THE EFFECTS OF SCHOOL-BASED HANDBALL INTERVENTION ON 12–14-YEAR-OLD CHILDREN’S PHYSICAL FITNESS AND PERFORMANCE

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Authors’ Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Accepted for Publication: September 27, 2023
Published: October 30, 2023
DOI: 10.17309/tmfv.2023.5.14

Abstract
Background. School-based physical activity interventions contribute positively to children's general health, wellness, and quality of life. The present study aims to investigate the effect of a 12-week handball training intervention on the ingredients of physical fitness and physical performances of primary school children.

Materials and methods. In this quasi-experimental study, students participating in school-based handball training constitute the intervention group (IG) (n = 15, aged 12.3 ± 0.96) and those who do not participate (n = 17, aged 12.1 ± 0.83) constitute the control group (CG). The linear speed (T30m), change of direction speed (T-test time), lower extremity power (standing long jump (SLJ)), muscular strength and endurance (30-sec curl-ups and push-ups), and estimated maximum oxygen uptake (VO₂max) (YYIRTL-1) were measured at the beginning and end of the handball training session. Independent samples t-test was conducted to test the significant differences in pretests between groups. Paired samples t-test was carried out to analyze statistically significant differences within groups.

Results. The results revealed that, except for SLJ test scores, the pre-tests IG performed statistically significantly higher than the CG. In post-test scores, the IG performed statistically significantly higher than the CG in all test scores. In addition, physical fitness performance levels of the IG significantly changed between pre- and post-test (p < 0.05) but not in the control group (p > 0.05).

Conclusions. In conclusion, school-based handball intervention can positively affect students’ physical fitness and performance characteristics.

Keywords: physical fitness, performance, school-based activity, health benefits, prepuberty.

Introduction

In a study published in The Lancet in July 2012, physical inactivity was announced as a pandemic (Kohl et al., 2012), and it has been known to spread without slowing down despite the global measures taken by governments and non-governmental organizations since then (Sallis, Bauman, & Pratt 1998). In WHO reports (2007), it is stated that there are diseases related to sedentary lifestyles, such as cardio-respiratory system disorders, cancer types and diabetes, and approximately 1.9 million deaths are related to physical inactivity (WHO, 2019). Obesity and lack of physical activity, which first emerged in a WHO report in 2000, draws attention to the fact that sedentary life in children and young people has reached alarming proportions (WHO, 2020).

It is also known that participating in regular physical activity contributes to the shaping of the individual's physical, cognitive, emotional, and social potential and benefits society (Longmuir & Tremblay, 2016). It has been observed that regular physical activity habits, which are known to have positive contributions to the general health, wellness, and quality of life of the individual (Edwards et al., 2017), have socio-economic benefits such as reducing obesity, heart diseases, cancer, and treatment (Edwards et al., 2017; Haskell et al., 2007; Warburton & Bredin, 2017) and reducing health expenditures (Gehris et al., 2017). Because of the previously mentioned benefits, WHO (2010) recommends children to have average of 60 minutes of moderate to vigorous physical activity daily at least three times a week, plus muscle-strengthening activities in addition to these studies.

Admittingly, those who participate in physical activity in their childhood and youth trigger positive psychosocial developments such as mastering fundamental movement skills, overcoming challenging physical activities, enjoying
participation, and increasing motivation to participate in sports. Therefore, the enhancement of participating in regular physical activity gives children the motivation and confidence to maintain regular participation in physical activity throughout their life (Clend, Dwyer, & Venn, 2012; Rangel, Fellinham, Santana, & Lamas, 2022). In fact, a positive linear association between the duration of physical activity and positive health effects has been established, with longer duration associated with increased physical fitness (Pate 1995; Shephard, 1997).

