmia University owned a smartphone running the operating systems Android 4.0 or iOS 8.0 or higher. Before starting the program, the researchers met four general physical education instructors at Urmia University and shared the goals and process of the study. Participants were recruited through took the online courses of physical education unit during the COVID-19 pandemic. The initial sample recruited for this study using an Available and purposeful sampling method encompassed 220 participants (63.64% female), aged 19–28 years (M = 21.23 ± 3.15 years).

Eligible participants gave their written consent to participate in the study after they were informed about its aims and procedures. The exclusion criteria were: having a medical condition impeding physical activity for exercise and/or being unable to comply with the entire intervention (where applicable). Participants were also excluded by getting coronavirus After applying exclusion criteria, the final sample of the study, divided two groups randomly by instructors, which comprised 75 participants in the smartphone app intervention group (45 females; M = 21.68 ± 3.23 years), and 90 in the control group (60 females; M = 21.23 ± 3.15 years).The participants of the two groups followed the program to the end of the intervention.

Two instructors were assigned to each experimental and control group randomly by researchers. The instructors of each group (2 instructors) were in contact with the participants via a group they created on WhatsApp to follow the programs, guide the students, and provide the questionnaires to them. Before starting the physical activity program, the participants completed the Time 1 questionnaires (physical activity, basic psychological needs, subjective vitality, depression, headache, sleep disturbance, and demographic characteristics). Then, the physical activity programs were provided to the participants in the intervention group. The workouts were performed every other day. After five workouts (Day 10), the Time 2 questionnaires (basic psychological needs, subjective vitality, and depression) were completed by the participants. And finally, the participants completed the Time 3 questionnaires (physical activity, basic psychological needs, subjective vitality, depression, headache, and sleep disturbance) after ten workouts (Day 20). The research questionnaires were provided to participants with online via WhatsApp and the university website, using the Google Doc forms.

Physical activity intervention:

The 30-day Fitness Challenge application, which is a free offline application and compatible with different types of smartphones, was provided to the subjects of the intervention group. It included four -challenge programs for 30 days (all parts of body, arms, abdomen, and legs) which each challenge has three - difficulty levels, from beginner to pro. So, this application is designed to work

for every major muscle group in the body—each workout. The application included strength, endurance, and aerobic exercises ranging from simple to complex. By fully considering workouts rules, application workouts increases exercise intensity step by step.

Exercises for each session begin with warm-up exercises such as Simple stretching movements, rope, long knees, and Jumping jacks. This app is No equipment needed, just uses bodyweight to workout at home (plank, squat, launch, butt bridge, etc.). The repetitions and the type of movements of each workout are different based on the selected level. For people at the beginner level, low-intensity exercises with a low number of repetitions, and for people at a pro-level, higher intensity exercise with higher repetitions. Table 1 presented the first workout of each level.

The program manual was also provided to the participants. The language of the application could be changed to Persian. The program provided the exercises in two forms of animated and explanatory. It also included warm-up and cool-down exercises. The participants were asked to, first study the manual, then select one of the challenges based on their interests and abilities. To better choose the physical activity program, the instructors of each group guided the participants by receiving feedback on their physical condition, body aches, and injuries. They were also explained to do the selected challenge every other day (one day rest, the following day physical activity) during the 20 days in their free time. The instructors, during this period, answered the problems and guided the participants. Based on self- determination principles, we asked the instructors of the experimental group to give students the freedom to choose the program, time, and manner of performing physical activity. Also, encourage them with feedback and positive points. And at the same time establish friendly relations with the members of the group. At the end of each day, the participants sent the report of physical activity, which was provided to them by the program, to the instructors of the intervention group. They also asked questions and the intensity of exercises to help them in case of any problems. The participants in the control group received no physical activity program and only completed the questionnaires. They had no information about the program provided to the participants in the intervention group. The participants of the two groups followed the program to the end of the intervention.

