

Effects of an Intervention in Online Physical Education Classes on Motivation, Intention, and Physical Activity of Adolescents during the COVID-19 Pandemic

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Abstract

Background: An important issue for pediatric health is to understand how to enhance the level of physical activity of children and adolescents during the pandemic. The present study aimed to investigate the effects of a physical education-based online intervention on promoting motivation and physical activity of adolescents during the COVID-19 pandemic.

Methods: The present study used an experimental design with pre-test and post-test conducted in Iran, 2020. The participants were 68 high school students who were randomly allocated into intervention and control groups. The participants of the intervention group were exposed to a three-month intervention based on Self-Determination theory within the online physical education classes while those in the control group followed their regular online physical education classes. Perceived autonomy support, motivation, intention, and physical activity behavior were measured using standard questionnaires. Independent t test and analysis of variance (ANOVA) were utilized to analyze the data.

Results: The pre-test showed that the participants of both groups had similar perceived autonomy support, motivation, intention, and physical activity behavior at baseline. However, the participants in the intervention group reported higher perceived autonomy support (3.2 vs. 1.48, $P<0.001$), motivation (3.03 vs. 1.49, $P<0.001$), intention (2.75 vs. 1.51, $P<0.001$), and physical activity level (2.4 vs. 1.11, $P<0.001$) in the post-test in comparison to those in the control group.

Conclusions: These results highlighted the importance of developing strategies in online physical education classes for improving motivation and physical activity level of adolescents during the COVID-19 pandemic.

Keywords: COVID-19, Exercise, Intervention, Motivation, Adolescents

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1. Introduction

With Due to the emergence of novel coronavirus disease (COVID-19), isolation and strict quarantine were required as extensive preventive strategy to reduce its spread. Consequently, many countries worldwide decided to close schools, which in turn caused children and adolescents to spend most of their time at home (1). These restrictions led educational organizations, such as schools, to turn to online education. Online education became a challenge for teachers and families as they attempted to reorganize routine activities of students so that homeschooling could not disrupt regular school

activities. However, for school students, online education limited the opportunities for school-based physical activities as well as routine social contact with peers (2-3). As a result, several studies have reported that social distancing seriously changed the mental health and level of physical activity of children and adolescents during the COVID-19 quarantine (4-6); for example, Gul and Demirci (4) reviewed the studies about the prevalence of psychiatric diseases and symptoms in children and adolescents during the COVID-19 pandemic and found that it increases stress, anxiety, depression and negative social behavior among children and adolescents. Moreover, Dunton and colleagues (5) reported greater

decreases in physical activity level and greater increases in sedentary behaviors of children from the pre- to early-COVID-19 periods. Finally, Tulchin-Francis and colleagues (6) reported that children's level of physical activity in the United States declined significantly during the pandemic. Specifically, moderate-to-vigorous physical activity decreased while light physical activity remained the same. These findings indicate that the level of physical activity in children and adolescents decreased during the COVID-19 pandemic. To cope with such harmful consequences, the WHO encouraged children and adolescents to "be active and stay healthy at home". It is well documented that regular physical activity promotes children's and adolescents' wellbeing (7-8). Additionally, it tends to track into the latter stages in lifespan (9-10). Therefore, it is essential to find certain ways to enhance the level of physical activity of children and adolescents during the pandemic.

Within the school setting, physical education classes provide a unique environment that could provide multiple opportunities for children to be physically active inside and outside school. Moreover, physical education is compulsory for school students and forces them to explore and perform physical activities that subsequently allow them to remain physically active (11). However, homeschooling during the COVID-19 was a major challenge for physical education teachers since physical education courses are mainly associated with physical activities outdoors or in gyms, not indoors. For online teaching, physical education teachers utilized various strategies in online classes, such as livestreaming or recorded videos (12). Nonetheless, due to the lack of natural climate in the physical education classes and also the lack of communication between students, it could not be expected that sports classes be able to encourage students to do the recommended level of physical activity (for example, 60 minutes of moderate to vigorous physical activity per day).