In this context, school PE courses are a unique opportunity that provides direct access to the children and young population and have facilities, teachers, and curricula to achieve social and educational physical activity and healthy lifestyle objectives (Dobbies et al., 2013; Hills, Dengel, & Lubans, 2015). On the other hand, PE classes are unique places for many children to increase their physical fitness, play sports, and exercise (Sallis, Prochaska, & Taylor, 2000; Biddle & Mutrie, 2007). In addition to these, it is known that physical education lessons have psychosocial benefits such as body self-perception and general well-being (Bailey, 2006). Physical education courses are more likely to affect boys and young children better than girls and adolescents (Lemes et al., 2020). Because it is easier for these groups to reach higher physical activity levels, less sedentary behaviour and psychological satisfaction in the activities and sports events they participate in (Hilland et al., 2011).

Similarly, the positive effects of extracurricular sports activities on physical activity (Blair, Cheng, & Holder, 2001), motor competency (Cattuzzo et al., 2016), physical fitness (Clend et al., 2005), psychological well-being (Bailey, 2005), and even academic achievement (Brow, 2002) of children and adolescents were investigated in many studies. Studies examining the benefits of children's participation in extracurricular activities were clustered, especially around football (Krusstrup et al., 2010), basketball (DiFiori et al., 2018), and volleyball (Sozen, 2012). In the relevant literature, little information exists about the physical performance, physical fitness and motor characteristics of children and young handball players (Mohamed et al., 2009). On the other hand, handball, a competitive team sport, requires skills such as running, jumping, passing, throwing, catching, and dribbling together with the physical contact of the opponent in anaerobic and aerobic loads (Hermassi et al., 2017; Milanese et al., 2011). Stunning results have been found regarding the physical fitness and physical performance of children and young people participating in extra-curricular handball training. Fernandez-Fernandez et al. (2020) found a significant positive difference between the jump, sprint, and agility test scores and throwing velocity of the U-13 and U-15 age groups of handball players participating in extracurricular training all season and those not participating in a regular exercise program. Similarly, Vicente-Rodriguez et al. (2004) revealed that 14-year-old girls (n = 51) participating in handball training had better muscle mass, bone density, strength endurance running test and sprint time than their peers. In the study conducted with 14-year-old male (n = 88) and 13-year-old female (73) handball players, Zapteridis et al. (2009) found that there was a statistically significant difference in ball velocity, SLJ, 30 m sprint and VO₂max performances of males selected and not selected for the national team, and only ball velocity and SLJ performances of females. Training in team sports during puberty plays a significant role both in athletic performance (Garl, Ring, & Bomba, 1988). In this context, handball is attributed as a sport that improves and develops physical activity, physical fitness and performance in physical education classes and extracurricular sports activities for children and youth (Oxyzogolu et al., 2009).

Although studies show the benefits of physical education courses and extracurricular sports activities, studies still estimate the prevalence of inadequate physical activity in children and adolescents to be more than 80% worldwide (Foley et al., 2021; WHO, 2020). Research shows that children spend more time on non-energy sedentary behaviours such as sitting, lying down and watching screens and spend less time being physically active. This has been steadily increasing over the past decade (Guthold et al., 2018). Despite many comprehensive studies among elite young male and female players, little information is available concerning young handball players' physical fitness and performances characteristics in the current literature. However, to the best of our knowledge, studies evaluating the effect of handball training attended by pre-adolescent children are also scarce in the literature.

The purpose of the study was i) to determine the role and importance of participating in extracurricular sports in school-age children's physical fitness and performance development and ii) to examine the 12-week school-based handball intervention on the physical fitness performance in school children. It is hypothesized that handball training would develop all physical fitness and physical performance in young handball players. This study may be important for determining and comparing the physical fitness and performance characteristics of handball players of this age group and for creating the most appropriate training plans for these players. In addition, creating reference data on this age group of handball players is valuable for future comparisons and skill determination. As a result, this study can benefit long-term athletic development to improve juvenile handball players' health, fitness, and performance.

Materials and methods

Participants

A total of 32 schoolchildren, aged 12-14 years from the same school were included in the present study. The subjects were divided into two groups depending on their participation in any school sports. Fifteen were assigned to a handball group (age 12.3 ± 0.96 years) as they have been playing handball for at least 2 years and at least 2 times per week and have competition experience in school sports. The other subjects (n = 17, age 12.1 ± 0.83) who were not involved in extracurricular sports for at least 1 year in addition to their physical education class at school were defined as the control group. All participants and their parent(s) provided written informed consent and were informed about the procedures and potential threats and aids before being involved in the study. Subjects were free to quit the study anytime without providing a reason.

