OPEN ACCESS
Advances in Health and Exercise

ORIGINAL RESEARCH

The effect of basic table tennis training on some physical and physiological characteristics of children

İskender Güler[1], Mehmet Şen[2]

[1] Faculty of Education, Amasya University, Amasya, Türkiye. [2] Institute of Health Sciences, Amasya University, Amasya, Türkiye.

Received:
August 15, 2024

Accepted:
September 20, 2024

Online Published:
October 04, 2024

Keywords:
Children, sport, table tennis, training of table tennis, physical characteristics, physiological characteristics.

Abstract

This study was conducted to determine the effect of table tennis training on some physical and physiological characteristics of children aged 9-12 years. The study included 30 healthy and volunteer students randomly selected from children who did not participate in sportive activities and divided into experimental and control groups. Table tennis training was applied to the experimental group for 8 weeks, while no training program was applied to the control group. Parameters such as flexibility, speed, reaction time, anaerobic and aerobic power were measured. The data were analyzed using descriptive statistics and dependent groups t-test for the differences between the pre-test and post-test values within the group. The pre-test and post-test means of the experimental and control groups were 18.44-17.70 and 19.09-19.28 kg/m2 for BMI, 0.20-0.18 and 0.20-0.20 s for reaction time, 24.60-26.47 and 23. 47-23.00 cm for flexibility, 5.78-5.56 and 6.00-6.05 s for 30 m sprint, 71.91-74.77 and 69.49-69.56 kgm/s for anaerobic power, 35.30-37.93 and 31.74-31.24 ml/kg/min for VO2max, respectively. According to the results, significant improvements in flexibility, anaerobic power, speed and reaction time were observed in the experimental group ($p<0.05$). These improvements were not observed in the control group. Also, a significant increase in VO2max values was recorded in the experimental group. The study reveals that table tennis training contributes positively to the physical and physiological development of children and regular exercises are important for a healthy development process of children.

Introduction

Between the ages of 7 and 11, children's bodies grow slowly, continuously and in a certain order, and parts of the body are very functional. At this age, children are able to perform more complex movements starting from simple reflex movements. Along with coordinative skills, motor control and balance develop (Açıkada & Ergen, 1990; Gallahue, 1982; Muratlı, 1997; Özer & Özer, 2019).

It is known that regular physical activities have positive effects on health. Studies in the literature (Açıkada & Ergen, 1990; Günay, 2005; Oxendine, 1982; Ulukol, 2006) show that regular physical activities are beneficial for cardiovascular health, provide mental relaxation, are a powerful weapon against cancer and prevent obesity. In addition, it has been observed that children who exercise regularly acquire the habit of regular exercise more easily after growing up than children who have a sedentary childhood (Ulukol, 2006). Apart from performance sports, regular sportive activities are of great importance for the development of children as healthy, balanced and social individuals. Regular exercises before and after puberty contributes to the development of physical characteristics such as skeletal and muscular system of the child and delay the deterioration of the physical structure of the body in old age. During childhood, when growth is the fastest, the human body experiences a lot of change. In addition, this period is the most affected by negative environmental factors. These harmful environmental factors and inadequate physical activity both negatively affect growth and development and interfere with the individual's ability to reach the physical structure that he/she has inherited (Açıkada & Ergen, 1990).

Physical development includes the increase in weight, length and breadth of the body, as well as the growth and

✉ İ. Güler, e-mail: iskender.guler@amasya.edu.tr

To Cite: Güler, İ., & Şen, M. (2024). The effect of basic table tennis training on some physical and physiological characteristics of children. *Adv Health Exerc*, 4(2), 85-93.

competence of other mechanisms that make up the body. Motor skills are related to the degree of ability to perform a physical activity, and the loss, gain or equalization of motor skills is called physical change. Basic motoric characteristics are known as the basic skills that every healthy individual with a normal life history has and that determine the criteria for sportive performance. The most important feature that distinguishes basic motoric characteristics from motor skills is the skills that the individual has from birth and cannot learn later but can develop and are the main source of performance. For example, in shot put, how the athlete holds or throws the cannonball is part of the motor learning process and refers to a skill that is learned later, while the strength required for pushing and throwing the cannonball is an inherited ability and is a motor skill that is not learned later but can be developed through training and exercises. The level of basic motor skills depends on environmental and genetic factors. However, it is more affected by genetic factors and the development of basic motor skills can reach a certain stage (Çavdar, 2021). General motor development shows the development of an individual's motor skills as a result of repetition and experience. Motor skills such as speed, strength, agility, balance and coordination can be developed through an effective training program (Oxendine, 1982).

