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# The effect of 12-week step aerobic training on certain physical parameters in girls aged 8–12

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*This study was created by taking some variables from the author's master's thesis*

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**Abstract.** The aim of this study is to examine the effects of 12-week step aerobics training on certain physical parameters of girls aged 8–12. A total of 132 children aged 8–12 participated in the study, including 66 in the experimental group and 66 in the control group. While the experimental group underwent 12 weeks of step aerobics training, no exercise or training program was applied to the control group. Data related to measurements taken before (pre-test) and after (post-test) the step aerobics training-height, weight, sit-and-reach flexibility test, vertical jump, standing long jump-were collected using valid measurement techniques. For the statistical analysis of the research data, the SPSS program was used. Mean values and standard errors of all participants' parameters were calculated, and paired "t" tests were used to determine differences between the two measurement times, while independent (unpaired) "t" tests were conducted to determine group differences. The Shapiro–Wilk technique was applied to test whether the measurements followed a normal distribution. As a result, a significant difference was found in the pretest and posttest height, standing broad jump, vertical jump, and left-right and double-foot flexibility test measurements of the experimental group following 12 weeks of aerobic step training. A comparison of the pretest and posttest values of the control group also revealed a significant difference in height, vertical jump, and right-hand flexibility. In addition, in the comparison of the pretest-posttest measurement values of the two groups, it was found that there was no significant difference in both measurements between height, weight, standing long jump and left flexibility measurements, but there was a significant difference in the posttest values between vertical jump, right and double flexibility measurements.

## Introduction

School sports and physical education can help children develop a positive self-concept and resist the destructive and pervasive images imposed by societal demands. Not all children may be good at sports; however, all children can be encouraged to enjoy and appreciate certain aspects of sport. While some children enjoy playing football, others may prefer engaging in different activities to stay fit. Some like playing badminton, while others may prefer officiating matches, coaching, or being knowledgeable spectators. There is something beneficial for almost everyone in physical education and sports (Laker, 2000). Physical activity and sports activities support social, physical, and mental development (Kar, 2022). An environment should be created for children to be aware of their bodies' activity and fitness needs. The positive effects of physical activity, which encompasses the muscular, cardiovascular, respiratory, and circulatory systems, on the body are an important part of physical education. Understanding what physical fitness is, why it's important for a healthy life, the relationship between diet and activity, how various elements such as speed, strength, and endurance are tested, what their own fitness level is, and how to maintain and improve it is essential for a healthy life (Özer & Özer, 2005). Aerobic capacity, body composition, flexibility, muscular strength, and endurance are included within this context. These components are essential for measuring physical health and maintaining and improving children's optimal performance (Mengütay, 2005). Aerobic exercises, when performed regularly, play an effective role in children's physical and cognitive development,

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maturation, and socialization. Numerous studies have shown that aerobic exercises have positive effects on many parameters of children and adolescents. Aerobic exercises are often recommended starting from early childhood to support healthy growth, development, and bone-muscle system improvements (Brooke-Wavell & Stensel, 2008). Moreover, aerobic exercises have been reported to contribute to weight control, prevention of obesity, maintaining low heart rates, improving cardiovascular systems, enhancing resistance to diseases, and having protective effects (e.g., childhood asthma) in later years (Zahner et al., 2006).

Step-aerobics is a type of sport consisting of body movements performed by taking rhythmical steps to the side, forward, or in circular patterns in sync with music of various tempos. A step board is used when needed to increase the difficulty of the movements. By increasing rhythm or intensity, aerobic work can become anaerobic. In addition, it provides a more enjoyable exercise opportunity especially for girls. Exercise therapy helps individuals lose weight, maintain weight loss, and reduce the risk of complications. Additionally, regular exercise increases fat loss and helps preserve lean body mass (Salihli, 2017). It is stated that combining aerobic exercise with diet enables more effective weight loss without muscle loss compared to dieting alone (Yaprak, 2004). Step-aerobic exercises combined with a low-calorie diet are considered one of the most effective methods for weight loss (Sözen, 2007).

Among physical activities, step-aerobic dance is one of the most commonly practiced methods (Kin et al., 1996). Many activities such as walking, running, cycling, swimming, aerobic dance, and step dance can be performed depending on the individual's interest to improve physical fitness (Özdöl-Pınar et al., 2018). Step, aerobics, and dance are group activities performed with music at specific tempos, involving coordinated movements of large muscle groups. These exercises help protect and improve cardiorespiratory health and are becoming increasingly popular in fitness and weight-loss programs (Kurt et al., 2010; Özdöl-Pınar et al., 2018; Yenigün et al., 2007).