Study Protocol

The pre-and post-test measurements of the participants were evaluated one week before and after the 12-week intervention session. In general, handball training sessions
lasted for 90 minutes, including about 20 min of low intensity warmups including dynamic stretching exercises, 60 min of technical handball exercise drills and 10 minutes of cool-down. The handball training method is shown in Table 1. One familiarization session was held before the tests. The physical fitness performance levels (Running speed (T30m), Change of Direction (CoD speed (T-test time)), jumping ability (standing long jump (SLJ)), muscular strength and endurance (30-sec curl-up and push-up), and estimated maximum oxygen uptake (VO₂max) (Yo-Yo intermittent recovery test level-1 performance (YYIRT-1)) were tested. All physical fitness tests were conducted on an indoor handball court at the same time (16:00-18:00). A normalized warm-up (5-min of sub-maximal running, dynamic stretching activities, jump exercises, and sprints) procedure was followed prior to the testing session. 10-minute breaks were given between all tests (Fernández-Romero, Suárez, & Carral, 2017).

**Statistical analysis**

Descriptive statistics were calculated and presented as mean and SD for anthropometric and physical fitness variables for the gender and groups. The normality assumption of the data was met by the Skewness & kurtosis and Shapiro-Wilk tests; therefore, parametric tests were used. Independent samples t-test was conducted to test the significant differences in pretests between groups. Paired sample t-test was carried out to analyze statistically significant differences within groups. In Excel, the effect size was calculated by converting partial eta-squared scores to Cohen’s d. The ES is classified as small (0.00 ≤ d ≤ 0.49), medium (0.50 ≤ d ≤ 0.79), and large (d ≥ 0.80). The data were processed using SPSS Statistics 23.0 (IBM, 2015), and the significance level was set at p < 0.05.

**Results**

There were no statistically significant differences in any pretests between the IG and CG (p > 0.05). The height of the IG and the body mass and BMI of CG increased over time (p < 0.05) (Table 2).

Curl-up test results are given in Table 3. At baseline and post-training, the number maximum of curl-ups was significantly higher in IG than in CG (p < 0.05). After the 12-week handball intervention period, IG demonstrated a significant increase in the maximum number of curl-ups by 24% (p = 0.00, d = -3.42 [large effect]). In contrast, the number of curl-ups significantly decreased by 24% (p = 0.001, d = 0.95 [large effect]) in the CG.

Table 3 illustrates the changes in push-up test scores both in IG and in CG. The push-up test showed similar results, at baseline and post-training, the maximum number of push-ups was higher in IG than in CG (p < 0.05). IG increased the maximum number of push-ups from the pretest score of 18% (p = 0.011, d = -0.76 [medium effect]). No significant change was evident in CG push-up between a pretest score to a posttest score (p = 0.641).

Table 3 summarizes pre and post-test values for SLJ tests. At the baseline, no significant differences were observed between the two groups, whereas SLJ performance was found higher in TG than in CG after the intervention period

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**Table 1. The content of 12-week handball training intervention**