Table tennis, which was first played by British soldiers in South Africa and India in the 1880s under the name of indoor tennis and started to be played in Turkey in 1924 (Kırlı, 2007), makes important contributions to the development of children in many areas including physical, mental and social skills. Table tennis helps children and other individuals to establish social bonds as it is an ergonomic sports branch that is played not only in schools but also in many institutions, social activity centers and family members among themselves. Physically, it strengthens children's muscle and bone structure and improves hand-eye coordination. Table tennis also plays an important role in increasing children's motor skills and developing their strategy skills. The fact that this sport can be practiced from an early age and that it is also affordable gives children an advantage in terms of accessibility (González-Devesa, 2024).

Although table tennis is an important sport branch in terms of the acquisition of physical, mental and social skills, there is not enough research on the development of some physical and physiological characteristics and motoric functions in children when the literature is examined. Contributing more to the literature and delivering scientific results about table tennis, which is an ergonomic sport, to schools, clubs and youth centers will eliminate the misconception that it does not improve children's physical characteristics. From this perspective, it is thought that the results obtained from this study will contribute to the literature.

This study was conducted to determine the effect of eight weeks of basic table tennis training on some physical and physiological characteristics such as body fat level, reaction, flexibility, speed, anaerobic and aerobic power of children aged 9-12 years.

Method

The research was conducted in Yozgat Şehit Zemçi Doğan Middle School during the 2021-2022 academic year. For the research, permission was obtained from Yozgat Directorate of National Education (dated 03.01.2022 and numbered E-55005497-20-40398250) and Ethics Committee approval was obtained from Amasya University Social Sciences Ethics Committee (dated 19.10.2020 and numbered 15386878-044). In this section, the research group, data collection, data collection tools and data analysis were discussed.

Research Group

In this study, 30 healthy and volunteer students in the age group of 9-12 years, who were randomly selected from the students studying at Yozgat Şehit Zemçi Doğan Middle School, who had not played table tennis before and did not participate in any sportive activities other than physical education classes, participated. In the formation of the experimental and control groups, a randomly balanced distribution of children from the 9-12 age group was made for each group. The differences between the experimental group and the control group in terms of the measured values (such as strength, flexibility, standing long jump) were determined by Student's t-test or paired sample t-test according to whether the normality assumption was met or not. For this purpose, according to the study titled "The Effect of 16-Week Basic Table Tennis Training on Some Physical and Physiological Parameters of 10-12 Year-Old Children" by Taş & Sinanoğlu (2017), the minimum number of samples required was determined as 14 and 7 per group, taking the effect size for flexibility as 0.97, alpha=0.05 and power=0.95 as the

criterion that gives the largest sample group to include measurements such as strength, flexibility and long jump. However, considering the possible problems in the research (measurement errors, individuals dropping out of the trainings, etc.), it was planned to conduct the experiment with 15 individuals in each group and the sample size was formed as a total of 30, 15 individuals per group (experimental-control). G*Power 3.1.9.2 statistical program and t tests - Mains: Difference between two dependent means (matched pairs) module was used.

Data Collection

The mean physical and physiological measurements of the selected students were determined for the groups before they were included in the experiment. The experimental group received a table tennis training program for 80 minutes a day, 2 days a week for 8 weeks. No training program was applied to the control group. At the end of 8 weeks, the averages of physical and physiological measurements of both the experimental group and the control group were taken and compared with the baseline values. Height and weight (BMI), flexibility, vertical jump (anaerobic power), reaction time, 30 m sprint and 20 m shuttle run (aerobic power) tests were used as data collection tools:

Height and body weight: The height of the subjects was measured with a device (First Master Steel Tape Measure) with a precision of 1 cm, and their body weight was measured with a device (Felix Smarta Model fl 598) with a precision of 100 g, with their feet bare, head erect and eyes facing the other way. During the measurements, the clothes on the subjects were minimized, their feet were bare and both feet were allowed to step on the scale equally.

