

EFFECTS OF A STAGE-BASED INTERVENTION ON EXERCISE SELF-EFFICACY

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ABSTRACT: Studies on the changes of physical activity patterns demonstrated that physical activity rates decline sharply in adolescence and goes on well into adulthood. Psychological readiness, not physical readiness and facilities, is likely to be the main barrier to activity for most of the people. This seems to signify the importance of designing interventions to improve psychological factors related to exercise behavior willingness. This study evaluated the effect of an intervention contained strategies related to psychological factors of exercise behavior. Fifty-six sedentary adolescents completed an assessment at baseline, 2 months, and 4 months. Experimental group participants received the intervention lasting for 16 weeks and consisting of a 30-minute session every week with the aim of raising learners' awareness about the factors affecting intention to physical activity. Control group attended physical education classes based on the guidelines of the Ministry of Education. Changes in psychological variables were compared between groups using analysis of two-way repeated measure ANOVA. The interaction between group and test was statistically significant, $F(2, 108) = 127, P = .01, \eta^2 = .702$. There was a significant difference between the scores of self-efficacy in the 3 times measurements in the experimental group. It can be concluded that the stage-based intervention had a significant positive effect on self-efficacy hence enhancing sedentary students' intention towards physical activity.

Keywords: Physical activity, Sedentary, Self-efficacy, Transtheoretical Model

1. INTRODUCTION

Health behavior refers to any activity undertaken by an individual for the purpose of promoting, protecting, or maintaining health as well as preventing or detecting diseases [1]. Accordingly, regular physical activity can be also regarded as a health behavior, because this behavior helps individuals maintain and promote their physiological health through improving cardiovascular endurance, as well as improve immune system function [2-4]. Strong evidence showed that physical activity influences individuals' psychological health as well [5] such as enhancing self-esteem, cognitive functioning and reducing anxiety, stress and depression [6].

Despite the benefits of regular physical activity for health, more than 60% of the world's population were considered sedentary, failing to be active for at least 30 minutes daily doing moderate intensity physical activity [7]. Studies on the changes in physical activity patterns showed that physical activity rates decline sharply in adolescence to 75% inactivity and they continue to be low throughout adulthood [8, 9]. This seems to signify the importance of designing interventions for adolescents in order to improve their intention to engage in exercise behavior.

In the context of Iran, patterns of sedentary behavior bear some similarity to the rest of the world, and adolescents constitute a major portion of the society (81.5%) that is not sufficiently physically active [8, 10]. The study by Kelishadi, Razaghi [11] on elementary, middle, and high school students showed a significant decrease in physical activities among the girls during high school. Moreover, studies have been confirmed sedentary behavior among Iranian adolescent girls [10, 12] and they showed that only 35.9% of girls but 64.1% of boys were in the action or maintenance stages of physical activity.

Psychological readiness, not physical readiness and facilities, is likely to be the main barrier to activity for most people [13]. Many people consider the idea of starting a performance or an action, but they usually fail to realize it. Some people might engage in some physical activity but have not quite figured out how to make it a habit of sufficient frequency and duration. The significance of assessing psychological constructs of change becomes more salient when a researcher attempts to determine what can encourage the unmotivated individuals to consider leading a more active lifestyle [13].

Behavioural change related to physical activity have been studied by numerous cognitive

behaviour models [14]. The most important factors to consider in changing physical activity behaviour probably include beliefs related to physical activity, attitudes and self-efficacy, motivations and barriers, and formulation of self-perceptions and identity related to physical activity. However, the issue of behavior change has not been tackled sufficiently as most of the intervention studies on adolescents have not been successful since they have not identified the root causes of inactivity among adolescents.

According to the transtheoretical model (TTM), which is a combination of several theories of psychotherapy related to behavior change [15], self-efficacy is one of the several psychological constructs contribute to behavior change among individuals. Within the framework of the TTM, since people have different motivation levels, or change readiness, they require different interventions. For this study, the stages of change are considered in conjunction with the constructs of processes of change, decisional balance and self-efficacy in terms of both intervention content and outcomes. The stages of change represent specific collections of intentions, attitudes and behaviors which are related to one's change cycle status [15].

Self-efficacy describes the degree of confidence one has in the ability to perform a certain physical activity [16]. Sedentary students did not possess or make use of these essential psychological factors to improve their intention to change their sedentary behavior, engage in physical activities, and maintain a more active lifestyle [8, 12].

The public health community is becoming increasingly interested in the potential contributions of school physical education to child health. School physical education is seen as an ideal site for the promotion of regular physical activity because up to 97% of students participate in some sort of physical education program. For maximal public health benefit, school physical education programs should prepare children for a lifetime of physical activity.