Questionnaires

All questionnaires were suitable for the age group over 18 years and were provided to the participants through Google Doc forms.

Physical activity

The participants' physical activity was assessed by the two-item physical activity assessment questionnaire.[30] Items included: "How many times a week, do you usually do 20 min of vigorous physical activity that makes you sweat or puff and pant?" and "How many times a week, do you usually do 30 min of moderate physical activity or walking that increases your heart rate or makes you breath harder than normal?". The sufficient score (≥4) or insufficient score (0-3) indicated active participants. The reliability and validity of the questionnaire were confirmed and reported in similar Iranian research by Behzadnia et al.[31]

Basic psychological need experience in exercise

To assess the basic psychological needs in exercise, the questionnaire of Cheon et al.[20] was used. This questionnaire is scored based on a 7-option Likers scale from 1 (Totally disagree) to 7 (Totally agree). This scale contains 6 items of satisfaction and 6 items of frustration and three subscales of autonomy, competency, and relatedness that each need was assessed with four items, of which two were used to satisfaction basic needs and two to frustration basic needs. We measured a combined score of need satisfaction and need frustration with the average of the three needs. Internal reliability of this scale was reported acceptable in an Iranian sample by Behzadnia et al. The CFA (*Confirmatory Factor Analysis*) yielded a satisfactory fit to the data, $\chi 2$ = (4) 8.59; p = 0.34; RMSEA (*Root Mean Square Error of Approximation*) = 0.02; RMSEA 95% CI = .03 to .08; CFI (*Comparative Fit Index*) = 0.99; SRMR (*Standardized Root Mean Square Residual*) = 0.01. All items were above 0.42, p < 0.001.

Subjective vitality

The participants' subjective vitality was assessed by the five-item version of the subjective vitality scale.[27] The sample item included "I have energy and spirit". Students were asked, "To what degree do you typically feel each on the following …?" The participants answered the questions on a scale of 1 (*Not true at all*) to 7 (*Very much true*). This scale was previously used for Iranian samples, and its validity and reliability were confirmed.[21] In current study, the results of CFA yielded a good fit to the data, χ^2 = (9) 12.15; p = 0.8 RMSEA = 0.05; RMSEA 95% CI = 0.00 to .06; CFI = 0.98; SRMR = 0.03. All items were above 0.42, p < 0.001.

Depression

The participants' depression was assessed by the 6- item version of the depression scale.[25] Participants answered the items on a scale of 1 (*Not true at all*) to 7 (*Very much true*). The validity and reliability of this questionnaire were also confirmed in similar Iranian research.[32] The results of CFA to assess the internal structure of the Coronavirus Anxiety Scale, yielded a satisfactory fit to the data, χ^2 = (4) 8.85; p = 0.27; RMSEA = 0.02; RMSEA 95% CI = 0.00 to 0.11; CFI = 0.95; SRMR = 0.02. All items were above 0.47, p < 0.001.

Public health

The participants' public health was assessed regarding two dimensions of headache and sleep disturbance, using the Public Health Questionnaire (PHQ).[33] This scale included 4 subscales which we used 2 subscales, sleep disturbance (fore-item: e.g., "How often have you had difficulty getting to sleep at night?") and headaches (three-item: e.g., "How often have you experienced headaches?"). They answered the items on a scale of 1(*Not true at all*) to 7 (*Very much true*). The results of CFA yielded a good fit to the data, χ^2 = (6) 10.14; p = 0.15, RMSEA = 0.02; RMSEA 95% CI = 0.00 to 0.04; CFI = .97; SRMR = 0.02. All items were above .45, p < 0.001.

Demographics questions

To better assess the relations between variables and the influence of physical activity approach on study variables based on participants' demographic information, we collected some demographic information that includes: age, gender, marital status, education level, and socioeconomic status. Socioeconomic status assessed through a numbered stepladder image. We asked students to choose

the step where they located in their social community in terms of earning, education, and job, ranged from 1 (lowest level) to 10 (highest level).