Step-aerobics is a combination of steps performed on a specially designed platform with adjustable height and shock-absorbing properties that reduce the load on the ankles and knees, integrated with aerobic dance movements. Different movement patterns are combined in various choreographies in this way. A step-aerobic exercise program for children should, first, include a variety of physical activities to enhance participants' physical skills. Second, activities at the beginning of the program should focus on building self-confidence and perceived self-efficacy. Third, a training program should include both group-based and individualized components. Fourth, the program must be enjoyable and contain a wide range of exercises. Fifth, a dynamic program should preferably be developed in an open format (Özdöl-Pınar et al., 2018). Recently, life-kinetic exercises have gained importance. Life-kinetic exercises, which are known to improve motor coordination in children, facilitate movement education, accelerate learning, and have positive effects on individuals, are becoming increasingly popular (Çimen, 2021).

Although numerous studies have examined aerobic exercise in children, controlled studies focusing specifically on step-aerobic training in girls aged 8–12 years remain limited. The purpose of this study is to examine the effects of a 12-week step-aerobic training program on certain physical parameters of girls aged 8–12 years.

## Materials and Methods

### Type of Research

The study was conducted using an experimental model with a pre-test/post-test step-aerobic group (experimental) and a control group that did not participate in any activity. In the model, the dependent variables were height, body weight, sit-and-reach flexibility test, vertical jump, and standing long jump measurements of girls aged 8–12 years, while the independent variable was "step-aerobic activities."

### Population and Study Group

The study group consisted of a total of 132 girls aged 8–12 studying at Selçuklu Diltaş Educational Institutions in Konya in 2017, including 66 girls participating in step-aerobic activities (experimental group) and 66 girls not participating in any sports activities or branches (control group). The experimental group received step-aerobic lessons for 12 weeks, once a week for 70 minutes. The limitation of the study includes the fact that the training program was conducted for a duration of 12 weeks and was limited to one session per week. Children who voluntarily and regularly agreed to participate in the study, met the inclusion criteria, and had no health problems were included, while participants who met the exclusion criteria such as absenteeism,

injury, missing measurements, etc., were excluded from the analysis. In addition, the age range of 8–12 years covers a broad developmental period. Therefore, the possible effects of biological maturation and developmental differences are also considered among the limitations of the study. The experimental group was divided into three subgroups: 8–9 years, 11 years, and 11–12 years. Step-aerobic sessions were held on Tuesdays for the 11-year-olds, Wednesdays for the 8–9-year-olds, and Thursdays for the 11–12-year-olds. Each group completed 10 minutes of warm-up and stretching, followed by 70 minutes of step-aerobic practice, and the last 10 minutes consisted of cool-down, between 08:50 and 10:20. The control group did not receive any additional training or practice apart from regular physical education lessons.

### Data Collection Tools

**Height:** Participants' height was measured with a height scale sensitive to 0.01 cm. Measurements were taken barefoot in anatomical position, with heels together, feet flat, breath held, and the head in the frontal plane, with the headboard touching the vertex. Results were recorded in centimeters.

**Body Weight:** Body weight was measured using a King electronic scale with 99% accuracy. Measurements were taken barefoot with light clothing, and recorded in kilograms.

**Standing Long Jump:** Children performed a standing long jump from a shoulder-width stance using arm swing to support leg thrust. The distance from the starting line to the nearest heel upon landing was measured with a 4-meter measuring tape (Günay et al., 2017).

**Vertical Jump:** Children stood facing a wall with feet flat on the floor and reached upward with one hand to mark maximum reach height. The participant holds the chalk at the tips of the fingers and marks the highest point that can be reached on the wall while standing. Then, the participant jumps vertically from a standing position and marks the highest point reached on the wall. The distance between the two marks is measured. Three attempts were allowed, and the best value was recorded (Günay et al., 2017).

**Sit and Reach Test:** The children are seated on the floor with their feet placed flat against the test platform. They are instructed to lean forward from the trunk and reach as far as possible with their hands positioned in front of the body, without bending the knees. At the furthest point reached, they are asked to hold the position for 1–2 seconds without flexing forward or backward. The test is repeated twice, and the higher value is recorded (Günay et al., 2017).

