

Participation in Homework Exercise and Its Effects on Physical Fitness in Turkish Adolescents

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ABSTRACT

The aim of this study was to evaluate whether or not self-monitored and directed physical fitness homework may improve selected physical fitness indices of Turkish adolescents. The participants of this study were 174 students aged between 11 and 13 years from two secondary school located in Manisa. For the randomized two-group pretest-posttest design, the students (n=174) were randomly grouped as control (females=38 and males=50) and homework (females=40 and males=46) groups. The control group continued as normal with its daily activities and physical education classes, while the homework group was also assigned a homework exercise program. Both groups were measured at the beginning and end of the 14 weeks by using running and physical fitness tests. It was found that the homework group had higher scores in running tests and physical fitness tests than the control group. This study supports that teacher assigned; self-monitored and directed physical activity homework significantly improved the selected physical fitness characteristics of Turkish secondary school adolescents.

Key words: School based intervention, students, homework, physical activity.

INTRODUCTION

One of the main purposes of physical education is to promote the physical well-being of adolescents through physical activity (24). The optimistic assumption is that P.E will promote the physical activity and active life style that will bring physical as well as psychological benefits for young people (28). Regular physical activity may benefit adolescents by improving their aerobic fitness, muscular strength and endurance (25), controlling weight (17), helping bone development (8) and improving cardiovascular health such as decreased blood pressure, improved low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol, and the total cholesterol/HDL and LDL/HDL ratios in young people (13, 17, 29).

In addition, physical activity may assist adolescents in coping with stress and depression better (3, 21) and in having a more positive well-being than their less physical counterparts (5) and participation in sport and physical activity might bring about favorable changes in self-perceptions and perceived strengths (6, 10).

Despite all the well-recognized benefits, physical activity levels of young people are decreasing and possible health risks are increasing (23). In developed countries, such as the United States and United Kingdom, there are calls for action to increase the physical activity among youth. For example, reports and meetings in the U.S., such as Healthy People 2010

(2000), The Surgeon's general's 2001 report, and Action for Healthy Kids Summit (2003), are all calling attention to promoting physical activity among young people (1, 31, 32). The Healthy People 2010 objectives consider physical activity as a health indicator and provide goals to make children, adolescents, and adults more active. Recently, in the UK, the EPPI-Center (Evidence for Policy and Practice Information and Coordinating Center) published a report to emphasize the importance of promoting adolescent physical activity as a public health policy (9).

In fact, the purpose of promoting the physical well-being of adolescents as well as adults through physical activity is under question not only in developed countries but also in developing countries (World Health Organization [WHO], 2002). Turkish children are not immune from the dangers of inactivity, which results in becoming overweight and obese (18, 19). As a recent study in Turkey indicated (20), urban children (aged 9-11 years) are less active, watch more TV, and have a higher body mass index and skinfold thickness than the rural children. Recent research findings also showed that almost 40% of Turkish adolescents living in the city have no physical activity participation (2). In addition, an earlier study with a randomly selected population of 4,026 Turkish adolescents, aged between 7 and 18 years showed that 20.7% of females and 14.5% of males had low levels of physical activity (30).

Although it is not clear what kind of intervention will promote physical activity to help in a decline in overweight and obesity among adolescents, studies show young people who participate in some form of physical activity during their early life are most likely to adopt active life styles later in their life (23, 27). Therefore, school-based and non-school-based intervention programs focused on increasing physical activity and physical fitness levels are essential for healthy adolescents. Numerous school-based intervention programs appear to achieve a physical activity increase in young people. For example, the Child and Adolescent Trial for Cardiovascular Health (CATCH) 2.5-year intervention study (33), which provided a program to improve traditional PE classes by increasing opportunities for all to be more physically active, showed that moderate-to-vigorous physical activity levels of students in the intervention group improved compared to control group schools. Non-school based physical intervention programs also showed some benefits to improve adolescent's physical activity levels. However, in their recent review, Jago and Baranowski (2004) warn researchers about the limited success of non-school based interventions and encourage the researcher about the possibility for further development of these interventions (15).

The simple but important question is the reason for this study: Can teacher assigned, student-monitored and directed homework exercise be an effective intervention and help students improve their physical fitness? Researchers decided to use homework exercise as an intervention to encourage children to be physically active outside the classroom. It was expected that the physical activity routines that are assigned as homework would produce an increase in physical fitness. Therefore, the purpose of this study was to determine the effects of 14 weeks of homework exercise on the physical fitness levels of secondary school students.