Data analyze

The research data based on the skewness and kurtosis indices initially showed that they were in a normal range. Also, the internal reliability of the questionnaires (using Cronbach's alpha coefficients) was acceptable. We then assessed the effects of physical activity intervention on students' need satisfaction and need frustration, subjective vitality, depression, headaches and, sleep disturbance. To assess the effects of physical activity intervention on students' headaches and sleep disturbance, we conducted 2 (experimental and control conditions) × 2 (time of assessment) repeated measures ANCOVAs, One for each. To assess the effects of physical activity intervention on students' need satisfaction and need frustration, subjective vitality, and depression. We conducted 2 (experimental and control conditions) × 3 (time of assessment) repeated measures ANCOVAs (covariates included: socioeconomic status), One for each.[31] To prevent Type I error, the Bonferroni correction test was used, which was considered to be $p<0.01$ (α/n) according to the number of the examined hypotheses. Also, a medium effect size of d = .40 (Cohen's d) was considered based on the number of variables, using G*Power.

Human Participant Compliance Statement

The research protocol was approved by the University Research Ethics Committee of the Urmia University (IRURMIA.REC1400.003).

Results

Table 1 shows students' demographic information. Preliminary analyses showed that socioeconomic status was related to some of the study variables, but age was not related to the study variables. Then, we examined mean differences in students' gender, education level (college and master), and marital status (single and married), through MANOVA. The results showed there were no differences between students' marital status and education level. Therefore, we only included socioeconomic status as covariates in the analyses.

For students' physical activity, the interaction effect of time × group, $F(1, 162) = 27.48$, $p < 0.001$, ηp2 = 0.14, the main effect for group, $F(1, 162) = 52.91$, $p < 0.001$, $\eta_p^2 = 0.25$, and the main effect for time, $F(1, 162) = 5.72$, $p = 0.02$, $\eta_p^2 = 0.00$, were significant. As Figure 1 shows, simple main effect of time for the experimental group increased from Time 1 to Time 2 ($p < 0.001$, d = 0.49, 95% CI [0.50, 1.49]), whereas it remained unchanged in the control group. The two groups did not differ at Time 1, but students in the experimental group reported higher physical activity than students in the control group at Time 2 ($p < 0.001$, d = 0.68, 95% CI [1.12, 0.88]).

For students' *experience of need satisfaction in exercise*, the interaction effect of time × group, $F(2, 162) = 7.45$, $p < 0.001$, $\eta_p^2 = 0.05$, and the main effect for time, $F(2, 162) = 6.33$, $p = 0.002$, $\eta_p^2 = 0.06$, were significant, but the main effect for group was not significant, $F(2, 162) = 0.31$, $p = 0.58$, $\eta_p^2 = 0.00$. As Figure 2a shows, simple main effect of time for the experimental group increased from Time 1 to Time 2 ($p < 0.001$, d = 0.58, 95% CI [0.29, 1.12]), Time 2 to Time 3 ($p < 0.001$, d = 0.48, 95% CI [0.25, 0.83]), Time 1 to Time 3 ($p < 0.001$, d = 0.57, 95% CI [0.81,

1.68]) whereas it remained unchanged in the control group from Time 1 to Time 2, from Time 1 to Time 3, and from Time 2 to Time 3. The two groups did not differ at Time 1 and Time 2, but students in the experimental group reported higher need satisfaction than students in the control group at Time 3 ($p < 0.001$, $d = 0.49$, 95% CI [0.25, 1.15]).