The formula BMI = Body Weight (kg)/Height $(m)^2$ = (kg/m^2) was used to determine body mass index.

Flexibility (Sit reach test): For the measurement of the flexibility skills of the subjects, a sit-reach test was used. Participants were allowed to warm up a little before the test. Subjects sat tall on the floor and placed the sole of their bare foot flat on the test bench. Reaching forward with their upper body and arms, they slowly pushed the ruler forward with their hands to the end point without bending their knees. The test was repeated twice and the highest value was recorded.

Vertical jump test: A vertical jump board prepared on the wall was used to measure the vertical jump tests of the participants. The participants were allowed to warm up a little before the test. The subjects were made to reach to the maximum point with the dominant hand on the measurement board with both feet together on the floor and facing the opposite direction, and this point was marked as standing height. Then, the subject made a maximum leap by sprinting from his/her position in front of the measuring board and the height at which he/she touched the board with his/her dominant hand at the highest point was determined as the jump height. The test was repeated twice, and the difference between the best jump height and the standing height was recorded as the vertical jump height.

The anaerobic power of the subjects was determined by the Lewis formula using the vertical jump test value and body weight values.

Lewis Formula P= (√ 4.9 * W * √ D)

P= power (kgm/sec), W= body weight (kg), D= jump distance (m)

Reaction time test: For the Nelson hand reaction test, the subjects were seated in a chair with the forearm and hand relaxed on the table. The tips of the thumb and index finger were 8-10 cm away from the table and the tops of the thumb and index finger were parallel to each other. The test administrator held the ruler between the subject's thumb and index finger and instructed the subject to look directly at the midpoint of the ruler and asked the subject to grab the ruler when the ruler was released. The value on the upper edge of the thumb and index finger where the subject grasped the ruler was read and recorded. Five measurements were taken, the best and worst values were discarded and the average of the remaining three measurements was recorded as the distance the ruler fell (Tamer, 2000).

30 m sprint test: The speed tests of the subjects were evaluated on a 30 m long surface. The subjects were allowed to warm up a little bit before the test. The subjects were asked to run at maximum speed from the starting line to the finish line. They started from the starting point on cue and the time between the start and the finish line was recorded in seconds with a handheld stopwatch. Subjects were made to run 2 times and the shortest time was recorded.

20 m shuttle run test: The 20 m shuttle run test is a multistage test to measure the estimated maximal O2 consumption capacity of the participants. The 20 m

shuttle run test was used to estimate the aerobic power levels of the children. In the estimation of aerobic power, the table of estimation of Maximal Oxygen Consumption (VO_2max) based on the results of the 20 m shuttle run test was utilized (Ramsbottom et al., 1988; Reeves et al., 1999).

Table Tennis Training Program

Table tennis training program was applied to the subject group for 80 minutes a day, 2 days a week for 8 weeks. Before the study, 15 minutes of game-based warm-up and branch-specific mobility exercises were performed, 60 minutes of table tennis training was applied and the studies were terminated with 5 minutes of game-based cooling exercises (Table 1).

Data Analysis

In the evaluation of the data, it was determined that the groups were normally distributed and "Dependent Groups t Test" was applied to determine the differences between the pre-test and post-test values within the group as well as descriptive statistics. The significance level was set as $\alpha = 0.05$.

Results

All findings of the study were presented and evaluated separately in Table 2 and Table 3.

According to Table 2, when the pre-test and post-test averages of the experimental group were compared, significant differences were found between the pre-test and post-test averages of all parameters except body weight in favor of the post-test ($p<0.05$, $p<0.01$). This result can be evaluated in the sense that table tennis training was effective.

According to Table 3, when the pre-test and post-test averages of the control group were compared, no significant difference was observed in other parameters except for height and weight parameters ($p>0.05$).

Table 1

Tennis training program.

