

“Playing with Little Behaviors”; Physical Activity Promotion by Gamified Education in Young Boys

Abstract

Background: Physical activity is affecting every aspect of our life. A sedentary lifestyle can be the risk factor for noncommunicable diseases (NCD) or premature death all over the world. Several studies demonstrate that school-based physical activity promotion is an important solution to make healthy behaviors, especially in children and adolescents. In this vein, the current research evaluates a model for physical activity, which is promoted through a game among high school students. **Methods:** In this study, 47 high school's 10th-grade boys from Tehran were required. The game scenario included the suggestion of some behaviors which can increase daily physical activity by each student, like or dislike each behavior by other students, counting likes, selecting the most-liked behaviors, and rewarding their proposers. After a week, the behavioral recall was assessed and compared with a control group who had been heard these behaviors in the class without gamification. **Results:** The participants in the game could recall physical activity behaviors significantly more than peers in the control group. **Conclusions:** The findings show gamification could significantly improve the effectiveness of education for normal behaviors in physical activity.

Keywords: Adolescent, gamification, physical activity, schools

Introduction

Insufficient physical activity is a serious risk factor for noncommunicable diseases (NCDs), especially cardiovascular diseases^[1] and is the fourth leading risk factor for mortality, due to lifestyle changes.^[2] In 2016, NCDs were accounted for 72% of causes of death globally, among which ischemic heart disease is the first cause of premature death in most parts of the world. In Iran, 48% of all deaths were attributed to NCDs during the 1990s, reaching 80% in 2016.^[3] Approximately 1.173 million people died due to physical inactivity in 2016 in the world, and this figure is over 14,000 in Iran.^[1] Also, high blood sugar, overweight, obesity, high cholesterol, and high blood pressure are among the top 10 diseases causing the most deaths worldwide in 2016; of which five are known to be associated with inadequate physical activity and poor nutrition.^[4,5] In particular, these NCDs-causing factors in Iran include hypertension, unhealthy nutrition, overweight and obesity, high levels of cholesterol, and inadequate physical activity.^[3]

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Recent studies in Iran have revealed inadequate physical activity, which continues to overweight and obesity.^[3] A survey in Iran in 2011 suggested that 40% of the population aged 15–64 years lack regular physical activity.^[6] The patterns of physical activity are formed in childhood and adolescence, and it is likely to persist throughout life.^[7] Over 70% of obese teens are expected to become obese adults.^[8]

A substantial body of research in Iran and the world calls the need for systematic education in different strata to raise awareness about the benefits of physical activity, create culture, and sustain a supportive environment, as well as lifestyle modification in the field of physical activity. In this vein, the positive impact of education on changing unhealthy behaviors has been proven in various public health interventions.^[9-11]

Health education, especially when targeting teenagers and young adults, must go beyond traditional pathways. Proper use of various educational methods will increase the effectiveness and efficiency of the program, which will ultimately lead to more satisfaction to bring about greater participation.^[12]

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One way that has lasted more than two decades is to increase the students' passion for learning through playing. The word gamification refers to the use of mechanisms, techniques, and elements of games in nongame contexts to create happiness, increase user's motivations on the ground, improve processes, and solve problems that ultimately reinforce fruitful learning.^[13]

Most researchers have investigated the use of games in the classroom and expressed that games are powerful in conveying concepts in learning environments.^[14] Educational games can facilitate student learning and lead the active participation of students in the classroom.^[15]

As discussed earlier, due to the rapid global growth of NCDs, and the direct and indirect impact of physical activity on these diseases, on the other hand, the impact of providing appropriate educational interventions, especially by using the games as a mean of increasing physical activity, with emphasize in adolescents, the researcher of the present study aimed to compare the effectiveness of two educational models, that is, traditional vs game-based teaching methods on students studying in high school's 10th grade in Tehran in accordance to national educational curriculum to address the major constraints to physical activity.