<table>
<thead>
<tr>
<th>Warm-up (20 min)</th>
<th>Main Session (60 min)</th>
<th>Cool-down (10 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Continuous running, lead ups</td>
<td>Ball handling drills, ball control static and dynamic, Basic athletic abilities with a technical component</td>
</tr>
<tr>
<td>Week 2</td>
<td>Jumping jag series, lead ups</td>
<td>Movement in the field, Dribbling, Basic athletic abilities with a technical component</td>
</tr>
<tr>
<td>Week 3</td>
<td>Continuous running, lead ups</td>
<td>Holding the ball, dribbling, moving in the court</td>
</tr>
<tr>
<td>Week 4</td>
<td>Lead ups, calisthenics</td>
<td>Throwing the ball, holding the ball, Dribbling</td>
</tr>
<tr>
<td>Week 5</td>
<td>Small-sided games, lead ups</td>
<td>Catching the ball, passing the ball dripping the ball, and throwing the ball</td>
</tr>
<tr>
<td>Week 6</td>
<td>Lead ups, calisthenics</td>
<td>Catching the ball, passing the ball dribbling the ball, and throwing the ball in different directions and against opponent</td>
</tr>
<tr>
<td>Week 7</td>
<td>Jumping jag, small-sided games</td>
<td>Shot on goal, passing, catching, and throwing, Basic athletic abilities with a technical component</td>
</tr>
<tr>
<td>Week 8</td>
<td>Lead ups, Continuous running</td>
<td>Shot on goal, passing, catching, and throwing, Basic athletic abilities with a technical component team offensive and defensive skill</td>
</tr>
<tr>
<td>Week 9</td>
<td>Small-sided games, calisthenics</td>
<td>Attacking the opponent, shooting, Basic athletic abilities with a technical component, team offensive and defensive skills</td>
</tr>
<tr>
<td>Week 10</td>
<td>Track running, calisthenics</td>
<td>Attacking the opponent, shooting, Basic athletic abilities with a technical component, team offensive and defensive skills</td>
</tr>
<tr>
<td>Week 11</td>
<td>lead ups, jumping jag</td>
<td>Basic athletic abilities with a technical component, passing catching shooting and blocking, scrimmage game</td>
</tr>
<tr>
<td>Week 12</td>
<td>Continuous running, Small sided games</td>
<td>Basic athletic abilities with a technical component, passing catching shooting and blocking, scrimmage game</td>
</tr>
</tbody>
</table>
Table 2. Subjects’ characteristics

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n = 15)</th>
<th>Control (n = 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.55 ± 0.09</td>
<td>1.55 ± 0.08*</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>46.90 ± 7.38</td>
<td>46.50 ± 6.61</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>19.30 ± 2.14</td>
<td>19.20 ± 2.33</td>
</tr>
</tbody>
</table>

BMI: Body Mass Index; *p < 0.05; * Significant difference from pre-training

Table 3. Physical fitness performance before and after the 12-week intervention program

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Post</th>
<th>Δ%</th>
<th>p value</th>
<th>Cohens d</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M±SD</td>
<td>M±SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IG (n = 15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curl-up</td>
<td>17.90 ± 4.07*</td>
<td>23.50 ± 5.11*</td>
<td>24</td>
<td>0.00</td>
<td>-3.42</td>
<td>Large</td>
</tr>
<tr>
<td>Push-up</td>
<td>12.50 ± 3.16*</td>
<td>17.90 ± 6.67*</td>
<td>18</td>
<td>0.01</td>
<td>-0.76</td>
<td>Medium</td>
</tr>
<tr>
<td>SLJ</td>
<td>136.90 ± 4.99</td>
<td>147.30 ± 14.5*</td>
<td>6</td>
<td>0.01</td>
<td>-0.80</td>
<td>Large</td>
</tr>
<tr>
<td>T-test</td>
<td>12.60 ± 1.06*</td>
<td>10.30 ± 0.97*</td>
<td>-22</td>
<td>0.00</td>
<td>3.64</td>
<td>Large</td>
</tr>
<tr>
<td>T30m</td>
<td>6.15 ± 0.64*</td>
<td>5.59 ± 0.51*</td>
<td>-8</td>
<td>0.00</td>
<td>1.66</td>
<td>Large</td>
</tr>
<tr>
<td>VO₂max</td>
<td>28.30 ± 3.85*</td>
<td>34.80 ± 3.24*</td>
<td>19</td>
<td>0.00</td>
<td>-4.02</td>
<td>Large</td>
</tr>
<tr>
<td>CG (n = 17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curl-up</td>
<td>10.10 ± 2.47</td>
<td>8.35 ± 2.12*</td>
<td>-24</td>
<td>0.00</td>
<td>0.95</td>
<td>Large</td>
</tr>
<tr>
<td>Push-up</td>
<td>6.47 ± 5.25</td>
<td>6.88 ± 4.82</td>
<td>6</td>
<td>0.64</td>
<td>-0.12</td>
<td>-</td>
</tr>
<tr>
<td>SLJ (cm)</td>
<td>127.60 ± 11.6</td>
<td>128.10 ± 10.5</td>
<td>0</td>
<td>0.66</td>
<td>-0.11</td>
<td>-</td>
</tr>
<tr>
<td>T-test (s)</td>
<td>14.90 ± 1.28</td>
<td>14.70 ± 1.33</td>
<td>-1</td>
<td>0.26</td>
<td>0.29</td>
<td>-</td>
</tr>
<tr>
<td>T30m (s)</td>
<td>7.10 ± 0.74</td>
<td>7.30 ± 0.87</td>
<td>-2</td>
<td>0.51</td>
<td>0.16</td>
<td>-</td>
</tr>
<tr>
<td>VO₂max</td>
<td>24.50 ± 3.2</td>
<td>22.50 ± 2.74*</td>
<td>-9</td>
<td>0.00</td>
<td>1.05</td>
<td>Large</td>
</tr>
</tbody>
</table>