Week	Duration (min)	Place of Work	Number of Students	Content
1	80	School Sports Hall	15	Racket grip shapes and drills
	80	School Sports Hall	15	Racket grip, ball bounce and control exercises
2	80	School Sports Hall	15	Bouncing the ball on the racket body harmony exercises
	80	School Sports Hall	15	Teaching and practicing the backhand stroke technique
3	80	School Sports Hall	15	Teaching and practicing the backhand stroke technique
	80	School Sports Hall	15	Teaching forehand stroke technique
4	80	School Sports Hall	15	Teaching and practicing forehand stroke technique
	80	School Sports Hall	15	Backhand and forehand stroke technique variations
5	80	School Sports Hall	15	Service shot practice and drills
	80	School Sports Hall	15	Table tennis chop (cutting) technique teaching and exercises
6	80	School Sports Hall	15	Table tennis flipping technique teaching and exercises
	80	School Sports Hall	15	Teaching and practicing table tennis spin technique
7	80	School Sports Hall	15	Table tennis lop technique teaching and exercises
	80	School Sports Hall	15	Table tennis block technique teaching and exercises
8	80	School Sports Hall	15	Application of learned techniques in the match
	80	School Sports Hall	15	Single and double match practices

***Note**: 15 min warm-up, 60 min table tennis training, 5 min cool down.*

Table 2
Comparison of the physical and physiological characteristics of the experimental group (Mean ± SD).

Variables	Experiment Group (n:15)		t	p
	Pre-test	Post-test		
Height (cm)	152.07±5.97	153.00±5.84	3.88	0.00
Weight (kg)	42.80±7.18	41.53±6.11	0.75	0.45
BMI (kg/m^2)	18.44±2.42	17.70±2.12	2.39	0.02*
Reaction time (sec)	0.20±0.01	0.18±0.02	2.89	0.00**
Flexibility (cm)	24.60±4.83	26.47±4.15	2.30	0.02*
30 m speed (sec)	5.78±0.51	5.56±0.50	2.40	0.02*
Anaerobic power (kgm/sec)	71.91±10.31	74.77±10.03	3.49	0.00**
VO_2max (ml/kg/min)	35.30±6.34	37.93±5.58	2.25	0.03*

** p<0.05; ** p<0.01*

Table 3
Comparison of the physical and physiological characteristics of the control group (Mean ± SD).

Variables	Control Group (n:15)		t	p
	Pretest	Post-test		
Height (cm)	153.20±5.72	153.67±5.97	2.16	0.04*
Weight (kg)	45.13±10.09	45.93±10.93	2.56	0.02*
BMI (kg/m^2)	19.09±3.42	19.28±3.55	1.85	0.08
Reaction time (sec)	0.20±0.01	0.20±0.20	0.02	0.98
Flexibility (cm)	23.47±6.71	23.00±6.32	1.45	0.16
30 m speed (sec)	6.00±0.82	6.05±0.82	1.91	0.07
Anaerobic power (kgm/sec)	69.49±7.24	69.56±7.49	0.15	0.87
VO_{2max} (ml/kg/dk.)	31.74±6.07	31.24±5.42	1.31	0.21

** p<0.05; ** p<0.01*

Discussion

The effects of regular and irregular training on children and adolescents have been the subject of many studies for many years. Children's exposure to physical activity is of interest to scientists in the field of sport (Muratlı & Sevim, 1993).

Cinthuja et al. (2015), a study that investigated factors that contributed to the improvement of physical fitness of school badminton players in the Kandy region, highlighted that speed, upper body strength and strength and aerobic endurance in both male and female school badmintons develop depending on body mass index. Çınarlı et al. (2017), a study of the body composition and biomotor performance of candidate athletes for the Turkish table tennis youth national team found no significant difference (p>0.05) in the BMI values of women and men at the rate of 19.71 kg/m2. In their study of table skins in children, BMI found a pre-test mean of 21.13 kg/m2 and a post-test average of 21.06 kg/ m2 and found no significant difference (p>0.05). But the fact that it is very important in the development of physical fitness supports our work. These differences in studies may be attributable to changes in height and weight over a short period of time, as children are in the developmental age.

