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**ORIGINAL SCIENTIFIC ARTICLE**

# EFFECTS OF IAAF KID'S ATHLETICS PROGRAMME ON PSYCHOLOGICAL AND MOTOR ABILITIES OF SEDENTARY SCHOOL GOING CHILDREN

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**Abstract**

**The purpose of this study** was to find the effects of a 12 weeks IAAF Kid's Athletics programme on the psychological and motor fitness abilities of sedentary school-going children.

**Materials and methods.** The study involved 40 students (age 10 to 14 years) with no previous history of systematic training. The subjects were further sub-divided based on their age, i.e. low age (10 to 11 years) and high age (13 to 14 years), and then randomly assigned to either an experimental group (Kid's Athletics) or a control group. The psychological variables selected were stress tolerance reactive, simple motor speed, simple reaction speed, visual perception, and focused attention, whereas motor variables selected were sit and reach test, standing broad jump, 50m sprint, T-test, and 150m sprint. Tests were conducted pre-training, mid-training, and post-training for motor variables while only pre-training and post-training tests were conducted for psychological variables.

**Results.** The two-way mixed ANOVA revealed a significant difference in all the selected variables (motor and psychological variables) in group × time interaction (p = 0.001 to <0.001) with large effect sizes. Larger effect sizes in motor fitness variables were observed after 12 weeks (ES=2.09 to 5.72) than 6 weeks (ES=1.92 to 3.47) when compared to baseline in the experimental group.

**Conclusion.** The study shows that Kid's Athletics recommended by IAAF may be considered as an effective programme to improve psychological as well as motor abilities in sedentary school-going children.

**Keywords:** physical fitness, physical education, Vienna Test System Sport, sprint, jump, agility.

## Introduction

In this last decade, modernization has taken a sharp growth leading to a more sedentary lifestyle among children resulting in the occurrence of hypokinetic diseases and mental health issues, due to the lack of activities and social isolation. In contrast to this, involvement in regular physical activities during childhood and adolescence has been associated with improved physiological and psychological aspects (Baranowski et al., 1992; Sallis & Patrick, 1994), and ultimately reducing the chances of occurrence of hypokinetic diseases or mental health issues. Participating in sport as early as in preschool has been linked to increased physical capacity and social skills development in children (Chatrath, 2002), and positively influences anthropometric measures such as body weight and body composition (Sallis & Patrick, 1994), and also improves physical fitness (Hands, 2008; Ortega et al., 2008; Reilly et al., 2005), considered an important marker of health (Ortega et al., 2008). Besides, sports participation at an early age develops motor coordination by providing more opportunities to learn and refine motor skill executions (Okely et al., 2001; Reilly et al., 2005). The differences in the levels of physical fitness and motor coordination among children involved in sport can be partly explained by the amount of time spent within the sport. A previous study reported a positive effect of the number of training hours per week on flexibility, explosive leg power, and motor coordination in children aged 10 to 12 years (Fransen et al., 2012). Sports is also considered as a training strategy to stimulate intellectual processes such as attention, memory, creativity, and reasoning (Krogius, 1972) and strengthen abilities such as concentration, problem-solving, planning strategies, and creativity for children with special education needs (Storey, 2000).

Although regular physical activity is linked to improved physical and mental health, the major challenge is the involvement of children in a long-term programme. This can be countered by including new events and innovative organization of activity sessions which enables children to discover basic activities like sprint, endurance running, jumping, and throwing. In addition, sports also create an excellent environment that allows interaction between children and inculcate a peer group because of various competition. Previous research has shown that game-based exercise intervention played a pivotal role in these beneficial changes in both motor abilities and athletic performance (Armstrong, 1992; Houston-Wilson et al., 1997). This concept meets the needs of children by providing appropriate activities, education, and fun.