Because of the occurrence of new mutations of COVID-19 and the lack of adequate vaccination in numerous countries, restrictions have continued in many countries and it is unclear when schools can return to onsite education. Therefore, it is essential to improve the quality of physical education classes during online-teaching so that it could promote motivation of students for participating in physical activity and consequently improve their physical and mental health. The present

study was conducted to investigate the effects of a home-based intervention in online physical education classes on motivation, intention, and physical activity in adolescents during the COVID-19 pandemic. In this study, the intervention was based on the theoretical frameworks of Self-Determination theory (13-15). According to this theory, there are three basic psychological needs, namely autonomy, competence, and relatedness, which once satisfied, could facilitate one's behaviors. Autonomy refers to the freedom to make decisions and become independent in performing different activities and tasks. Competence is a multi-dimensional, dynamic, and interactive concept affecting the efforts for mastery and success. Relatedness refers to the experience of interpersonal relationships and reflects the extent of a person's sense of belonging to a society and having caring relationships and connection with significant individuals (13-15). In this study, we focused on an autonomy-supportive intervention in online physical education classes. It was hypothesized that the intervention would enhance motivation, intention, and physical activity of adolescents in post-test.

2. Methods

The present study used an experimental design with pretest and post-test conducted in Iran, 2020. The Ethics Committee of Islamic Azad University of Aliabad Katoul approved the research method with the code of IR.IAU.AK.REC.1400.001. Both parents and their students provided written informed consent.

2.1 Participants

The participants comprised 68 male students aged 15 to 17 (mean age of 16.29 ± 0.57 years) in tenth and eleventh grade from two regular high schools of Gonbad Kavous city, Golestan province, Iran, in 2020. Means and standard deviations of height of the boys and girls were 166.41 ± 9.03 and 156.86 ± 8.10 , respectively. Means and standard deviations of weight of the boys and girls were 58.38 ± 10.37 and 54.95 ± 10.07 , respectively. The ethnicity of the adolescents was a mixture of Fars and Turkmen. Inclusion criteria included: studying in Gonbad Kavous high schools, consent to participate in the study, studying in the national schools, and be healthy without any acute physical or mental disorders. The participants were

selected using a convenience sampling method and randomly allocated to intervention (n=36) or control (n=32) groups. To this end, we employed a simple random coin-throwing method for allocating the classes either to an intervention or a control group. The specified sample size was selected according to GPower statistical software with an effect size of 80%, a test power of 0.8, and a significance level of 0.05 (16).

2.2 Measures

The dependent variables in the present study included perceived autonomy support, intrinsic motivation, intention to physical activity, and self-reported physical activity.

2.2.1 Perceived Autonomy Support: Perceived autonomy support in online physical education (PE) classes was measured using a 5-question scale (17), which was scored on a Likert scale from strongly disagree (1) to strongly agree (7). Total score was an average of all questions. Cronbach's alpha coefficient of the original form of this questionnaire was 0.91 (17). In the present study, the initial questionnaire was translated into Persian using the standard method of translation and retranslation. For this purpose, we got help from a translator who was familiar with terminology of the area and knowledgeable of the English-speaking culture, but his mother language was Persian. Afterwards, a bilingual (in English and Persian) expert panel identified and resolved the inadequate translation, as well as any discrepancies between the translation and the original version. Ultimately, using the same approach as that in the first step, the instrument was then translated back to English by an independent translator. Subsequently, the validity of the Persian version of this questionnaire was confirmed by nine experts (CVI=1.00, CVR=0.78). Furthermore, we assessed the reliability of this questionnaire with Cronbach's alpha coefficient of 0.96.

2.2.2 Intrinsic Motivation: Intrinsic Motivation Scale (18) with eight questions, which was scored on a Likert scale from strongly disagree (1) to strongly agree (7), was used to assess intrinsic motivation in PE class and outside school (18). The total score of this questionnaire was an average of all the items. Cronbach's alpha coefficient of its original form was 0.90 (18). In this study, nine experts confirmed the validity of the Persian version of this questionnaire (CVI=0.88, CVR=0.78). Moreover, in this

study, Cronbach's alpha coefficient of this questionnaire was 0.97.

2.2.3 Intention to Physical Activity: The intention to physical activity was measured using two questions (19) assessed with a Likert scale from strongly disagree (1) to strongly agree (7). The total score of this questionnaire was an average of all the items. Cronbach's alpha coefficient of its original form was 0.87 (19). Herein, the standard method of translation and retranslation was utilized to convert the initial questionnaire into Persian. In this study, nine experts confirmed the validity of the Persian version of this questionnaire (CVI=1.00, CVR=1.00). Furthermore, we assessed the reliability of this questionnaire with Cronbach's alpha coefficient of 0.89.

2.2.4 Physical Activity: Leisure-time physical activity was assessed via Physical Activity Behavior in Leisure Time Scale (18), including three questions scored based on an eight-point Likert scale from zero days (0) to seven days (7). Validity and reliability of this questionnaire was confirmed in the previous research (19). In the current study, 11 experts corroborated the validity of this questionnaire and its reliability was assessed where the Cronbach's alpha coefficient was 0.90.