According to the results of our study, there was a statistically significant difference (p<0.05) regarding the improvement of the flexibility characteristics of the subject group's table tennis training (Table 2). In studies on flexibility, a study by Taş & Sinanoğlu (2017) found significant differences (p<0.05) in flexibility skills of both men and girls (from 16.25 cm to 22.40 cm in men and 16.70 cm to 20.50 cm in girls) when looking at pre- and post-training values of subjects. Evrim (2006), in a study to study the effect of table tennis on certain physical and physiological properties in children, measured the average flexibility value of the subjects at 34.10 cm in the pre-test

and 35.40 cm at the post-test, and found a significant difference ($p<0.05$). Çınarlı et al. (2017), in his study, measured the average flexibility of women at 28.30 cm and men at 24.86 cm, and found a significant difference between groups ($p<0,05$). In another study to study the effect of 12-week badminton training on motor characteristics in children aged 10-14 years, the experimental group's pre-flexibility test average was 16.66 cm, the post-test average 19.93 cm, and a significant increase in flexibility values ($p<0.05$) was observed (Toprak, 2019). In a study by Çoşkun & Eyüpoğlu (2020), the subjects measured the flexibility pre-test speed average of 24.90 cm and the post-test average of 25.86 cm and found a significant difference ($p<0.05$). Cinthuja et al. (2015), a study that investigated factors that contributed to the improvement of physical fitness of school badminton players, said that both male and female school badmintons could improve flexibility over time. The results of this study are parallel to the above-mentioned studies in terms of flexibility parameters. To develop flexibility, it is important to start exercising at an early age and to practice mobility exercises during the training process. So when you look at our study and the above studies, it can be said that the exercises that are done develop the children's flexibility skills.

A significant difference ($p<0.01$) was found between the pre-test and post-test anaerobic power averages of the subject group in favor of the post-test (Table 2). When examining studies on motor skills and anaerobic strength, Cinthuja et al. (2015), a study that investigated factors that improve physical fitness of badminton players, highlighted that agility, speed, upper body strength and strength can be improved in both male and female school badminton players over time. Gu et al. (2021), in a study examining the effects of the table tennis physical activity program on the rough motor skills of preschool children, found that rapid jogging, jumping, jumping, sliding, turning, etc. significantly increased their maneuvering scores, such as locomotive, fixed-ball hitting, catching, throwing, and object control ($p<0.05$, and that the physical activities of table tennis could support the development of pre-school children's rough-motor skills, especially object control skills. Çimen & Günay (1996), in a study that examined the effect of fast strength training on some motor characteristics of young men's table tennis players, measured the subjects' pre-workout anaerobic strength averages to 120.85 kgm/s, training end averages of 129.26 kgm/s, and observed significant differences between pre- and post- workout values ($p<0.05$). Taş & Sinanoğlu (2017), a study that examined the effect of basic table tennis training on the physical and physiological characteristics of 10-12-year-olds, found significant differences in the anaerobic strength values of male and female subjects between pre- and post-training values ($p<0.05$). Ağgön & Ağırbaş (2015), who studied the effect of table tennis exercises on anaerobic performance and muscle strength, determined the average pre-test values of the subjects' anaerobe forces to be 93.78 kgm/s and the average post-test values to 95.76 kgm/s. In the study Evrim (2006) to study the effect of table tennis on certain physical and physiological properties in children, the experimental group measured the anaerobic force capacity at 121.67 kgm/s for the preliminary test and 123.75 kgm / s for the post-test. No statistical difference was found in the pre-test and post-test values of subjects in the studies of Ağgön & Ağırbaş (2015) and Evrim (2006). Cınarlı et al. (2017), in their study, measured the average anaerobic strength of women at 55.55 kgm/s and men at 71.28 kgm /s, and found a significant difference between groups ($p<0.05$). Mallam et al. (2003) found significant differences when comparing the vertical jumps of students who participated in sports activities and those who did not participate in them in primary school ($p<0.05$). The differences between the findings from the studies may be due to the different age groups of the subjects or the different form of their physical characteristics. In addition, the effect of table tennis training on strength development is assessed as evidence of the significant increase in anaerobic strength capacity in subjects and the absence of an increase in control group (Table 3). Again, in relation to anaerobic force, the group speed pre-test averages were 5.78 s, the post-test averages 5.56 s, and a statistically significant difference ($p<0.05$) was detected (Table 2). In the literature on speed, a study by Evrim (2006) found that the experimental group had a pre-training speed average of 4.96 s. and a post-train average of 4.06 s., and a statistically significant difference was observed ($p<0.05$). Kien & Chiodo (2003) compared the speed skills of children from the 10-12 age group who participated in a school-based recreation program with those who did not participate and found a significant difference in favour of children participating in recreational activities ($p<0.05$). In another study, in which the effect of fast strength training program on some motor