For students' *experience of need frustration in exercise*, the interaction effect of time × group, F (2, 162) = 4.72, $p = 0.01$, $\eta_p^2 = 0.02$, the main effect for group, F (2, 162) = 16.63, $p < 0.001$, $\eta_p^2 = .09$, were significant .While the main effect for time, F (2, 162) = 0.11, $p = 0.90$, $\eta_p^2 = 0.01$, was not significant. As Figure 2b shows, simple main effect of time for the experimental group decreased from Time 1 to Time 3 ($p = 0.002$, $d = 0.52$, 95% CI [-0.94, -0.08]), and Time 2 to Time 3 ($p = 0.003$, $d = 0.47$, 95% CI [-0.81, -0.05]), whereas it remained unchanged in the control group from Time 1 to Time 2, from Time 1 to Time 3, and from Time 2 to Time 3. The two groups did not differ at Time 1 and Time 2, but students in the experimental group reported lower need frustration in exercise than students in the control group at Time 3 ($p < 0.001$, $d = 0.64$, 95% CI [-0.99, -0.30]).

For students' *subjective vitality*, the interaction effect of time × group, F (2, 162) = 17.77, $p < 0.001$, $\eta_p^2 = 0.07$, and the main effect for time, F (2, 162) = 4.83, $p = 0.009$, $\eta_p^2 = 0.03$, were significant, but the main effect for group was not significant, F (2, 162) = 0.83, $p = 0.31$, $\eta_p^2 = 0.01$. As Figure 3a shows, simple main effect of time for the experimental group increased from Time 1 to Time 2 ($p < .001$, $d = .45$, 95% CI [0.12, 1.12]), and from Time 2 to Time 3 ($p < .001$, $d = 0.51$, 95% CI [0.41, 1.38]), whereas it remained unchanged in the control group from Time 1 to Time 2, from Time 1 to Time 3, and from Time 2 to Time 3. The two groups did not differ at Time 1, and Time 2, but students in the experimental group reported higher subjective vitality than students in the control group at Time 3 ($p < 0.001$, $d = 0.44$, 95% CI [0.12, 0.84]).

For students' *depression*, the interaction effect of time × group, F (2, 162) = 6.55, $p < 0.001$, $\eta_p^2 = 0.04$, the main effect for time, F (2, 162) = 5.94, $p = .003$, $\eta_p^2 = .04$, and the main effect for group, F (2, 162) = 6.91, $p = 0.009$, $\eta_p^2 = 0.04$ were significant. As Figure 3b shows, simple main effect of time for the experimental group decreased from Time 1 to Time 2 ($p < 0.001$, $d = .38$, 95% CI [-0.22, -0.81]), and from Time 1 to Time 3 ($p < 0.001$, $d = 0.63$, 95% CI [-1.71, -0.41]), whereas it remained unchanged in the control group from Time 1 to Time 2, from Time 1 to Time 3, and from Time 2 to Time 3. The two groups did not differ at Time 1 and Time 2, but students in the experimental group reported lower depression than students in the control group at Time 3 ($p < 0.001$, $d = 0.40$, 95% CI [-1.59, -0.44]).

For students' *headaches*, the interaction effect of time × group, F (1, 162) = 14.52, $p = 0.01$, $\eta_p^2 = 0.04$, and the main effect for group, F (1, 162) = 21.45, $p < 0.001$, $\eta_p^2 = 0.09$, the main effect for time, F (1, 162) = 10.13, $p = 0.01$, $\eta_p^2 = 0.02$ were significant. As Figure 4a shows, simple main effect of time for the experimental group decreased from Time 1 to Time 3 ($p < 0.001$, $d = 0.59$, 95% CI [-0.18, 0.74]), whereas it remained unchanged in the control group from. The two groups

did not differ at Time 1, but students in the experimental group reported lower headaches than students in the control group at Time 3 ($p < 0.001$, $d = 0.69$, 95% CI [-0.19, -0.33]).
For students' *sleep disturbance*, the interaction effect of time × group, $F(1, 162) = 21.22$, $p = 0.01$, $\eta_p^2 = 0.02$, and the main effect for group, $F(1, 162) = 12.24$, $p < 0.001$, $\eta_p^2 = 0.08$, were significant, but the main effect for time was not significant, $F(1, 162) = 4.32$, $p = 0.18$, $\eta_p^2 = 0.02$. As Figure 4b shows, simple main effect of time for the experimental group decreased from Time 1 to Time 3 ($p = 0.03$, $d = 0.38$, 95% CI [-0.14, -0.22]), whereas it remained unchanged in the control group. The two groups did not differ at Time 1, but students in the experimental group reported lower sleep disturbance than students in the control group at Time 3 ($p < 0.02$, $d = 0.35$, 95% CI [-0.40, -0.10]).