Methods

This research was carried out in the following steps:

Study participants

The participants were adolescents studying in high school's 10th grade in Tehran. The students were matched according to their socioeconomic status. Prior to the intervention, the permission from the school board was obtained in order to conduct the intervention in a school setting. Adolescents were informed about the study and were randomly divided into two groups of cases and controls. This intervention was in accordance with the formal educational curriculum for 10th grade and authors did not make any modification in educational objectives.

Game scenario

In the intervention group, in order to instruct the physical activity behaviors, a group game was designed as follows:

The facilitator followed by introduction and briefing asked the teenagers to participate in a game. After a brief explanation of the benefits of exercise and physical activity, he provided the students with a sheet of paper to write a sample behavior that increases physical activity throughout the day.

After about 5 min, the papers were collected and, after an initial assessment and removal of unrelated behaviors, 10 suggested behaviors were installed on the board.

At this stage, the pupils were asked to attend the blackboard in groups of five to express their opinion

about any behaviors as the likes (✓) or dislikes (×). There was no limitation on the number of ballots. After this step, the number of checkmarks of each suggested behavior was counted by the help of two students, and the subtraction of total likes from dislikes was considered as the popularity index of each specific behavior. At this point, the three most liked behaviors were selected, and each student was asked to present their idea to the class in 2 min. After every three explanations, these behaviors were reevaluated through a voting process by students. Finally, the behavior that received the highest score was encouraged as a superior behavior and its suggested was rewarded [Figure 1].

Behavioral education in controls

In the control group, in order to educate behaviors that promote physical activity, the facilitator attended the classroom, and after a brief explanation of the benefits

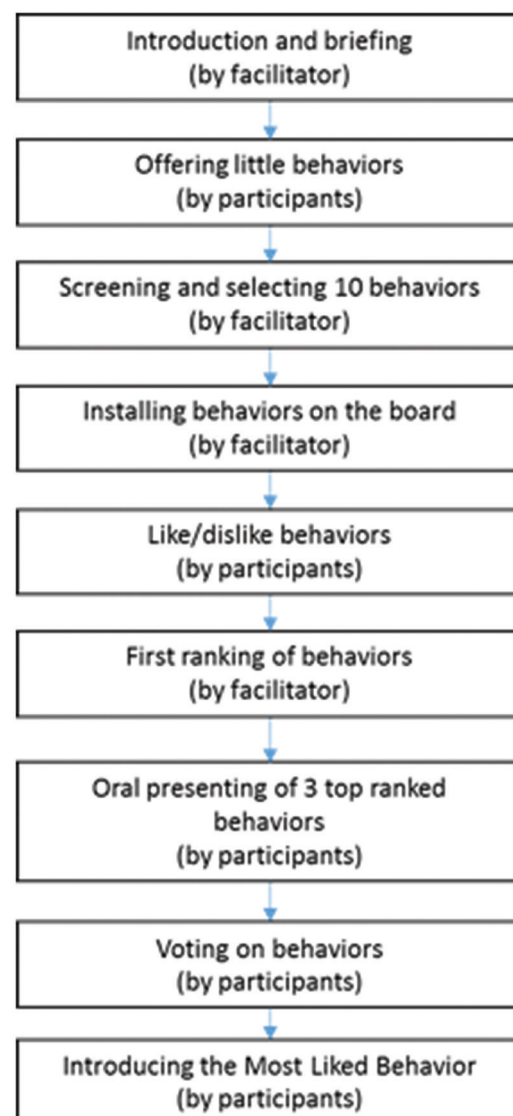


Figure 1: The step-by-step game process lasted 60 min

of physical activity, described the 10 suggested behaviors by the cases and explained a bit about each behavior. The instruction lasted about 60 minutes.

Effectiveness Evaluation

In order to evaluate the effectiveness of the gamification pattern in the behavioral training, 1 week after the intervention, a questionnaire containing 10 pairs of statements were given to participants. Each pair included sentences stating a suggested behavior suggested in the class last week, as well as an equivalent similar behavior. This questionnaire was designed and validated in an expert panel including a school consultant, two teachers, and researchers. The participants were asked to indicate in each pair the behavior discussed throughout the previous session. Doing so, the number of correct responses indicated the extent to which a particular behavior was sustained in their memory.