METHOD

Participants and Setting

Two secondary schools (Ova Küme Evleri Elementary School and Eczacı Fadime Bolkan Elementary School), which are located in Manisa, were part of this study. The participant sample included students from 6th, 7th and 8th grade. School administrations and parents of the participants provided written informed consent for the study. The students were then randomly assigned to control (females=38 and males=50) and homework (females=40 and males=46) groups. The female and male homework group mean age was 12.9 ± 1.4 and

13.1 ± 1.3 , respectively. On the other hand, the females and males in the control group had mean age of 13.0 ± 0.9 and 12.9 ± 1.1 , respectively.

Procedures

The participants were recruited through announcements in two secondary schools. The informed consents were obtained from the school officials, parents, as well as students. All participants' measurements were completed in one week. During the first week, measurements were taken from physical tests such as the vertical jump, 30 m and 800 m run, 1 min sit up, and sit and reach. And then the 2 groups, control and homework, were formed. While the control group participated only in their PE classes (2 hours per week), the homework group had special homework which included a physical activity program plus they participated in PE classes at their school (2 hours per week). At the end of 14 weeks, both groups were measured again in terms of their physical variables.

Intervention

Participants in the homework group were given a homework sheet that included various physical activities (jogging, flexibility exercises, push-ups, bank dips, sit-ups, reverse sit-ups, etc.), the number of days for exercising, and self-evaluation checklist of performance. Every physical activity on the homework sheet was explained and demonstrated by the teacher. In addition, each student was given written directions to explain further how to do each physical activity. The main objective was to include relatively easy physical activities in the students' exercise homework sheet so that the student could follow them without any problem. Homework exercises were also planned to include several fitness components such as flexibility, strength, speed, and endurance. The homework group was asked to exercise 3 days a week by doing the physical activities on their homework sheet. In the homework group had written directions to explain further how to do each physical activity. By using check-lists, students in the homework group evaluated themselves for each activity by check marking the various statements such as "I fully completed", "I was not able to finish" and "I did not do it at all". It was assumed that such self-evaluations of performance would give self-feedback that they will try to show more effort when they do the same exercise next time. It was also feedback for the P.E teacher to evaluate what students can and can not do, which enabled to the P.E. teacher to provide help if the students needed. The researcher regularly communicated with the homework group students. As a result of student

communications, the researcher provided feedback to students to answer questions about how to do their physical activities in their homework.

Measures

Physical as well as psychological measures were collected through field-based fitness tests and a questionnaire. The Freedson and et al. (2000) review shows that field-based fitness testing in children and youth can be used to educate children about physical activity and promote moderate levels of physical activity participation and it is suitable for children between 5 and 17 years of ages and older. In addition, all field-based fitness tests used in this study have some level of validity and reliability (14).

In order to evaluate the physical fitness levels of the students, the sit and reach test, 1 min sit-ups, vertical jump, 30 m run, and 800 m run were utilized. Before each test, the tester demonstrated the appropriate way of doing the tests and the students were given the opportunity to warm up and practice.

The Sit and Reach Test was used to determine the flexibility of the lower extremity and trunk. The participants were asked to sit shoeless on the floor, with their legs outstretched, and with the soles of their feet against the sit and reach box. From this starting position, the participants then rested their hands with thumbs touching the top of the apparatus. They were then asked to reach forward as far as they could and to hold that position for a count of three. The score was determined by the distance reached by the fingers. Three trials were obtained and the highest score was recorded for analysis.

One min. Sit-up Test was used to assess the endurance of abdominal muscles. Participants were placed in the supine position with the knees flexed at 90° and their fingers resting on their upper legs. The participants were asked to curl their head, shoulders and trunk toward their knees and the return to the original position. The number of times they could repeat was recorded for analysis.

Vertical Jump Test was used to measure the lower extremity muscle strength. The participants, standing with their right hips leaning against a wall, were asked to hold a piece of chalk in their right hand and point up to the highest level that they could reach on the wall. Each participant then jumped vertically as high as possible at a 20 cm distance from the wall, and the distance he/she jumped was measured. The participants performed three jumps with 2 min of rest between trials, and the highest score was recorded for analysis.