(p < 0.05). The handball training followed by the IG had a beneficial impact on SLJ performance because jumping height after rebound increased by 6% (p = 0.008, d = -0.80 [large effect]). The CG exhibited no significant changes in SLJ performance (p > 0.05).

Pre and posttest for training and control groups were presented in Table 3. In both baseline and post-training, the IG had a higher agility test time than the CG (p < 0.05). A significant decrease of -22% (p = 0.00, d = 3.64 [large effect]) in the T-test score, which shows the enhancement in performance, was observed for the IG (12.6±1.06 to 10.3±0.97 seconds). However, there was no significant change observed in the control groups (p = 0.255).

At baseline and post-intervention, IG was significantly faster than the CG in the T30m test (p < 0.05) (Table 3). The analysis indicated that only the training group has a significant main effect over the 12-week intervention period (Δ% = -8%, p = 0.00, d = 1.66 [large effect], 6.15±0.64 to 5.59±0.51 seconds). In contrast, it was found that no significant difference between the pre-to post-test for the CG (p < 0.05).

Performance on the YYIRT-1 run significantly differed between the two groups (Table 3). The IG had a higher estimated VO₂max performance than CG at the baseline and post-intervention tests (p< 0.05). The estimated VO₂max performance showed the greatest improvement following the handball training group with an increase of 19% (p = 0.00, d = -4.02 [large effect]). On the other hand, a significant negative difference was observed in the estimated VO₂max values of the CG (Δ% = -9%, p < 0.001, d = 1.05 [large effect]) from pre to post-test.

Discussion

This study shows that 12-week school-based handball intervention is associated with higher physical fitness in prepubescent children. The findings of this present study are as follows: (i) Baseline data indicated that students who participated in school-based handball training, apart from their SLJ performance, achieved higher scores in maximum curl-ups, push-ups, and VO₂max, compared to their age-matched CG; (ii) as expected, IG improved running speed, agility, muscular strength and endurance, as well as the estimated VO₂max performance compared to CG; (iii) There was a decrease in the maximum number of curl-ups and VO₂max mean values in the CG. However, no significant changes were found in the maximum number of push-ups, SLJ, speed, and agility time.