characteristics in children's table tennis players was studied, statistically significant differences were observed ($p<0.05$) when compared with pre- and post-training speed values in the control group (Skylza, 2007). In their study, Çimen & Günay (1996) measured the pre-training speed average of 6.04 seconds and the post training average of 4.38 seconds and observed a statistically significant difference. In other studies, Taş & Sinanoğlu (2017) found that the male subjects had a pre-test speed average of 5.76 s, the post-test average was 5.37 s, and the girls 6.14 s and the last test average 5.61 s, with significant differences in both boys and girls ($p<0.05$). Çınarlı et al. (2017), in his study, measured the average speed of women at 5.11 s and men at 4.54 s, and found a significant difference between groups ($p<0.05$). A study conducted by Çoşkun & Eyüpoğlu (2020) with children in tennis training, the subjects measured the speed pre-test speed average of 6.33 s, the last test average of 6.29 s, and found a statistically significant difference ($p<0.05$). Changes in speed skills in the work of Evrim (2006), Yıldız (2007), Çimen & Günay (1996), Taş & Sinanoğlu (2017) and Çoşkun & Eyüpoğlu (2020) are similar to the changes in speed in the study we did. The absence of a significant increase in the speed of the control group in this study between pre-test and post-test values (Table 3), both in the literature results and the significant increase between the speed values of the experimental group in the study, shows that table tennis studies have contributed positively to motor skills, anaerobic strength, and fast strength-related skills.

According to the results of this study, the experimental group's reaction time averaged pre-test values of 0.20 s, the post-test values averaged 0.18 s, and a statistically significant difference ($p<0.05$) was detected (Table 2). When studies in the literature on reaction time were examined, in a study of the effect of rapid strength training on some motor characteristics of young male table tennis players, the group's pre-workout reaction times were 0.18 s and post-workouts 0.16 s, and there was no statistically significant difference ($p>0.05$), although there was a positive rebound during the reaction period. In the study Evrim (2006), the respondent group's reaction time averaged 0.18 seconds before the test and 0.15 seconds after the last test, with a statistically significant difference ($p<0.05$). Can et al. (2014) compared the reaction times of male table tennis players and sedentary in the 10-12-year-old group. They found significant differences between the reaction values of men's table tennis players and sedans ($p<0.05$). In a study of some motor functions and reaction times in children in badminton, Polat (2009) found that there was a significant difference ($p<0.05$) between the initial and final measurements of the reaction time of the group. In a study by Starz (2007), significant differences were found in the speed averages of the subjects before and after training ($p<0.05$). In a study by Asan (2011), which examined the effect of table tennis exercises on children's attention, it was observed that table tennis exercise improves the attention attributes of children. Reyhan (2019), a study that compared the attention skills of table tennis athletes with those of sedentary, found that both groups had a Bourdon attention test and that the test response times differed statistically significantly ($p<0.05$), and that table tennis players completed the test faster. Our study shows that the literature shows similarities between reaction times and the evolution of table tennis players. The findings of our study and the results of the studies we have examined suggest that table tennis exercises improve children's reaction times as well as mental qualities such as attention and perception.