Discussion

It has caused sleep disturbance and inactivity among students. This new lifestyle started without training and experience for all people. It had undeniable and unavoidable problems for everyone, especially students, due to the online student lifestyle.[37] However, they can be directed towards a positive path, and the problems can be prevented. This goal can be achieved by finding solutions and considering them in educational programs.[38] Physical education and sports activities are the best and most necessary solutions. They help to achieve academic goals and are significantly associated with health indicators during the pandemic.
Several studies have also confirmed this issue and shown that physical activity with moderate intensity under the supervision of experts and sports trainers can improve the immune system, cardiovascular system, and quality of life.[39] Thus, the present study aims to investigate the effectiveness of using exercise and sports applications in online university physical education classes in the indicators of physical activity, basic psychological needs, mental vitality, depression, headache, and sleep disturbance. The present study was conducted experimentally by providing the necessary training to different groups of students studying in online classes. The present study revealed that implementing support and guidance instructions for using physical activity applications on smartphones and paying attention to people's interests and abilities in selecting a physical activity program can positively affect students' health.
Nowadays, depression is considered more important than ever due to its impacts on the mind and body, especially during corona disease, which has increased depression among all people.[9] Based on previous studies, exercise and physical activity reduce depression and are even considered therapeutic factors.[42] Based on the results, using exercise and sports applications will effectively reduce students' depression during difficult conditions of coronavirus. Performing organized physical activity under the guidance of trainers, even through mobile phones, can have positive effects. This effect can be increased by creating healthy communication.
Based on the self-determination theory principles,[19] meeting the psychological needs of people in sports environments will bring positive outcomes. The present proved that using an exercise and sports application compared to traditional physical education classes could positively affect

students' satisfaction with their basic psychological needs in online physical activity environments. Hence, people's basic psychological needs can be met through the virtual system with planning. In addition to reducing adverse effects, it is associated with positive effects such as increasing mental vitality.

Based on the results of studies conducted in this area, people are willing and interested in doing physical activity. However, they do not have a specific motivation and plan to do it, and they feel confused due to the lack of facilities and conflicting views and opinions about it.[43] Therefore, according to the self-determination theory,[19] when people's basic psychological needs are met in the physical activity environment, they will be more interested in continuing physical activity and bringing positive and desirable results. Thus, they act based on inner motivation, awareness of the importance of physical activities, and their values, not just to avoid punishment.[40] Also, the friendship and support of trainers and teachers play a significant role in performing and continuing physical activities.[40] Such communication and support of basic psychological needs create a feeling of mental vitality in students and improve their physical and mental health and performance. This issue has also been shown in the online environment and is generally consistent with the results of some similar studies,[18,30,32]

The present study also revealed that physical health problems such as headaches and sleep disorders caused by the new lifestyle (online lifestyle due to the corona pandemic and long-term use of mobile phones or computers) decreased significantly by performing physical activity. If physical activity meets basic psychological needs, the feeling of independence and competence in performing the physical activity and good communication with trainers and classmates in students limited to the virtual space (online lifestyle) will make them happy. In such a situation, a person feels better physically and mentally by doing physical activity according to their needs, and anxiety and worries caused by new conditions will decrease. Also, headaches and sleep disturbances caused by confusion, inability to change the conditions, and stress will decrease in such a situation.[44] The vitality and physical activity decreased among the participants of the control group who attended only MLS classes over time. They also reported more headaches and sleep disturbances due to prolonged use of mobile phones and tablets. If continued, this situation will be very harmful to the physical and mental health of students. The use of applications that provide exercise and sports programs has increased nowadays, and this issue can have positive outcomes under the supervision of a trainer.