Statistical analysis

Data were analyzed using SPSS 17 after data collections. Paired T-test and Pearson correlation coefficient were used for comparing two groups and related correlations.

Results

Participants

We analyzed 47 adolescents who were enrolled in the present study. The socioeconomic status of participants is summarized in Table 1.

Suggested behaviors

Table 2 summarizes 10 suggested behaviors, the frequency of likes and dislikes among cases, and the rate of recall of each behavior in two groups case and control.

In total, the mean score of the intervention group for behaviors recall questionnaire was 7.56 (SD = 2.29) which was significantly higher than the mean score of the control group (6.36, SD = 1.61), using paired t-test (P value < 0.05). Table 3 summarizes the statistical results of the interventions and the results of the two study groups.

In examining the rate of behavior recall in the intervention group and its association with popularity and visibility indices, using the Pearson correlation coefficient, a notable direct correlation was observed between the rate of behavior recall and total likes and dislikes given to

them as the visibility index for each behavior. (Pearson correlation = 0.301). However, this was not statistically significant.

Discussion

The findings of this study which evaluated the effectiveness of the gamification in behavior recall have indicated that the mean score of behavior recall in the intervention group obtained by the questionnaire was 7.56 (SD = 2.29) which was significantly higher than control population 6.36 (SD = 1.61). Despite the fact that in this study the same learning opportunity was provided for both study groups, data suggest that gamification encourages better understanding and retention of learning through recreation among students. The game's experts have introduced the game as an official educational strategy in the first two decades of the twentieth century. The results of the research have shown that educational games are more useful and effective than traditional methods of education.^[14]

In Iran, health education programs implemented in schools often rely on traditional methods. Considering the type and the method of instruction used, its effectiveness, its applicability, and its fit with the target group, it is possible to select and execute the most appropriate teaching method in different situations.^[16,17] Application of the game in the field of education improves social skills, learning retention, creativity, and innovation among students.^[18] In the last two decades, gamification has been widely used as an inducer of better learning outcomes and has found its way into the learning process.^[19] Education in the world is one of the most popular areas for using the game.^[20,21]

The growing interest in the production, use, and influence of this educational model are mainly because it provides a suitable substrate for student participation and motivation during the learning process. A substantial body of research has shown that gamification has been incorporated to increase students' motivation, improve skills, and maximize their learning.^[21] Also, the research data suggest that the mechanisms of gamification can provide suitable means through which an innovative training cycle could be organized. This way, a suitable pathway is formed to incorporate specific educational activities. On the other hand, gamification has been proven to create motivation and activate students and can stimulate and nurture classroom settings, and lead them to development.^[22] Findings in a research study affirmed the positive impact of gamification in the utilization of the "Learning Management System" (LMS) so that the game element made the "educational management system" (EMS) more interactive and engenders learners' participation in learning.

Research findings have reported that learners who are trained using a game-based approach system show a better performance than those trained by a traditional training method. In Iran, one study conducted on the effect of

Table 1: Demographic characteristics of students

Index	Rate
Number of students	47
Mean age of students	16.65±0.3
Time spent in school (hours per day)	8.5
Time spent in school (hours per week)	51
Average family income (USD per month)	2080.4

Table 2: Frequency of visibility and popularity indices of suggested behaviors among cases and controls