### Data Analysis

The research data were analyzed using SPSS. Mean values and standard errors for all participants were calculated. Paired t-tests were used to determine the differences between pre-test and post-test measurements, and independent t-tests were used to determine differences between groups. The normality of height, weight, standing long jump, vertical jump, and flexibility measurements was assessed using the Shapiro-Wilk test. Analyses indicated that pre-test and post-test measurements met the assumptions of normal distribution ($p>0.05$). Therefore, parametric statistical techniques were used for analyses of these variables.

## Results

**Table 1.** Comparison of the Experimental Group's Pre-Test and Post-Test Height, Weight, Standing Long Jump, Vertical

| | | N | $\bar{X}$ | SS | t | p |
|---|---|---|---|---|---|---|
| **Height (cm)** | Pretest | 66 | 145,39 | 14,97 | 5,215 | **0,000*** |
| | Posttest | 66 | 146,38 | 14,86 | | |
| **Weight (kg)** | Pretest | 66 | 41,94 | 14,37 | 0,864 | 0,380 |
| | Posttest | 66 | 45,76 | 16.73 | | |
| **Standing Long** | Pretest | 66 | 97,52 | 9,89 | -4,957 | **0,000*** |
| | Posttest | 66 | 98,80 | 10,03 | | |
| **Vertical Jump** | Pretest | 66 | 16,59 | 3,53 | -9,286 | **0,000*** |
| | Posttest | 66 | 18,38 | 3,81 | | |
| **Flexibility Right Leg** | Pretest | 66 | 20,64 | 4,47 | -5,783 | **0,000*** |
| | Posttest | 66 | 22,15 | 4,52 | | |
| **Flexibility Left Leg** | Pretest | 66 | 20,98 | 3,89 | -8,228 | **0,000*** |
| | Posttest | 66 | 22,91 | 4,27 | | |
| **Flexibility Both Leg (cm)** | Pretest | 66 | 22,61 | 3,30 | -9,708 | **0,000*** |
| | Posttest | 66 | 24,74 | 3,88 | | |

*d*ifference between measurements ($p<0.05$).*

**Table 2.** Comparison of the Control Group's Pre-Test and Post-Test Height, Weight, Standing Long Jump, Vertical

| | | N | $\bar{X}$ | SS | t | p |
|---|---|---|---|---|---|---|
| **Height (cm)** | Pretest | 66 | 148,45 | 16,99 | -5,640 | **0,000*** |
| | Posttest | 66 | 149,02 | 16,74 | | |
| **Weight (kg)** | Pretest | 66 | 44,04 | 17,26 | -0,652 | 0,670 |
| | Posttest | 66 | 44,13 | 17,43 | | |
| **Standing Long Jump** | Pretest | 66 | 97,67 | 8,72 | -1,104 | 0,274 |
| | Posttest | 66 | 97,98 | 8,41 | | |
| **Vertical Jump (cm)** | Pretest | 66 | 16,64 | 3,62 | 2,297 | **0,025*** |
| | Posttest | 66 | 16,32 | 3,40 | | |
| **Flexibility Right Leg** | Pretest | 66 | 20,48 | 3,50 | 3,309 | **0,002*** |
| | Posttest | 66 | 19,94 | 3,87 | | |
| **Flexibility Left Leg** | Pretest | 66 | 20,42 | 3,37 | -0,842 | 0,403 |
| | Posttest | 66 | 23,51 | 3,64 | | |
| **Flexibility Both Leg** | Pretest | 66 | 21,68 | 3,60 | -0,864 | 0,391 |
| | Posttest | 66 | 21,77 | 3,70 | | |

*d*ifference between measurements (p<0.05).*

**Table 3.** Comparison of Pre-Test and Post-Test Measurements of the Experimental and Control Groups Using t-Test Results.