Cardiovascular fitness level (Ruiz et al., 2016) and muscular strength (Castro-Piñero et al., 2010) are often
defined to as part of health-related fitness test batteries and usually have relationship with disease prevention and health (Howley, 2001). In the present study, the IG displayed a superior performance in terms of maximum curl-up and push-up numbers, as well as VO\textsubscript{max} scores, compared to the CG (p < 0.05). It has been previously observed that students enrolled in physical activity programmes exhibit improved cardiovascular fitness (Ahmed et al., 2017; Larsen et al., 2021; Madsen et al., 2022) in comparison to non-active individuals, as well as demonstrating a higher maximum capacity for completing curl-ups and push-ups (Ahmed et al., 2017). Moreover, previous studies have demonstrated that children who partake in physical activity interventions within the school environment exhibit greater jumping abilities compared to their non-active counterparts (Fernández-Romero et al., 2017; Marques & González-Badillo, 2006). The present baseline outcomes of the current study contradict prior research that implied greater achievement in SLJ among the active group. Gorostiaga et al., (2006), stated that handball trainings could enhance upper extremity strength compared to lower extremity. These low scores can be attributed to the programme's emphasis on technical and coordination training before the study, which may have resulted in insufficient training time for other areas. Ziv and Lidor (2009), suggested that explosive power training should be implemented in handball for athletic performance. The lower score in SLJ is correlated with poor muscular strength (Castro-Piñero et al., 2010) thus, coaches should give more attention to leg strength training in the training season program.

Both speed and agility were found higher for IG compared to the CG. Previous research suggests that engaging in sports during prepubescence can have a positive impact on the speed and agility performance of children (Gracia-Marco et al., 2021; Masanovic et al. 2020). In a study, boys who participated in soccer training in the prepubertal period exhibited better running speed (30-m sprint) and agility (T-test) performance than those who only participated in the physical education program (Ateş, 2018). Although speed and agility are considered performance-related physical fitness parameters (Howley, 2001), in particular, evaluating these abilities contributes to enhance health, especially bone health, (Ortega et al., 2008) and motor skill development in young individuals (Schmidt et al., 2018; Palou et al. 2019).

When analysing the effects of 12-week of handball intervention sessions, the students in the IG made greater gains in selected health-related fitness measures after 12-week of school-based handball intervention than the CG. The maximum number of curl-up and push-ups increased significantly after the intervention session in IG. These findings support previous studies' results, that school-based handball intervention enhances muscular strength and endurance in prepubertal children (Lemes et al., 2023). In this study Lemes et al. (2023) reported that girls, aged 10-16 years, who attended handball training programs at school (2 hours weekly for 38 weeks) were found to have greater the maximum number of sit-ups compared to children who attended only physical education classes. In addition, our results showed that the maximum number of curl-ups significantly decreased (-24%) in CG. It can be said, improvement in weight and BMI values in CG during the study could have affected the maximum number of curl-ups. Because both abdominal and upper body strength was inversely associated with overweight in cross-sectional analyses (Kim et al., 2005).

A significant increase in VO\textsubscript{max} mean values (19%) in IG and a significant decrease in VO\textsubscript{max} mean values (-9%) in CG demonstrated the benefits of a school-based handball training program to improve specific cardiovascular fitness level of prepubescent children. These findings agree with previous studies, which suggest that implementing handball activities in school settings can enhance prepubertal children's cardiovascular capacity (Ion, 2015; Lemes et al., 2023). Furthermore, the decrease in VO\textsubscript{max} mean values in CG can be explained by the increase in weight and BMI values during the study. These results were confirmed by previous studies (Kim et al., 2005).

The school-based handball intervention session was also successful in significantly increasing the jump distance measured in the SLJ test (6%). Previous studies (Ion, 2015) investigating handball training in children have reported the same tendency of greater improvement in jump tests involving SLJ. In this study, it is possible that the characteristics of the handball exercise, including throwing with long jumps, could be explained by the increased distance jumped after the handball intervention.

The current study, improvement in selected performance-related physical fitness parameters (agility (T-Test) and sprint (T30m) test) was observed after 12-week of handball intervention sessions in IG. In parallel with our results, Oxyzoglou et al. (2009) reported that handball training programs (3 times/week for 60min (50 training sessions)) have been associated with increased 30-m sprint and agility time performance in preadolescent children. In addition, Ion (2015), reported a significant increase in 50 m running time after start practicing handball games in children. It can be said that the performance improvement in speed (-8%) and agility (-22%) time performance in the IG demonstrated the positive effects of handball training to improve the explosive skills of prepubescent children. This reflects the characteristics of the training programs of handball, which emphasize specific explosive actions such as fents and directional change, attacking/attacking the opponent, defending, and direct and lateral movement in the field (running, stops, turns). In addition, sprint and CoD exercises with and without a ball (Marques & González-Badillo, 2006), used throughout 12-week of school-based handball training may have also developed running speed performance. Thus, sport-specific speed and agility exercises are recommended for handball conditioning programs (Ziv & Lidor, 2009).