Study groups	Behavior	Likes	Dislikes	Behaviors visibility (sum of likes and dislikes)	Behaviors popularity (subtraction of likes and dislikes)	Behavior recalls by participants (%)
Intervention	Take a walk from home to school.	45.00	-	45.00	45.00	22.00 (88%)
Controls						21.00 (95.45%)
Intervention	Do your favorite sport less, take a taxi, and walk further	40.00	-	40.00	40.00	20.00 (80%)
Controls						15.00 (68.18)
Intervention	Smooth movements and walking in water	9.00	4.00	13.00	5.00	22.00 (88%)
Controls	Walk short distances and do not even use public transport.					20.00 (90.91)
Intervention	Run in the par in the morning	9.00	5.00	14.00	4.00	19 (76%)
Controls	Walk a little faster while walking					7 (31.82%)
Intervention	Use the stairs on the subway	13.00	1.00	14.00	12.00	17.00 (68%)
Controls	Increase the use of bikes, skates, and skateboards in our everyday life					14.00 (63.64%)
Intervention	Walk while studying instead of sitting and studying.	15.00	5.00	20.00	10.00	14.00 (56.00%)
controls	Do your favorite sport					5.00 (22.73%)
Intervention	less take a taxi and walk further	6.00	8.00	14.00	-2.00	18.00 (72%)
controls	Smooth movements and walking in water					17.00 (77.27%)
Intervention	Walk short distances and do not even use public transport.	2.00	12.00	14.00	-10.00	22.00 (88%)
controls	Run in the par in the morning					20.00 (90.91%)
Intervention	Walk a little faster while walking	13.00	3.00	16.00	10.00	16.00 (64.00%)
Controls	Use the stairs on the subway					13.00 (59.09%)
Intervention	Increase the use of bikes, skates, and skateboards in our everyday life	14.00	3.00	17.00	11.00	19.00 (76%)
Controls						8.00 (36.36%)

*The statistics only implies to participants

Table 3: Comparison of study groups in recalling behaviors 1 week after the intervention

	Sample size	Intervention duration (min)	Intervention model	Mean of behavior recall (out of 10)	Std. deviation
Intervention	25	60	Gamification	7.56	2.29
Controls	22	60	Traditional teaching	6.36	1.61

gamification on the prospective perception of individuals with sports field management jobs revealed higher effectiveness of gamification in learning strategic thinking than traditional methods.^[23]

Generally, gamification is assumed as a way in which “game thinking” can engage participants and change behaviors in real and nongaming contexts. Papers that discuss the development of innovative interventions indicate that gamification improves the health and quality of life.^[24] In a study investigating the game thinking in the context of physical activity (active school travel) on children aged 8–10 years, the experimental group showed a moderate to a severe increase in physical activity.^[25]

To put it in a nutshell, one can conclude that a substantial body of research in the field of gamification is consistent with the current research which confirms the significance of this study.

On the other hand, it deserves attention that many epidemiological studies have consensus on the reducing

pattern of physical activities level from adolescence to adulthood^[26,27] in the sense that effective interventions to increase physical activity in order to prevent diseases and having an active living in the early years of adolescence are necessary.^[24]

In a study that examines the effect of the physical activity program within the school to promote physical activity and fitness in children and adolescents aged 6–18 years, the final result shows that school-based education on physical activity has a positive impact on lifestyle and physical health of adolescents and promotes physical activity in students.^[28] Findings of a research on the effect of educational intervention on knowledge, attitude, and behavior about physical activity among grade one male student of high schools revealed the effectiveness of educational intervention and, as a result, increased knowledge and attitude of students in the experimental group compared to the controls regarding physical activity which led to an increased physical activity among case populations.

It is widely agreed that most problems during adolescence are behavioral. On the other hand, almost all normal and abnormal behaviors of adulthood have their root in earlier periods of development which can affect the whole person's life.^[29] Hence, the implementation of educational interventions to increase and promote physical activity is a health priority.^[30]

Studies conducted by the researchers in the field of educational games have demonstrated that although games lead to desirable educational outcomes and pave the way to achieve educational goals, the use of the game in the field of education has been neglected and has not yet found its proper place in the practice of education and research. As a result, there is a dearth of research the very little papers have been published in this regard.^[31]

Despite the remarkable results of this intervention, there were limitations in its implementation such as the number of participants.

To summarize, gamification is growing as an innovative educational model in the world whose effectiveness has been proven in various fields.

However, this method has not been widely practiced in Iran in the sense that little documentary experiences are available on this subject in the cultural context of Iran.

Accordingly, it is suggested that this educational approach be taken into account in educational planning in order to increase learning efficiency in different areas; and school educators are proposed to be trained so that they could acquire the capability to design and implement these educational models.

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Conflicts of interest

There are no conflicts of interest.

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