Athletics, also known as track and field encompasses a wide variety of events that involves walking, running, jumping and throwing. Success in such events is underpinned by a diversity of physiological, psychological, and biomechanical attributes. The world's governing body of athletics, the International Association of Athletics Federation (IAAF), recognizes a number of distinct disciplines to be included as events. In the last few decades, a growing trend in every sport is grassroots development. The respective governing bodies of particular sport are putting in an endless effort to involve as many children as possible in their grassroots development programme. In the same vein, IAAF has developed a new concept of athletics that focuses on the developmental needs of children by inspiring children's sporting enthusiasm and mutual interaction and named it as "IAAF Kid's Athletics" programme (IAAF, 2006). The objective of this programme is to make athletics the most participated sport in school, and to educate children about sport (athletics in particular), thus promoting a balanced and healthy lifestyle. It also aims to resolve the issue of early specialization in the training programmes, which temporarily boosts performance at a young age but later becomes a reason for drop out from sport.

Previous studies (Calik et al., 2018; Cillik & Willweber, 2018; Petros et al., 2016; Willweber & Cillik, 2018) have tried to find the benefits of Kid's Athletics programme in various age groups (6 to 7 years, and 11 to 12 years) and on motor variables such as sprint, jump, flexibility, agility, coordination, etc. and psychological variables such as self-esteem. The duration of the studies ranged from 12 weeks to 6 months (Calik et al., 2018; Cillik & Willweber, 2018; Petros et al., 2016; Willweber & Cillik, 2018). Although the results of the studies reported positive outcomes, there is a lack of research conducted on the short term effect (6 weeks) of Kid's Athletics programme. Additionally, there is limited research regarding the effect of Kid's Athletics programmes on psychomotor variables among school-going children for the age of 10 to 14 years.

Therefore, the aim of this study was two-fold, i.e. to find the effect of six weeks and twelve weeks of Kid's Athletics programme on psychological as well as motor abilities in sedentary school-going children, and to find if age (low and high) has any effect on those abilities. The author's hypothesized that there would be a positive effect of the Kid's Athletics intervention on both psychological as well as motor abilities compared to the control group.

## Materials and methods

### *Study participants*

A total of 40 subjects agreed to participate in the study. The subjects were school-going children aged between 10 to 14 years and did not had any previous experience of a scheduled training programme. The inclusion criteria of subjects in this study were the absence of any recent lower extremity injury and any musculoskeletal disease which could affect the training or data collection. The subjects were grouped into two subgroups, i.e. low age (10 to 11 years) and high age (13 to 14 years), and then randomly assigned to an experimental group (i.e. IAAF Kid's Athletics) and control group with equal subjects in each subgroup. The 12 years aged subjects were not included in this study to maintain a sufficient gap between the low and high age groups. A written consent form was signed by the parents/guardian after explanations of the procedure and possible risk during the intervention/data collection. The study was approved by the Departmental Research Committee of Lakshmibai National Institute of Physical Education and was conducted following the ethical principles for human research proposed in the declaration of Helsinki.

### *Study organization*

A week-long familiarization session was conducted before the start of the intervention to make the subjects acquainted with the test protocols. The subjects were explained about the procedure of the data collection and training intervention during the familiarization sessions. The training intervention was conducted for a period of 12 weeks, with 36 training sessions of 60 minutes each. One micro-cycle consisted of 7 days, with 3 training sessions conducted on alternate days (i.e. Monday, Wednesday, and Friday; Table 1). The training intervention was designed such that it focused on developing the motor abilities with exercises based on maximum fun and pleasure-based elements.

The motor fitness tests were conducted three times, i.e. pre-training (0 week), mid-training (6 weeks), and post-training (12 weeks), whereas the psychological tests were conducted twice (due to the longer duration of test per subject it would possibly affect the training programme), i.e., pre-training (0 week) and post-training (12 weeks).

The motor fitness tests comprised of sit and reach test, standing broad jump, 50m dash, T-test, and 150m sprint.

*Sit and reach test.* The sit and reach test was conducted to measure the flexibility of the back and leg (hamstring) muscles. A sit and reach flexibility assessment testing box was placed on a plain surface and the subjects were asked to sit on the floor with fully extended legs in such a way that the bottom of the feet was fixed at the box. The subjects were then asked to stretch and reach directly forward with palms down along the measuring scale holding the position for one second. Three trials were allowed with the highest measurements recorded for analysis.