In other words, when new educational environments are used in combination with new and efficient tools, they can have more positive and lasting effects in improving the inner motivation of students, compared to the times when only online environment (such as LMS) is used to achieve the educational and health goals of the university physical education class. Performing planned activities under the trainer's support creates motivation and interest in people. However, explaining and presenting the importance of physical activity and related issues does not encourage students to perform physical activity. Due to the availability of diverse applications in sports, motivation will not be created per se and requires the support and guidance of trainers and professors.

The results of the present study have practical recommendations and implications for university professors. Accordingly, it is recommended to make more efforts to support basic psychological needs in physical education classes. In this regard, it is recommended to delegate decision-making power to students and establish a friendly relationship within the framework of principles through flexible programs since it helps students to enjoy the support and presence of the trainer in advancing their physical activity programs. They will receive appropriate and energetic feedback. Additionally, students can be ensured that they will be supported in the face of external problems and pressures, and they can engage in physical activity in very favorable conditions without anxiety and fear of strict judgment and feedback (See Behzadnia and Fattah Modarres[18] for practical examples of physical activity interventions outside the classroom). Thus, students become more interested in performing physical activities and will feel better mentally and physically despite all these restrictions and pressures caused by online education due to the Corona pandemic.

It should be noted that using applications designed only for certain levels and people will discourage people. Hence, selecting a flexible application with different programs and levels is crucial. Choosing an application with a range of simple to professional activities with a high variety of exercises will be more effective than applications that provide routine daily programs.

The present study suffered some limitations. The statistical population of the study was limited, considering the existing conditions, so conducting a study with a larger sample size will provide more accurate results. It is also recommended for future studies to investigate individual differences and personality traits.[41] Based on the survey by Behzadnia,[41] students' personality traits can affect the outcomes. This issue can be considered in online education systems. It is also recommended to conduct longitudinal studies to investigate adherence to physical activities and the effectiveness of using such applications in physical activity behaviors and psychological indicators of students in the long term. Also, it is recommended that future studies examine the students' motivational indicators (such as intrinsic and extrinsic motivation), given the direct effects of the basic psychological needs on them and the effects of motivational indicators on the behavioral outcomes in the use of mobile phone applications.

Generally, the present study revealed that technology plays a significant role in today's life and brings different positive and negative effects. However, its correct use requires training and can reduce its negative effects. Using physical activity applications with varying capabilities in general physical education courses, freedom of action for students, follow-up, and positive support of trainers will bring positive physical and mental outcomes, vitality, and physical and mental health for students. This issue will also reduce depression, headaches, and sleep disturbances due to the long-term use of mobile phones. Therefore, when their use is taught correctly, new exercise and sports applications and technology can positively affect people's health.

Implications for Policy & Practice

These results show that physical activity application is more effective considering principles of basic psychological needs theory.

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Figure captions

Figure 1. Changes in participants' physical activity.