A number of interventional studies used stages of change to assess changes in individuals' physical activity behavior because of implementing various psychological strategies. Although the number of intervention studies on adolescents' willingness to engage in physical activity in the context of school and physical education courses is very limited. This seems to signify the need to conduct more stage-based intervention studies on psychological constructs in school settings to motivate students to engage in physical activity. Therefore, this study aimed to design an intervention based on TTM in the school context to evaluate the effect of the psychological

strategies on the exercise self-efficacy (SE) among Iranian sedentary students.

2. METHOD

2.1 Participants

Prior to the beginning of this research project, a pre-screening survey was conducted using the stages of change questionnaire to identify the population of sedentary students from a high school in Mashhad, Iran. This research was conducted in the first semester of 2014 on Autumn. Based on the result of given questionnaire, 247 of students were in precontemplation, contemplation and preparation stages (sedentary stages) who were considered as the population of the current study (female, $M_{age} = 16$ years ($SD = 1$)). Fifty-six students (15% more than the estimation of G-Power) were randomly selected as the participants and were assigned into experimental and control groups with 28 students in each group, respectively. This study assessed students' current exercise behavior, their intention to engage in regular physical activity, and Self-efficacy related to physical activity. A consent forms (parental consent forms for those younger than 18 years) were obtained for all subjects.

2.2 Procedure

At the onset of the study, the stages of change questionnaire [13] was given as pre-test to all participants in order to determine their stages of physical activity as well as possible differences between the participants in the groups in terms of their stages of change before starting the treatment phase of the study. Self-efficacy questionnaires were also given to participants at pre-test in order to determine any psychological differences prior to the treatment phase of the study.

Subsequently, the participants in the experimental group received a TTM stage-based intervention lasting 16 weeks and consisting of a 30-minute session every week for the duration of the treatment. The intervention was designed based on guidelines by Marcus and Forsyth [13]. It involved consciousness-raising assessed by awareness-raising questions, discussions, and speeches about the benefits of being physically active; watching film segments and discussing the importance of physical activity; and modeling activities with the aim of raising learners' awareness about the factors affecting intention to physical activity as well as the strategies and processes used to improve students' willingness to become physically active.

The participants in the control group attended physical education classes based on the guidelines

provided by the Ministry of Education that did not contain any awareness-raising activities about physical activity. After two months from the beginning and also at the end of the treatment phase at four month, two post-tests were administered to the learners in both groups to determine their stages of physical activity and related psychological factors. The results obtained from the pre-tests, post-test 1, and post-test 2 were analyzed to determine the effect of the treatment on sedentary students' self-efficacy related to physical activity.

2.3 Instruments

A set of questionnaires was used divided into two parts. The first part contained questions assessing the demographic profile of sedentary high school students while part two contained TTM questionnaires on stages of change and self-efficacy.

Stages of change questionnaire were used to assess participants' current stage of change measured on a dichotomous scale with *No* = 0 and *Yes* = 1, based on previous work in the areas of exercise studies [13]. According to the stages of change algorithm, If (question 1=0 and question 2=0), then they are at stage 1. If (question 1=0 and question 2=1), then they are at stage 2. If (question 1=1 and question 3=0), then they are at stage 3. If (question 1=1 and question 3=1, and question 4=0), then they are at stage 4. If (question 1=1 and question 3=1, and question 4=1), then they are at stage 5.

A five-item measure of self-efficacy [17] was also administered to assess participants' involvement in exercise. It was designed to measure one's confidence in his/her ability to exercise in various situations. Higher mean score of physical activity self-efficacy can determine whether an individual attempts an activity; the degree of persistence extended when difficulties are encountered, and ultimate success. Reliability analysis was done on all the items in the instrument which used Likert scale measurement. The Alpha coefficient for the instruments of the pilot test (answered by 20 local females, age 15 to 17) ranged from 0.858 to 0.927. The applicability of the questionnaire was confirmed. For the present study, feedback was requested from the advisory committee regarding readability, Persian language, clarity, and redundancy of items. The feedback provided by the pilot participants was also used to revise the instrument and provided content validity for the instrument.

2.4 Statistical Analysis

The Statistics Package for Social Science (SPSS) for Windows version 21 was used to analyze the data. Firstly, data was tested for normal distribution with the Kurtosis and Skewness test and for homogeneity of variances with Levene's test [18, 19]. Two-way repeated measures ANOVA design was conducted to analyze the data in order to compare the mean difference to measure whether there was any improve in the psychological variables and stages of change during intervention in the experimental group.