As a result of the study, the pre-test VO_2max averaged 35.30 ml/kg/min, the post-test averaged 37.93 ml/ kg/min and a statistically significant difference ($p<0.05$) was detected (Table 2). In studies on aerobic strength, a study by Taş & Sinanoğlu (2017) found a significant difference ($p<0.05$) in the average pre-workout VO_2max values of male subjects as 47.13 ml/kg/min and 48.83 ml/ kg/min after workout. In girls, the pre- and post-training mean values were 44.71 ml/kg/min and 46.04 ml/ kg/min, and no difference was found ($p>0.05$). Evrim (2006) measured the mean VO_2max of table tennis exercisers as 31.01 ml/kg/min in the pre-test and 31.92 ml/kg/min in the post-test and observed a statistically significant difference ($p<0.05$). Rowland & Boyajian (1995) found significant differences in VO_2max values of endurance exercisers in children ($p<0.05$). Cinthuja et al. (2015) found that both male and female school badminton players were able to improve aerobic endurance over time. The findings from our study and the literature we reviewed are similar in terms of the positive effect of table tennis exercises on the development of children's aerobic fitness. Therefore, it can be said that table tennis exercises improve children's maximum oxygen consumption capacity and aerobic endurance.

Conclusion

Based on the experimental and control group findings from our study and the results of the literature studied, regular and periodic table tennis exercises have demonstrated the physical and physiological contributions of children, and it can be concluded that basic table tennis training for eight weeks contributes positively to the body fat level, flexibility, reaction, speed, aerobic and anaerobic strength characteristics of children aged 9-12 years.

Acknowledgement

The study was summered from the master's thesis titled "the effect of 8-week basic table tennis training on some physical and physiological characteristics of 9-12 age group children"

Authors' Contribution

Trial Design: İG, MŞ; Data Collection: MŞ; Statistical Analysis: İG; Manuscript Preparation: MŞ, İG.

Ethical Approval

The study was approved by the Amasya University Social Sciences Ethics Committee (19.10.2020/15386878-044) and was conducted in accordance with the Code of Ethics of the World Medical Association, also known as the Helsinki Declaration.

Funding

The authors declare that the study received no funding.

Conflict of interest

The authors hereby declare that there was no conflict of interest in conducting this research.

Data Availability Statement

Data supporting the findings of this study are available from the corresponding author [İ.G.] upon reasonable request.

References

Açıkada, C., & Ergen E. (1990). *Science and Sport*. Ankara: Büro Tek Ofset Printing.

Ağgön, E., & Ağırbaş, Ö. (2015). Effects of 12-week table tennis training on body composition, anaerobic performance and muscle strength. *İnönü University Journal of Physical Education and Sports Sciences*, 2(2), 12-20.

Asan, R. (2011). *The effect of eight weeks of table tennis exercise on attention in 9-13 year old children*. Master's Thesis, Selçuk University, Institute of Health Sciences, Konya.

Can, S., Kilit, B., Arslan, E., Suveren, S. (2014). The Comparison of reaction time of male tennis players, table tennis players and the ones who don't exercise at all in 10 to 12 age groups. *Niğde University Journal of Physical Education and Sport Sciences*, 8(2), 195-201.

Cinthuja, P., Jayakody, J. A. O. A., Perera, M. P. M., Weerarathna, W. V. D. N., Nirosha, S. E., Indeewari, D. K. D. C., Kaethieswaran, T., Adikari, S. B. (2015). Physical fitness factors of school badminton playersin kandy district. *European Journal of Sports and Exercise Science,* 4(2),14-25.

Çoşkun, M., & Eyüpoğlu, E. (2020). Investigation of the effect of basic motoric characteristics on tennis skill teaching in 10-12 year old boys receiving tennis training, *Spormetre The Journal of Physical Education and Sport Sciences,* 18(2), 191-200.

Çavdar, E. (2021). *The effect of types of warming according to circadian rhythm on basic motoric characteristics and physical education and sports course attitudes of students (14-16 years).* Phd Thesis, Gazi University, Institute of Educational Sciences, Ankara.

Çınarlı, F. S., Kafkas, M. E., Bastık, C., Çimen, O. (2017). Investigation of body composition and biomotor performance parameters of Turkish table tennis junior national team candidate athletes. *İnönü University Journal of Physical Education and Sports Sciences*, 4(3), 22-39.