2.3 Procedure

The pretest was primarily administered, and the post-test was given following the intervention. Both were completed at home and under guidance of the experimenter. He clarified any terms the students were confused about. During the experiment, the intervention groups were trained for three months and two sessions per week under the supervision of their physical education teachers within the online physical education classes in a WhatsApp mobile application. For this purpose, we asked four male physical education teachers (aged 35 to 47 years old) to join this project. We randomly assigned these teachers to two groups: intervention and control. In the next stage, the students of these teachers were divided into the intervention and control groups, respectively. Thus, 36 students attended in the intervention group and 32 students were in the control group. For implementing the experiment, each teacher created a group in WhatsApp mobile application and all the participants of his class were added into the group.

Before the protocol, the teachers of the intervention

group participated in a workshop under the supervision of the researcher. In this workshop, the teachers of the intervention group were taught how to work with students in online classes and the items that they should teach the students in online classes were explained. The aim of this workshop was to increase the knowledge of PE teachers about techniques and strategies in order to promote students' autonomous motivation toward physical activities at home (20). Based on the Self-Determination theory, we designed various activities and accordingly trained the teachers of the intervention group and asked them to run these activities in online physical education classes (13-15, 20-22). The activities were adapted from the previous studies (20-26) and focused on six sets of strategies and techniques that support autonomy: paying more attention to students' perspective using noncontrolling and informational language, presenting students with rationale, showing patience, presenting choices, and acceptance of negative emotions. In the online classrooms, the teachers in the intervention group asked their students to follow these instructions and activities. The students were allowed to ask their teacher any questions about the class activities. The students in the control group performed their regular activities during the online physical education classes.

2.4 Data Analysis

In the current study, the descriptive statistics consisted of means and standard deviations used to describe the research variables. Independent t test was employed to compare means of the groups in pre-test. To compare the post-test scores, we utilized ANCOVA. The significance level was set at $P < 0.05$.

3. Results

3.1 Pretest

The participants comprised 68 male students aged 15 to 17 (mean age of 16.29 ± 0.57 years) in tenth and eleventh grade from two regular high schools of Gonbad Kavous city, Golestan province, Iran, in 2020. Inclusion criteria included: studying in Gonbad Kavous high schools, consent to participate in the study, studying in the national schools, and be healthy without any acute physical or mental disorders. The results of t test indicated no significant differences between the groups in pre-test regarding all the research variables (Table 1). Therefore, the study groups had similar conditions prior to the intervention.

3.2 Comparison of Pre-test and Post-test

3.2.1 Perceived Autonomy Support

The results of ANCOVA indicated the significant differences between the groups ($F = 292.44$, $P < 0.001$). According to the means of the groups (Figure 1), we observed that the intervention group had significantly higher scores compared with the control group in the post-test, indicating that the intervention improved the level of perceived autonomy support in the adolescents.

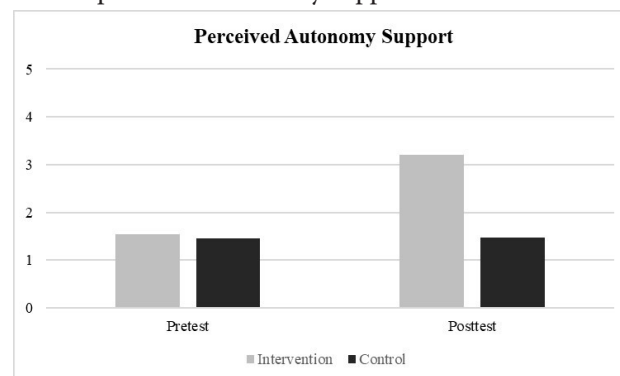


Figure 1: The figure shows mean of perceived autonomy support scores of the groups during the pre-test and post-test.

Table 1: Comparing the mean scores of the groups in the pretest

Variables	Pretest		Comparison	
	Intervention	M±SD	Control	M±SD
Perceived Autonomy Support	1.55±0.33		1.46±0.43	t=0.926 P=0.358
Intrinsic Motivation	1.53±0.38		1.59±0.49	t=-0.518 P=0.606
Intention to Physical Activity	1.37±0.43		1.42±0.42	t=-0.448 P=0.656
Physical Activity	1.16±0.46		1.28±0.47	t=-1.030 P=0.319

M=Mean; SD=Standard Deviation

3.2.2 Intrinsic Motivation

The results of ANCOVA indicated the significant differences between the groups ($F=466.82$, $P<0.001$). According to the means of the groups (Figure 2), the intervention group had significantly higher scores compared with the control group in the posttest, indicating that the intervention improved the level of intrinsic motivation of the subjects.