30 meter Run was used to measure the running agility of the participants. Each participant took position behind a start line; whenever they were ready they would start running the 30 m distance as fast as they could. The test giver started the time when the participant started running and stopped the time when the participant passed the finish line. Each participant did three runs with 2 min of rest between trials. The fastest run time was recorded for analysis.

800 meter Run was used to assess the cardio-respiratory endurance of the participants. Simply, the participants ran or walked the 800 m distance and tried to complete the given distance as fast as possible. Test givers started the chronometer as soon as the participants left the start line and stopped it when they finished the 800 m distance. The time each participant completed the 800 m was recorded for analysis.

Data Analysis

A paired samples *t*-test was used to compare the differences between before and after treatment with the same group and an independent sample *t*-test was used to compare the differences between the control and homework groups. All data were reported as means and standard deviations. The level of significance for statistical tests was set at $p < .05$. As suggested by the APA (33), effect size and percent improvements were also presented.

RESULTS

Overall Homework and Control Group Difference at the end of the 14 weeks

As Table 1 shows, when the two groups were compared in terms of overall scores at the end of the 14 weeks, the homework group had significantly higher scores in all running tests and physical fitness tests ($p < 0.001$).

Gender Difference between the Control and Homework groups at the end of 14 weeks

There were significant gender differences between males and females in the control and homework groups. Males in both groups had significantly better scores in the 800 m and 30 m running tests, vertical jump, and 1 min-sit up than the females in both groups ($p < 0.001$). Females in both groups had significantly better sit and reach scores than males ($p < 0.001$). The 800 m running test had the largest gender difference with an effect size of 1.08.

Table 1 also shows same gender difference in both groups. Females in the homework group had better scores than females in the control group in all running tests and physical fitness scores (ES ranged between

0.52 Moderate and 1.35 Large). In the same way, males in the homework group out-performed males in the control group in all categories of measurements (ES ranged between 0.44 Small and 1.09 Large).

Table 1. Physical fitness scores for all females and males in the homework and control groups after 14 weeks of intervention

	Control (n=86)	Homework (n=88)	t	p	Effect Size
Running tests					
800 m Running test (min)					
Females	4.86±.60	4.55±.58§	-2.31	0.023	0.52
Males	4.48±.48	4.05±.32†	-5.32	0.001	0.92
Overall	4.66±.57	4.27±.51*	-4.82	0.001	0.69
30 m Running test (s)					
Females	6.13±.37	5.82±.36§	-3.71	0.001	0.83
Males	5.68±.50	5.47±.40†	-2.35	0.020	0.44
Overall	5.89±.49	5.62±.42*	-3.90	0.001	0.55
Physical fitness tests					
Vertical Jump (cm)					
Females	26.63±5.26	32.53±6.22§	4.53	0.001	1.05
Males	30.80±7.54	36.62±6.79†	3.97	0.001	0.77
Overall	28.86±6.87	34.80± 6.82*	5.77	0.001	0.86
1 min sit-up test (rep)					
Females	18.43±5.99	26.42±6.54§	5.63	0.001	1.35
Males	25.00± 7.96	33.22±7.90†	5.07	0.001	1.09
Overall	21.94± 7.80	30.28±8.00*	6.93	0.001	1.06
Sit and reach test (cm)					
Females	4.88± 5.63	12.16±6.36§	5.35	0.001	1.30
Males	.65± 8.31	9.58± 6.22†	5.98	0.001	1.08
Overall	2.62±7.40	10.69±6.30*	7.68	0.001	1.09

Data are presented as the mean ± SD; *, §, †, indicates significant difference between the control and homework groups, between females and males in the control and homework groups, respectively. ES=.2, small difference; ES=.5, moderate difference; ES=.8 large difference.

Table 2. Gender difference in physical fitness scores for the control and homework groups after 14 weeks of intervention

	Females (n=86)	Males (n=88)	t	p	Effect Size
Running tests					
800 m Running test (min)					
Control	4.86±.60	4.48±.48§	3.19	0.002	.70
Homework	4.55±.58	4.05±.32†	4.94	0.001	1.08
30 m Running test (sn)					
Control	6.13±.37	5.68±.50§	4.73	0.001	1.02
Homework	5.82±.36	5.47±.40†	4.23	0.001	.92
Physical fitness tests					
Vertical Jump (cm)					
Control	26.63±5.26	30.80±7.54§	-3.01	0.003	.63
Homework	32.53±6.22	36.62±6.79†	-2.90	0.005	.63
1 min sit-up test (rep)					
Control	18.43±5.99	25.00± 7.96§	-4.27	0.001	.93
Homework	26.42±6.54	33.22±7.90†	-4.29	0.001	.94
Sit and reach test (cm)					
Control	4.88± 5.63§	.65± 8.31	2.78	0.007	.59
Homework	12.16±6.36†	9.58± 6.22	1.90	0.060	.41

Data are presented as the mean ± SD; §, †, indicates significant difference between females and males in the control and homework groups, respectively. ES=.2, small difference; ES=.5, moderate difference; ES=.8 large difference.