Çimen, O., Günay, M. (1996). The effect of circular quick strength training on some motoric characteristics of 16-18 age group young male table tennis players. *Journal of Sport Sciences*, 7(3), 3-11.

Evrim V. (2006*). 16-18 age group male table tennis players, investigation of the effect of technique related force continuity training on some physiological and physical parameters*. Master's Thesis, Gazi University, Institute of Health Sciences, Ankara.

Gallahue, L. D. (1982). *Understanding Motor Development in Children*. New York: JhonWileySons.

González-Devesa, D., Sanchez-Lastra, M. A., Pintos-Barreiro, M., Ayán-Pérez, C. (2024). Benefits of table tennis for children and adolescents: a narrative review. *Children,* 11(8), 963.

Günay M. (2005). *Sports Physiology and Performance Measurement*. Ankara: Gazi Publishing.

Gu, Y., Chen, Y., Ma, J., Ren, Z., Li, H., Kim, H. (2021). The influence of a table tennis physical activity program on the gross motor development of Chinese preschoolers of different sexes. *Int J Environ Res Public Health*, 18(5), 2627.

Kırlı, V. (2007). *Sports and table tennis. expanded and corrected* (2nd Edition). Istanbul: Table Tennis Sports Association,

Kien, C. L., Chiodo, A. R. (2003). *Physical activity in middle school-aged children participating in a school-based recreation program. Archives of Pediatrics & Adolescent Medicine*, 157(8), 811-815.

Mallam, K. M., Metcalf, B. S., Kirkby, J., Voss, L. D., Wilkin, T. J. (2003). Contribution *of timetabled physical educationto total physical activity in primary school children: a cross sectional study. BMJ*, 327 (7415), 592-593.

Muratlı, S. (1997). *Children and sports in the light of training science. (2nd Edition),* Ankara: Bağırgan Publishing.

Muratlı, S., & Sevim, Y. (1993). *Training knowledge.* Eskisehir: Etam A.Ş. Web-Ofset,

Oxendine, B. (1982). *Psychology of Motor Learning II*. New York: Mayfield Publications,

Özer, D. S., & Özer K. (2019). *Motor Development in Children. (11th Edition),* Ankara: Nobel Academic Publishing.

Polat, G. (2009). The *effects of 12-week basic badminton training trainings on motoric functions and reaction times in 9-12 age group children*, Master's Thesis, Çukurova University, Institute of Health Sciences, Adana.

Ramsbottom, R., Brewer, J., Williams, C. (1988). Progressive Shuttle Run test to estimate maximal oxygen uptake. *British Journal of Sports Medicine*, 22(4), 141-144.

Reeves, S. L., Poh, B. K., Brown, M., Tizzard, N. H., Ismail, M. N. (1999). Anthropometric Measurements and Body Composition of English and Malaysian Footballers. *Malaysian Journal of Nutrition* 5(1), 79-86.

Reyhan, S. G. (2019). C*omparison of table tennis athletes' attention skills with sedentaries*, Master's Thesis Institute of Health Sciences. Kahramanmaraş Sütçü İmam University, Institute of Health Sciences, Kahramanmaraş.

Rowland, T. W., & Boyajian, A. (1995). Aerobic response to endurance exercise training in children. *Pediatrics*, 96(4), 654-658.

Tamer, K. (2000). *Measurement and Evaluation of Physical, Physiological Performance in Sports*. Ankara: Bağırgan Publishing.

Taş, M., & Sinanoğlu, A. (2017). Effect of table tennis trainings on certain physical and physiological parameters in children aged 10-12. *Journal of Education and Training Studies,* 5(3), 11-19.

Toprak, T. (2019). *Investigation of the effect of 12-week basic badminton training trainings on sports-motoric characteristics in 10-14 age group children*. Master's Thesis, Van Yüzüncü Yıl University, Institute of Social Sciences, Van.

Ulukol B. (2006). *Child athlete health*. Ankara: Kendi Publication.

Yıldız, H. (2007) *The effect of quick strength training on some motoric characteristics of 12-14 age group table tennis players*. Master's Thesis, Sakarya University, Institute of Social Sciences, Sakarya.