Conclusion

The results of this study corroborate previous findings which suggest that engagement in school-based physical activity programme is positively associated with enhanced levels of physical fitness, in comparison to students who do not partake in any physical activities. The marked improvement in the maximal number of curl-ups and push-ups, speed and agility time, VO\textsubscript{max} mean values, and SLJ distance indicates the effectiveness of a school-based handball intervention as a method for enhancing the both health related and performance-related physical fitness of
preadolescent children. The role of these improvements in supporting a healthy life in both the present and the future is crucial. In this end, it has been suggested that school-based handball activities are valuable tools for promoting the holistic development of children.

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ВПЛИВ УТРУЧАННЯ У ФОРМІ ШКІЛЬНИХ ТРЕНУВАНЬ ІЗ ГАНДБОЛУ НА ФІЗІЧНУ ПІДГОТОВЛЕНІСТЬ І РЕЗУЛЬТАТИВНІСТЬ ДІТЕЙ ВІКОМ 12–14 РОКІВ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; Д – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 8 с., 3 табл., 59 джерел.

Історія питання. Утручання у формі шкільних заходів із фізичної активності позитивно впливають на загальний стан здоров’я, гарне самопочуття та якість життя дітей. Метою цього дослідження є вивчення впливу 12-тижневого тренування з гандболу на компоненти фізичної підготовленості та фізичних показників дітей молодшого шкільного віку.

Матеріали та методи. У цьому квазіекспериментальному дослідженні університетським відділенням учні, які беруть участь у шкільних тренуваннях з гандболу, складають групу втручання (ГВ) (n = 15, віком 12,3 ± 0,96 року), а ті, хто не бере участі (n = 17, віком 12,1 ± 0,83 року), складають групу порівняння. Лінійну швидкість (тест лінійної швидкості на дистанції 30 м – T30m), швидкість зміни напрямку (час виконання Т-тесту на спритність, який передбачає біг із маневрування Т-подібною траєкторією), силу нижніх кінцівок (стрибки в довжину з місця (СДМ)), м’язову силу та витривалість (підйоми корпуса та віджимання протягом 30 секунд) та розрахунковий максимум споживання кисню (VO₂max) (тест Йо-Йо з переміжним відпочинком (рівень 1) – YYIRTL-1) вимірювали на початку та в кінці тренування з гандболу. Для перевірки статистично значущих відмінностей у попередніх тестах між групами використовували t-критерій Стьюдента для незалежних вибірок. Для аналізу статистично значущих відмінностей у групах використовували t-критерії Стьюдента для парних вибірок.

Результати. Результати виявили, що, за винятком оцінок у тесті СДМ, показники попереднього тестування у ГВ були статистично значущо вищими, ніж у КГ. В оцінках підсумкового тестування показники у ГВ були статистично значущо вищими, ніж у КГ, у всіх тестових оцінках. Крім того, рівні показників фізичної підготовленості у ГВ статистично значущо змінилися за період між попереднім і підсумковим тестуванням (р < 0,05), а в контрольній групі – ні (р > 0,05).

Висновки. Підсумовуючи, утручання у формі шкільних заходів із гандболу може позитивно впливати на характеристики фізичної підготовленості та результативності учнів.

Ключові слова: фізична підготовленість, результативність, шкільний захід, користь для здоров’я, період, що передує статевій зрілості.

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Cite this article as: Akinci, Ya., & Ateş, B. (2023). The Effects of School-Based Handball Intervention on 12–14-Year-Old Children's Physical Fitness and Performance. Physical Education Theory and Methodology, 23(5), 754-761. https://doi.org/10.17309/tmfv.2023.5.14

Received: 28.08.2023. Accepted: 27.09.2023. Published: 30.10.2023

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