Table 3. Comparison of before and after intervention measurements between the control and homework groups

	Before intervention	After intervention	<i>t</i>	<i>p</i>	Percent Improvement
Running tests					
800 m Running test (min)					
Control	4.67± .56	4.66± .57	0.681	0.497	0.15
Homework	4.48± .57	4.27 ± .51‡	13.25	0.001	4.73
30 m Running test (sn)					
Control	5.91± .49	5.89± .49	1.67	0.097	0.25
Homework	5.74 ± .44	5.62± .42‡	17.22	0.001	2.14
Physical fitness tests					
Vertical Jump (cm)					
Control	27.41± 6.59	28.80± 6.87§	-5.59	0.001	5.29
Homework	30.05 ± 6.33	34.85± 6.82‡	-14.94	0.001	15.97
1 min sit-up test (rep)					
Control	21.60± 7.82	21.94 ± 7.80	-1.950	0.054	1.57
Homework	24.50 ± 8.24	30.28± 8.05‡	-19.19	0.001	23.60
Sit and reach test (cm)					
Control	1.70± 7.72	2.62± 7.46§	-5.02	0.001	54.12
Homework	2.92± 6.66	10.69± 6.38‡	-20.06	0.001	266.10

Data are presented as the mean ± SD; ‡,§, indicates significant difference before and after intervention in the control and homework groups, respectively.

Group Differences before and after intervention for the Control and Homework Groups

Table 3 presents, before and after intervention measurements for the running and physical fitness tests for the control and homework groups. Paired samples t-tests revealed that, 14 weeks after the start of the program, running test scores and physical fitness values increased significantly for the homework group ($p < 0.001$).

In addition, certain control group physical fitness values (vertical jump and sit and reach test) increased significantly ($p < 0.001$). Although the control group had a significant increase in certain physical fitness values, the percent improvements were higher for the homework group as opposed to the control group over the 14 week period (Table 3).

DISCUSSION

Physical as well as psychological benefits of physical activity on young people in particular, were well documented (7,11,12). Despite the benefits, the physical activity level of youth is either decreasing or already low all over the world, particularly among females (22). At this point, interventions that target an increase in physical activity in the daily life of young people are in demand in almost all countries of the world (4). Therefore, the purpose of our study was to propose and apply a teacher-assigned, student-monitored and directed exercise homework intervention program to increase the physical fitness levels of young people.

This study supported the idea that exercise programs do not need to be very complicated to provide improvements in the physical fitness levels of adolescents. As it is hypothesized, the self-directed and managed homework with informal supervision by P.E. teacher helped males and females to improve their physical fitness indices including aerobic fitness, strength and speed (Table 1). As recent review indicates, longitudinal studies with youth, 8 years and older, provide evidence that physical activity help them to improve their aerobic fitness as well as muscular strength and endurance (25). This study agrees with this recent review that the homework group students improved their 800 m and 30 m running, vertical jump and 1-min sit up scores more than the control group after following the 14 week physical activity intervention program. Students in the homework group also improved their flexibility more than the control group.

Over all, the homework group out-performed the control group in all the physical fitness indices. It's argued that since the association between physical activities and being overweight status appears to be present (16), any attempt/effort that helps adolescents to be more active is worth studying.

This study supports that teacher constructed and student directed homework assignments might be an alternative way to promote physical activity for female adolescents. Females in the homework group improved their physical fitness status during the pre-intervention to post-intervention time period. In general, females were less active than males in terms of

physical activity (18). In addition, promoting physical activity is particularly important for females, or minority or low-income youth since these populations tend to have more sedentary life styles (11,12,26). Therefore, any intervention that might influence females' possibility of being physically active is an important endeavor for researchers.

In conclusion, this longitudinal study revealed that teacher assigned, self-monitored and directed physical activity homework significantly improved the selected physical fitness characteristics of Turkish secondary school adolescents.

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