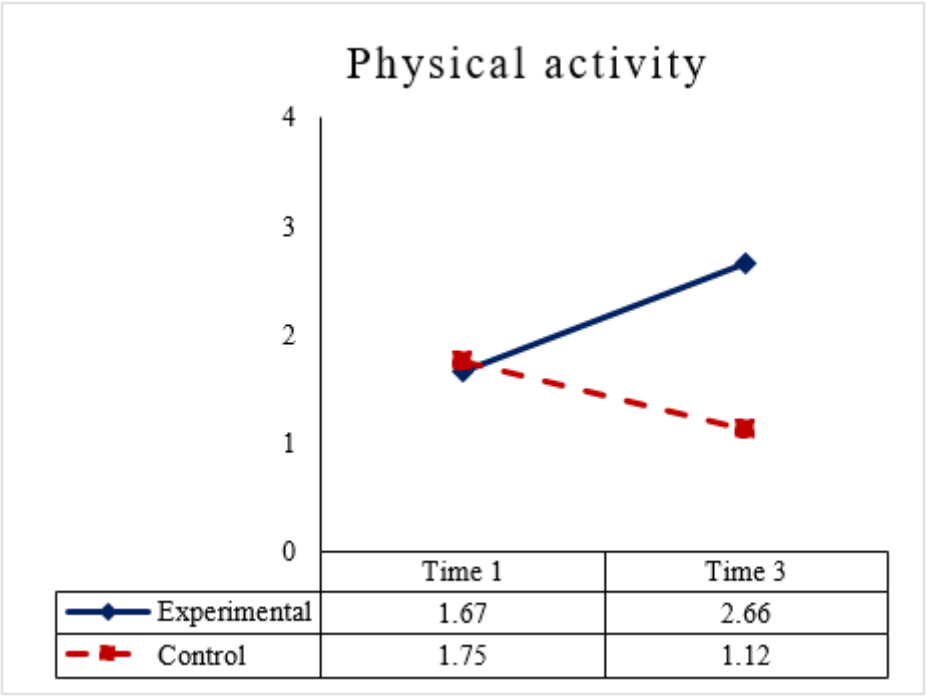

Figure 2. Changes in participants' basic psychological needs.

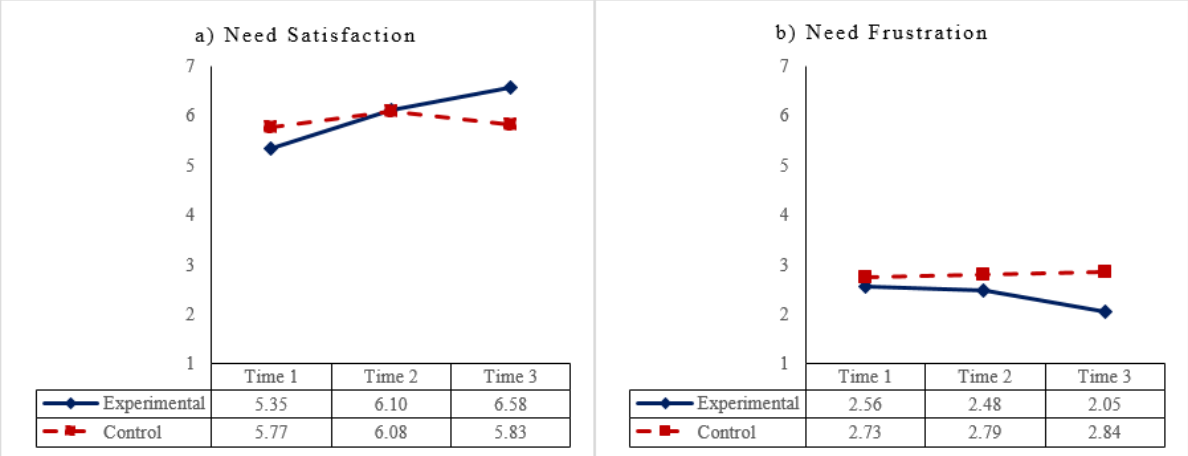

Figure 3. Changes in participants' subjective vitality and depression.