| | | | N | $\bar{X}$ | SS | t | *p* |
|---|---|---|---|---|---|---|---|
| **Height (cm)** | Experiment | Pretest | 66 | 145,39 | 14,97 | -1.098 | 0,274 |
| | Control | | | 148,45 | 16,99 | | |
| | Experiment | Posttest | 66 | 146,38 | 14,86 | -0,957 | 0,340 |
| | Control | | | 149,02 | 16,74 | | |
| **Weight (kg)** | Experiment | Pretest | 66 | 41.94 | 14.37 | -1,122 | 0,264 |
| | Control | | | 44,04 | 17,26 | | |
| | Experiment | Posttest | 66 | 45,76 | 16.73 | 0,226 | 0,791 |
| | Control | | | 44,13 | 17,43 | | |
| **Standing Long Jump (cm)** | Experiment | Pretest | 66 | 97,52 | 9,89 | -0,093 | 0,926 |
| | Control | | | 97,67 | 8,72 | | |
| | Experiment | Posttest | 66 | 98,80 | 10,03 | 0,508 | 0,612 |
| | Control | | | 97,98 | 8,41 | | |
| **Vertical Jump (cm)** | Experiment | Pretest | 66 | 16,59 | 3,53 | -0,073 | 0,942 |
| | Control | | | 16,64 | 3,62 | | |
| | Experiment | Posttest | 66 | 18,38 | 3,81 | 3.277 | **0,001*** |
| | Control | | | 16,32 | 3,40 | | |
| **Flexibility Right Leg (cm)** | Experiment | Pretest | 66 | 20,64 | 4,47 | 0,227 | 0,821 |
| | Control | | | 20,48 | 3,50 | | |
| | Experiment | Posttest | 66 | 22,15 | 4,52 | 3,070 | **0,003*** |
| | Control | | | 19,94 | 3,87 | | |
| **Flexibility Left Leg (cm)** | Experiment | Pretest | 66 | 20,98 | 3,89 | 0,894 | 0,373 |
| | Control | | | 20,42 | 3,37 | | |
| | Experiment | Posttest | 66 | 22,91 | 4,27 | -0,157 | 0,875 |
| | Control | | | 23,51 | 3,64 | | |
| **Flexibility Both Leg (cm)** | Experiment | Pretest | 66 | 22,61 | 3,30 | 1,541 | 0,126 |
| | Control | | | 21,68 | 3,60 | | |
| | Experiment | Posttest | 66 | 24,74 | 3,88 | 4,480 | **0,000*** |
| | Control | | | 21,77 | 3,70 | | |

*d*ifference between measurements (p<0.05).*

## Discussion and Conclusion

The purpose of this study was to examine the effects of 12-week step aerobics training on certain physical parameters in girls aged 8–12 years.

When the pre-test and post-test height measurements of the experimental and control groups were compared, no significant difference was found. However, a significant difference was observed in the pre-test and post-test height measurements *within* both groups. The lack of a significant difference between the pre-test and post-test height measurements may be attributed to the fact that the training sessions were limited to one day per week. On the other hand, the differences observed in height measurements within both groups can be explained by the developmental characteristics associated with the children's age. In a study comparing the physical fitness levels of boys and girls aged 10–12 who participated or did not participate in sports, Mazlumoğlu (2015) compared the height parameter between experimental and control groups and found no significant difference. Similarly, Diker et al. (2017), investigating the physiological and biomotor characteristics of tennis-playing children aged 9–13 and the influence of gender on performance, reported no significant differences in height. Both studies show similarities to our findings in terms of between-group comparisons. When the pre-test and post-test weight measurements were compared both within and between the experimental and control groups, no significant difference was observed. Danacı (2008) also found no significant differences in weight among adolescents aged 14–16 who participated in sports and those who led a sedentary lifestyle, which supports our results. At this point, it can be stated that step aerobics training may be partially beneficial for weight control. Furthermore, Babayiğit et al. (2002) reported that step aerobic dance applied to

university students contributed to weight loss, improved body composition, and reduced body fat percentage.

Regarding the standing long jump parameter, no significant difference was found between the pre-test and post-test measurements of the experimental and control groups. However, within-group analyses showed a significant difference in the experimental group but not in the control group. Sevim et al. (1996), in a study on handball players, stated that exercise programs and duration led to a significant increase in leg strength in female athletes. According to these researchers, leg strength plays an important role in standing long jump performance. Since step aerobics is largely based on leg strength, the significant improvement in the experimental group is consistent with their findings. In another study, Loko et al. (2000) reported that long jump performance increased linearly between ages 10–12 and remained stable from ages 13 to 17. These results partially support our findings. On the other hand, Veligekas et al. (2012), who examined long-jump, vertical jump, and sprint times (10 m and 20 m) in children aged 9–12 to determine the main contributors to long-jump performance, found no significant results—similar to our finding of no significant differences between groups. It should also be noted that puberty in girls typically begins around age 12, and that anthropometric parameters such as height, weight, leg length, and long-jump performance tend to have a stronger influence on physical performance after this age.