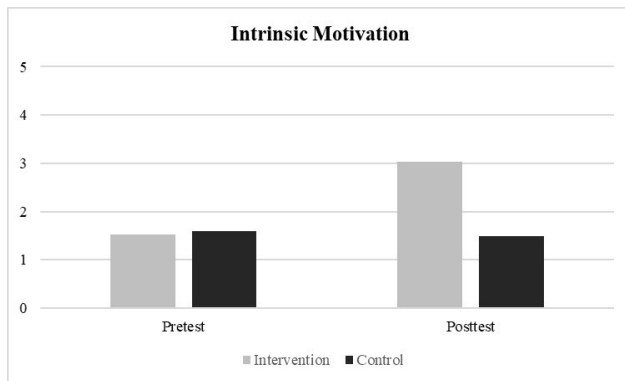


Figure 2: The figure indicates means of intrinsic motivation scores of the groups during the pre-test and post-test.

3.2.3 Intention to Physical Activity

The results of ANCOVA revealed the significant differences between the groups ($F=82.50$, $P<0.001$). According to the means of the groups (Figure 3), we found that the intervention group had significantly higher scores compared with the control group in the post-test, indicating that the intervention improved the level of intention to physical activity of the adolescents.

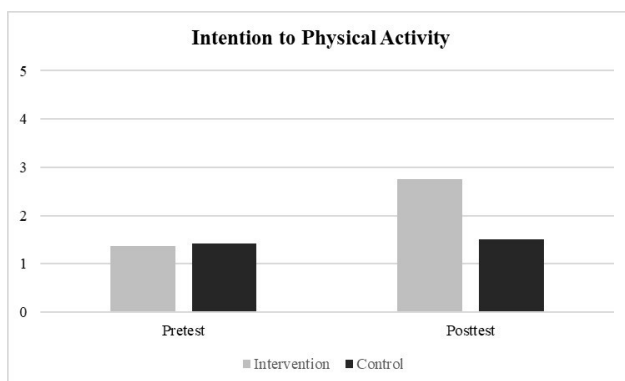


Figure 3: The figure shows mean of intention to physical activity scores of the groups during the pretest and the posttest.

3.2.4 Physical Activity

The results of ANCOVA implied the significant differences between the groups ($F=113.48$, $P<0.001$). According to the means of the groups (Figure 4), the intervention group had significantly higher scores compared with the control group in the post-test, indicating that the intervention ameliorated the level of physical activity level of the participants.

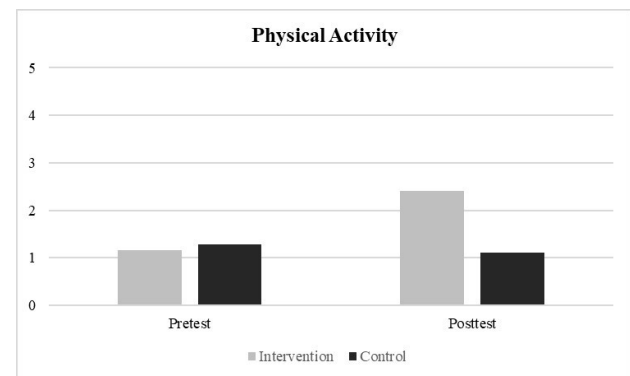


Figure 4: The figure shows mean of physical activity scores of the groups during the pretest and post-test.

4. Discussion

Quarantine continues in several countries due to the spread of the coronavirus as well as the lack of global vaccination. Hence, it is not clear when schools could return to onsite education. This necessitates promoting motivation of students for participating in physical activity using home-based intervention within online physical education classes. Therefore, we conducted the present study to investigate the effects of an autonomy-based intervention in online physical education classes on motivation, intention, and physical activity in adolescents during the COVID-19 pandemic. In this paper, the intervention was based on the theoretical frameworks of Self-Determination theory (13-15) based on which, people with a higher sense of autonomy are more likely to have a greater intrinsic motivation and intention to perform different tasks. In this study, we hypothesized that autonomy-supportive online intervention would increase motivation, intention and physical activity in adolescents.