3. RESULTS

The main objective of this study was to evaluate the effect of a stage-based intervention on students' self-efficacy, as measured by self-efficacy of exercise inventory at baseline, two months, and four months. The results of two-way repeated measure ANOVA on self-efficacy score showed that the interaction between group and test was statistically significant $F_{(2, 108)} = 84.9$, $P = .01$, $\eta^2 = .611$ therefore to test the related hypothesis post hoc test (Bonferroni) was applied to compare the mean scores (Table I).

Table I. Result of ANOVA within – between subject effects

	Source	MS	F	P value	Partial Eta Squared
Self-efficacy	Test	6.83	24.18	0.01	0.309
	Group	18.8	36.09	0.01	0.401
	Test* Group	24.1	84.97	0.01	0.611

In order to show the efficacy of intervention, pre, post 1 and post-test 2 in both the experimental and control were compared. The result of post hoc test (Bonferroni) revealed that the difference between pre and post-test 1 in self-efficacy score among experimental group was significant ($p = .01$). The mean for the self-efficacy in experimental group increased 1.15 unit in post-test 1 and also there was significant difference between self-efficacy mean between post 1 and post-test 2 ($p = .01$). While the result for control group was not significant between pre-test and post-test 2 ($p = .08$). There was no significant difference between self-efficacy mean between post-test 1 and post-test 2 ($p = .08$) in control group (Table II). According to the results, the students who received stage-based intervention improved more remarkably in their self-efficacy compared to those who received no specific intervention in the control group.

The significant difference between the mean scores of the experimental group and the control group showed that the intervention improved students' confidence in their ability to successfully perform a particular activity, and improve in their perceptions that they can perform physical activity successfully increased their engagement in physical activity.

Table II: Result of Bonferroni Post Hoc test

Group	(I) TEST	(J) TEST	MD	SE	P value	PES
Cont	1	2	.300	0.127	.06	
		3	.614	0.159	.08	0.218
	2	3	.314	0.139	.08	
Expe	1	2	-1.15	0.127	.00	
		3	-2.00	0.159	.00	0.754
	2	3	-.850	0.139	.00	

Note: Cont - control group
Expe - experimental group
MD - mean difference
PES - Partial Eta Squared

4. DISCUSSION

In the current study, students in the intervention group reported significantly higher self-efficacy at two months and four months compared to participants in the control group. These findings are similar to the previous work that reported an increase in self-efficacy from pre-test ($M = 3.4$) to post-test ($M = 3.8$) in sedentary individuals after a brief intervention [20]. In the current study, the mean of self-efficacy improved from 2.3 in the pre-test to 4.3 in the post-test 2. Considering that acquiring and changing attitudes and behaviors can be a long and complicated process (Marcus and Forsyth, 2009), the more improvement in the current study could be because of the duration of intervention, which was longer than the study by Pinto, Lynn [20] who developed six-week intervention. The results suggest that longer duration of intervention (more than 3 months) might be required to encourage change in motivational readiness for physical activity.

The findings of this study are in contrast with those of Boonchuaykuakul [21] who reported that self-efficacy did not improve during the stage-based intervention. This lack of change in self-efficacy may have emerged because the intervention strategies for precontemplators, contemplators, and preparers did not strongly focus on improving engagement on physical activity rather than the cognitive aspect of self-efficacy. It has been demonstrated that using the four information sources of self-efficacy, including verbal encouragement, performance accomplishment, vicarious learning, and

physiological and affective responses, have a positive effect on confidence to initiate and maintain physical activity (Lee et al., 2007). The results of the present study is also in contrast with the results of a study by Nelson [22], which indicated that the intervention group made no significant improvements in self-efficacy from pre-test to post-test.

According to [22], the intervention and control groups did not differ in self-efficacy because they became conditioned to particular responses on the questionnaires from previous testing. The measures used were short; hence, it would not have been difficult to remember the answers from one session to the next. The length of time of the study may have also affected the study results. Behavior change is a time-dependent variable and the duration of four months may not have been a long enough to result in significant changes in behavior, especially in self-efficacy.

5. CONCLUSION

The findings of this study would be useful for physical education teachers Ministry of Education, and researchers. They can undertake stage-based intervention in the physical education course in order to motivate sedentary students to put more time and effort into doing that activity. Moreover, it can encourage sedentary students to be more persistent when they encountered difficulties, which can help them achieve the ultimate success towards changing their sedentary behavior and engaging in physical activity.

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