When the other parameters vertical jump and flexibility (right leg, left leg, and double-leg flexibility) were examined and the experimental and control groups' pre-test and post-test values were compared, significant differences were found in vertical jump, right-leg flexibility, and double-leg flexibility, whereas no significant difference was found in left-leg flexibility. Within-group analyses showed statistically significant differences in all flexibility and vertical jump parameters in the experimental group. In the control group, significant differences were found in vertical jump and right-leg flexibility, but not in left-leg or double-leg flexibility. Although significant improvements were observed in the vertical jump measurements of both groups, the children in the experimental group achieved higher scores compared to their peers in the control group. However, the fact that significant improvements were also observed in the vertical jump and right foot flexibility values of the control group, which did not receive any training intervention, limits the extent to which the improvements observed in the experimental group can be attributed solely to the step aerobics program. Altınöz (2010) reported significant improvements in vertical jump performance among girls aged 12–14 after an 8-week step aerobics program, this also partially alings with our findings. Liman and Atalay-Güzel (2008), in a study on 30 sedentary women, found that both aerobic-step and Pilates exercises resulted in significant improvements in strength, flexibility, anaerobic power, balance, and body composition. Similarly, Kin et al. (1996) evaluated flexibility before and after an 8-week step aerobics program in sedentary female university students aged 19–28 and reported improvements in flexibility, which parallels our study. Some studies have shown that the best age to develop the range of motion of the spine, shoulder girdle and hip joints is between the ages of 11 and 14 (Muratlı, 1997). The statistically significant improvements observed in all vertical jump and flexibility measurements of the experimental group, although limited, can be attributed to the step aerobics program implemented in the study. On the other hand, the lack of significant results in the control group for left foot flexibility, as well as the absence of significant differences in left and bilateral foot flexibility in the between-group comparisons, may be explained by the fact that flexibility development requires planned, regular, and daily stretching exercises.

In this study, the effects of step aerobics exercises applied to girls aged 8–12 years on certain physical parameters were examined. According to the findings obtained, when the pre-test and post-test measurements of the children in the experimental group were compared, statistically significant improvements were observed in height, standing long jump, vertical jump, right flexibility, left flexibility, and bilateral foot flexibility values. When the pre-test and post-test measurements of the children in the control group were analyzed, significant differences were found in height, vertical jump, and right flexibility parameters. This finding suggests that, in addition to the training frequency being limited to one day per week in the experimental group, natural changes related to growth and development may also have contributed to the observed results. Comparisons of the pre-test and post-test measurement values between the experimental and control groups revealed statistically significant differences in favor of the experimental group in vertical jump, right flexibility, and bilateral foot flexibility parameters. Although the

training intervention had certain limitations, this finding indicates that step aerobics exercises provide an additional contribution beyond the natural growth process, particularly in the development of lower extremity performance and flexibility.

Overall, it can be concluded that step aerobics exercises are an effective and feasible exercise method for improving physical fitness components in girls aged 8–12 years. Based on the research findings, step aerobics activities may be considered an alternative content for physical activity–based practices among school-aged girls. However, it should be taken into account that the results are limited by the duration of the study, training frequency, and sample characteristics. Future studies are recommended to include larger samples, encompass different age groups and genders, and compare longer intervention periods with higher training frequencies. In addition, evaluating parameters such as balance, coordination, strength, body perception, and psychosocial variables alongside physical parameters may contribute to a more comprehensive interpretation of the findings.

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**Conflict of Interest**

The authors declare no conflict of interest related to this article.

**Ethical Statement**

It is declared that scientific and ethical principles were followed during the conduct and writing of this study, and all sources used were duly cited. (Ethical approval was received from the Selçuk University Faculty of Sports Sciences Ethics Committee with decision number 40990478-050.99/ dated 05.01.2017).

**Author Contributions**

**Study Desing:** ÖH, GG.
**Data Collection:** GG, ÖH.
**Statistical Analysis:** GG, ÖH.
**Manuscript Preparation:** ÖH.

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