*Standing Broad Jump.* Standing broad jump was conducted to measure the explosive strength of the subjects. The subjects were asked to stand behind the take-off line with their feet several inches apart and were asked to flex their knees and swing their arms backward allowing them to jump forward. The best trials among the three trials were recorded for analysis.

*50m dash.* This test was conducted to measure the speed of the subjects. A pair of photoelectric timing gates (Cronox sports, Madrid, Spain) were placed at the starting point and finish point. The subjects started 50 cm from behind the first timing gate and time was recorded between the first and second pairs of timing gates placed 50m apart.

**Table 1.** An example of training sessions followed during a micro-cycle by the Kid's Athletics intervention group

| Monday | Wednesday | Friday |
|---|---|---|
| **Warm-up** (10 minutes)<br>**Form a group:** Players run around in random directions avoiding body contact with other players. The coach calls a number and players form groups of that size.<br>**Sally & Steve:** Players pair up and from various starting positions sprint to their marker to collect an object and sprint back to the starting line. The first player back wins a point. | **Warm-up** (10 minutes)<br>**Racing Relay:** Players race each other in a relay, practicing hopping sequences along the way.<br>**Frogs & Lily pads:** Players continuously jump from lily pad to lily pad using a two-foot forward jump. (Play in groups of 4-8.) | **Warm-up** (10 minutes)<br>**Team Alphabet:** Players move randomly around the space until a letter of the alphabet is called. They then must form groups in the shape of the letter. (Play with 8-30.)<br>**Stone, Bridge & Tree:** A relay race using various static and locomotion movements. (Play in teams of 6-8.) |
| **Main Session** (40 minutes)<br>**Ladder Drills: (10m x 5 reps)**<br>Different speed & coordinative exercises.<br>**Reaction Drills: (20m x 5 reps)**<br>Short Sprints from different position x 5<br>**Curve Running: (20m x 2 reps)**<br>Players run curves around various markers from the starting point, following the directions that are called by the coach<br>**Slalom Sprint: (5 x 50m relay x 1 rep)**<br>In teams, players run slalom-style between markers in a relay race. | **Main Session** (40 minutes)<br>**Forward Squat Jump: (20m x 2) approx. 10 jumps**<br>Do very explosive continuous 10 squat jumps to the front.<br>**Speed Bounce: (20 seconds x 2)**<br>Players jump side to side over a foam wedge as many times as possible in 20 seconds<br>**Skip to my Lou: (40 nos. x 4)**<br>Holding the skipping rope behind the heels, players challenge themselves to skip as many two-foot jumps within a time limit. | **Main Session** (40 minutes)<br>**Formula one: (80m x 2)**<br>A team event in which each team member has to complete the full course. Up to six teams can compete at the same time on one course.<br>**"8" Endurance Race: (150m x 2)**<br>Each team has to run around a course of 150m from a given starting point. Each team member tries to run around the course as often as possible in 8 minutes. The start command is set for all teams at the same time by blowing a whistle. |
| **Cool Down** (10 minutes)<br>• Children do a slow jog to cool the body down followed by slight stretching.<br>• Working from head to toe stretching all main muscle groups. | **Cool Down** (10 minutes)<br>• Children do a slow jog to cool the body down followed by slight stretching.<br>• Working from head to toe stretching all main muscle groups. | **Cool Down** (10 minutes)<br>• Children do a slow jog to cool the body down followed by slight stretching.<br>• Working from head to toe stretching all main muscle groups. |

*T-test.* T-test was used to determine the speed with directional changes, which included forward sprinting, left and right shuffling, and backward running. The subjects were asked to start at cone A. On the command of the researcher, the subject sprints to cone B and touched the base of the cone with their right hand. They then turned left and shuffled sideways to cone C, and also touched its base, this time with their left hand. Then shuffled sideways to the right to cone D and touched the base with the right hand. Then they shuffled back to cone B touched with the left hand, and ran backward to cone A. The time was stopped as they passed cone A.