Regarding the results, it should first be stated that the intervention to support autonomy in online physical education classes enhanced the perceived sense of autonomy in the students, which could be of popular

importance. In fact, the results revealed that the intervention group had a significantly higher perceived sense of autonomy in online physical education classes than the control group. This is in line with the results of previous research (20-21) that has shown that exercises based on supporting autonomy in the physical education class increase students' perceived sense of autonomy. However, the results of the present study showed that the implementation of activities based on supporting autonomy within online classes also increases students' sense of autonomy.

Regarding intrinsic motivation, the results revealed no significant differences between the groups in the pre-test, indicating the same pre-training conditions for all the participants. However, the comparison between the pre-test and post-test showed that the intervention group had significantly higher scores of intrinsic motivations compared with the control group. These findings are of great importance since they indicated that the exposure of the adolescent students to an online autonomy-based exercise training increased their intrinsic motivation for physical activity and exercise; this is consistent with the assumptions of Self-Determination theory (13-15). These results are also consistent with those of previous research on face-to-face physical education classes (22-24). Our findings exhibited that providing the adolescent students with a sense of autonomy within online physical education classes might result in an increase in their intrinsic motivation to participate in physical activity and exercise. In other words, reducing the stress and control created by the trainer during online training and giving students further power induces greater intrinsic motivation towards physical activity and exercise. This result could be highly useful for physical educators during the COVID-19 pandemic as they can increase the intrinsic motivation of their students to participate in physical activity through providing them with small choices within online physical education classes.

Concerning the intention to physical activity, our results showed that the study groups were not significantly different in the pre-test. Nevertheless, participation in autonomy-based exercise training contributed to higher scores of physical activity intention in the intervention group compared with that in the control group. These results are consistent with previous research done on face-to-face physical education classes (22) and confirm the assumptions of Self-Determination theory (13-15). Our findings further indicated that giving the students

the freedom within the online physical education classes could significantly increase their willingness to engage in physical activity compared to regular methods with no autonomy.

Regarding physical activity, it should initially be stated that all the students had very small amount of physical activity in the pre-test, which indicated that the level of physical activity of the students is very low during the COVID-19 pandemic. Concerning to the pre-test, the results revealed no significant differences between the groups, implying the same baseline conditions for all the participants. Meanwhile, the comparison between the pre-test and post-test showed that the participants of the intervention group reported significantly higher scores of physical activity level compared with those of the control group. These results might indicate that exposure of the adolescent students to an autonomy supportive intervention within online physical education classes increased their physical activity level, which is in line with the assumptions of Self-Determination theory (13-15). These results are consistent with those of previous research on onsite physical education classes (19, 25-28). Our findings also revealed that sense of autonomy in the online physical education classes might result in an increase in participation of the adolescent students in physical activity and exercise. In other words, reducing external control by the physical education teacher during online physical education class induced greater physical activity and exercise participation. We believe that the change in physical activity level from the pre-test to the post-test in the subjects was meaningful from a health perspective. This change may contribute to healthy outcomes, such as reducing obesity and depression during the COVID-19 pandemic. These results could be very useful for physical education teachers and parents as they can increase the participation of their students in physical activity through an autonomy-based intervention in online physical education classes during the COVID-19 pandemic.

There were certain limitations in the present work. Due to the fact that we used only boys in this study, the results should be interpreted with caution once generalizing them to girls. We did not measure the social-economic status of the students, thus, so further research is needed emphasizing the socio-economic status of students in order to present a more comprehensive view of the effects of online interventions on physical activity behavior of adolescents. The small

sample size herein could be introduced as another limitation in this study. Further research with bigger sample size is needed to increase the reliability of these data. As another limitation to this study, we could state that our data were collected through a self-report, which may have self-reporting bias.

5. Conclusions

In conclusion, the present study showed that compared with regular training methods, the autonomy-based exercise training intervention within online physical education classes during the COVID-19 pandemic was more capable of increasing intrinsic motivation, intention, and participation in physical activity in adolescent students. These results may indicate that the feeling of autonomy during online physical education classes has a greater effect on psychological components including intrinsic motivation and physical activity intention. Our findings could have practical implications for physical educators during the COVID-19 pandemic. Based on the results of the present study, it could be recommended that physical education teachers use autonomy-based methods for increasing the motivation and intention of students concerning participation in physical activity. To this end, physical education teachers can support the need for autonomy through creating opportunities for choosing activities, emphasizing a sense of agency, and using non-controlling language and feedback during online physical education classes.

Ethical Approval

This study was approved by Ethics Committee of Islamic Azad University of Aliabad Katoul with the code of IR.IAU.AK.REC.1400.001. The participants voluntarily participated in the present study and written informed consent was obtained from the subjects and their parents.

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Conflicts of Interest: None declared.

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