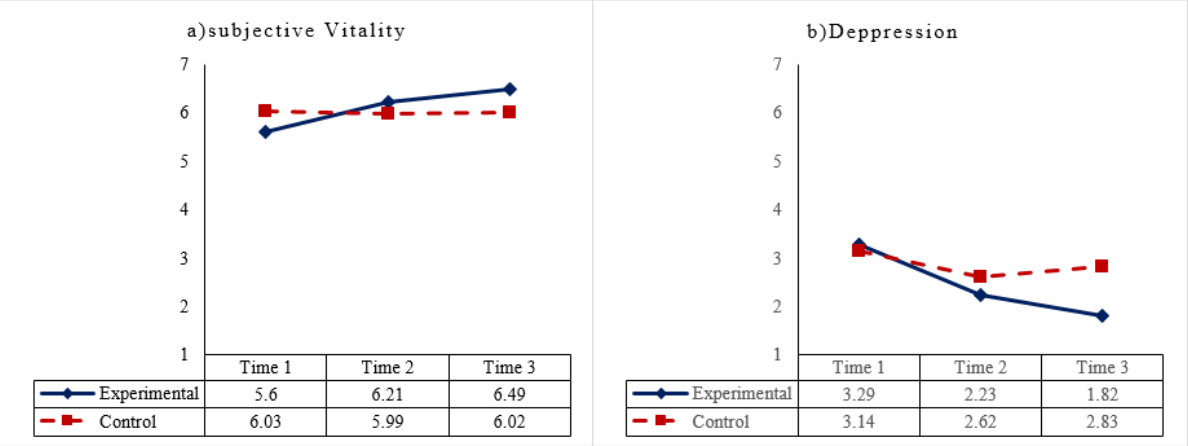

Figure 4. Changes in participants' headaches and sleep disturbance.

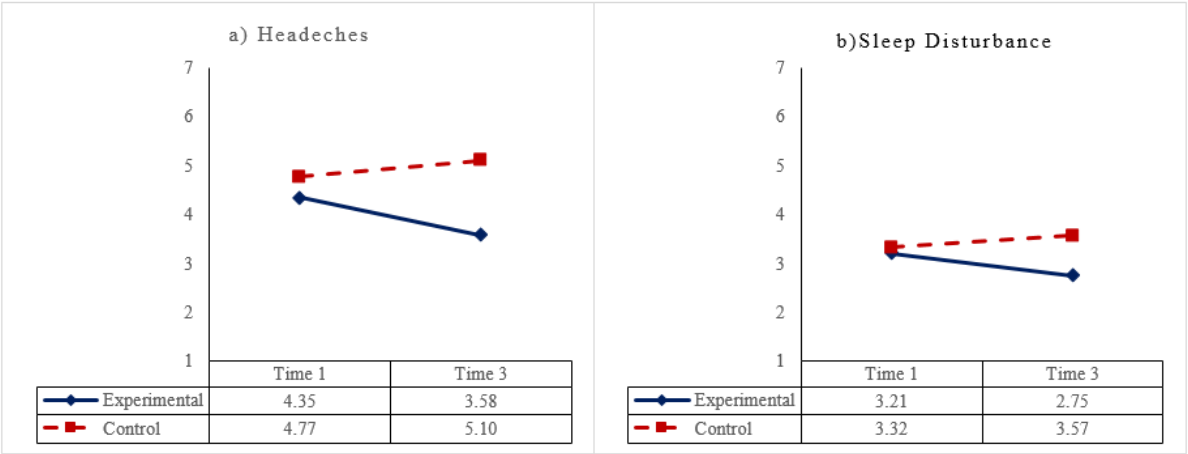

Table 1. Personal characteristics of participants in experimental and control conditions.

	Experimental (N = 75)	Control group (N = 90)	Total (N = 165)
Age (Years, M ± SD, range)	21.68 ± 3.23 18-28	21.23 ± 3.15,19-26	21.23 ± 3.15,19-28
Gender (Female, N (%))	45 (60 %)	60 (66.67 %)	105 (63.64 %)
Marital (Single, N (%))	69 (92 %)	63 (70 %)	132 (63.42 %)
SES (M ± SD)	5.60 ± 1.88	5.70 ± 1.68	5.68 ± 1.77
Education (N (%))			
Collage	65 (86.66 %)	80 (88.89 %)	145 (87.88 %)
Master	10 (13.34 %)	10 (11.11 %)	20 (12.12 %)

Note; SES = Socioeconomic status, N (%) = Number (Percent)