A pair of single beam photocell timing system (Cronox-sports, Madrid, Spain) was placed at the start/finish line. Subjects started 50 cm behind the photocell (Fig. 1)

*150m sprint.* The 150m test was conducted to measure the speed endurance of the subjects. The photocell timing gates were placed at the start and finish line 150m apart.

Whereas the psychological test was conducted using a valid and reliable (Lienert and Raatz, 1998) Talent Assessment Teens 2 (TATEENS2) test set in the Vienna Test System Sport (VTS Sport) which comprised of stress tolerance reactive, simple motor speed, simple reaction speed, visual perception, and focused attention. The tests were conducted in a calm and quiet room on a laptop installed with VTS software (TATEENS) and supporting equipments like VTS keyboard and foot paddle. The duration of the test for each subject was approximately 55 minutes. The procedure of all the test protocols can be obtained from elsewhere (Vienna Test System, 2013)

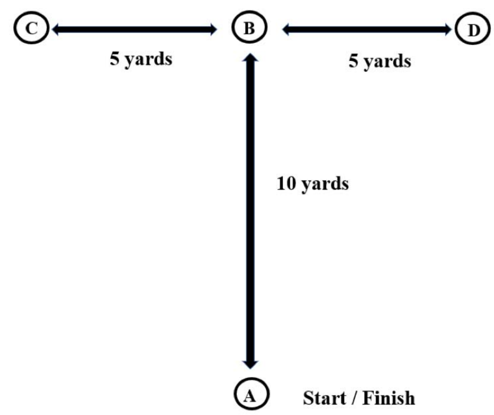


**Fig. 1.** Graphical representation of the T-test

### *Statistical analysis*

The data were analysed using IBM SPSS software (version 20.0.0) and presented as Mean [SD]. A two-way mixed ANOVA with time (Motor variables: pre-, mid-, and post-; Psychological variables: pre- and post-) as within-subject factor, groups (experimental and control) as between-subject factor, and age (low and high) as blocking factor were used for the analyses. Normality was verified using the Shapiro-Wilk test, while assumptions of sphericity were verified using Mauchly's test. In case of violation, the Greenhouse-Geisser correction was used. The level of statistical significance was set at $p \leq 0.05$.

The effect size of the interaction effect was calculated using $\eta^2_p$ with 0.01 meaning small, 0.06 moderate, and 0.14 large effect. Cohen d were also calculated for within-subject baseline and post-assessment effect size with <0.2 trivial, 0.2-0.6, small, >0.6-1.2, moderate, >1.2-2.0, large, >2.0-4.0, very large, >4.0, extremely large (Hopkins et al., 2009).

## Results

The two-way mixed ANOVA revealed a significant difference in all the selected variables (motor and psychological variables) in group × time interaction (p = 0.001 to <0.001) with large effect sizes (Table 2 and 3). Larger effect sizes in motor fitness variables were observed after 12 weeks (ES = 2.09 to 5.72) than 6 weeks (ES = 1.92 to 3.47) when compared to baseline in the experimental group (Table 2).

## Discussion

The aim of this study was two-fold, to find the effect of IAAF Kid's Athletics on motor variables and psychological variables among sedentary school-going children, and to find if age influenced the results. The findings of our study suggest that Kid's Athletics programme improves both the motor fitness variables and psychological variables of the subjects compared to control after 12 weeks of intervention. In addition, both 6 weeks and 12 weeks programme duration improved the motor fitness variables to a large extent when compared to baseline, with larger improvements in 12 weeks duration than in 6 weeks duration.

The findings of our study are in line with the previous study conducted by Petros et al. (2016). The study (Petros et al., 2016) was conducted on elementary school students aged 11 to 12 years for 12 weeks and reported significant improvement in all motor fitness components in Kid's Athletics group than the traditional method group. Petros et al. (2016) also suggested that Kid's Athletics may motivate the elementary students to learn track and field as a new sport. In addition, the Kid's Athletics programme also helped the students to

**Table 2.** Mean and standard deviation of motor variables in the pre-test, mid-test, and post-test

| Indicator | Experimental Group | | | Control group | | | P-value (group× time) | P-value (group× time× age) | ES (group× time) $\eta^2_p$ | ES (pre to mid) d [95%CI] | ES (pre to post) d [95%CI] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre-test | Mid-test | Post-test | Pre-test | Mid-test | Post-test | | | | | |
| | Mean [SD] | | | | | | | | | | |
| Sit and reach | 21.6 [3.35] | 24.3 [3.36] | 27.28 [3.35] | 23.08 [2.94] | 22.38 [2.81] | 22.48 [3.02] | <0.001 | 0.004 | 0.97 | 3.47 [2.49-4.45] | 5.72 [4.32-7.11] |
| SBJ | 1.5 [0.23] | 1.61 [0.22] | 1.82 [0.19] | 1.53 [0.2] | 1.49 [0.22] | 1.5 [0.22] | <0.001 | 0.001 | 0.91 | 1.99 [1.23-2.74] | 4.8 [3.58-6.02] |
| 50m | 9.19 [0.86] | 8.99 [0.82] | 8.6 [0.69] | 9.34 [0.64] | 9.35 [0.6] | 9.41 [0.68] | <0.001 | 0.34 | 0.78 | 2.12 [1.35-2.9] | 2.09 [1.13-2.86] |
| T-test | 14.06 [1.45] | 13.45 [1.27] | 12.61 [1.18] | 14.44 [1.31] | 14.5 [1.34] | 14.58 [1.36] | <0.001 | <0.001 | 0.93 | 1.92 [1.17-2.67] | 3.45 [2.47-4.43] |
| 150m | 29.42 [3.41] | 27.63 [2.78] | 25.96 [2.57] | 30.4 [4.05] | 30.55 [3.99] | 30.75 [4.02] | <0.001 | <0.001 | 0.90 | 2.93 [2.19-3.68] | 3.14 [2.45-4.03] |

**Note:** Pre-test = 0 week, mid-test = 6 weeks, post-test = 12 weeks, SBJ = standing broad jump, $\eta^2_p$ = partial eta squared, d = Cohen d

**Table 3.** Mean and standard deviation of psychological variables in pre-test and post-test

| Indicator | Experimental Group | | Control Group | | P-value (group× time) | P-value (group× time× age) | ES (group×time) $\eta^2_p$ | ES (pre to post) d (95%CI) |
|---|---|---|---|---|---|---|---|---|
| | Pre-test | Post-test | Pre-test | Post-test | | | | |
| | Mean [SD] | | | | | | | |
| Stress tolerance reactive | 16.8 [9.42] | 52.55 [9.7] | 17.55 [15.32] | 17.4 [12.58] | <0.001 | 0.205 | 0.97 | 4.65 [3.65-5.65] |
| Simple motor speed | 40.35 [27.59] | 68.05 [17.36] | 38.75 [31.46] | 38.45 [29.81] | <0.001 | 0.093 | 0.89 | 4.9 [3.86-5.94] |
| Simple reaction speed | 31.25 [17.42] | 68 [13.5] | 34.85 [22.92] | 32.3 [20.81] | <0.001 | 0.457 | 0.95 | 4.4 [3.44-5.36] |
| Visual Perception | 22.55 [18.33] | 24.5 [17.8] | 21.85 [16.04] | 20.35 [14.48] | <0.001 | 0.26 | 0.48 | 0.75 [0.21-1.29] |
| Focused attention | 21.2 [9.88] | 54.6 [10.52] | 24.25 [13.57] | 21.45 [12.15] | <0.001 | 0.343 | 0.98 | 7.08 [5.68-8.48] |

**Note:** Pre-test = 0 week, post-test = 12 weeks, $\eta^2_p$ = partial eta squared, d = Cohen d

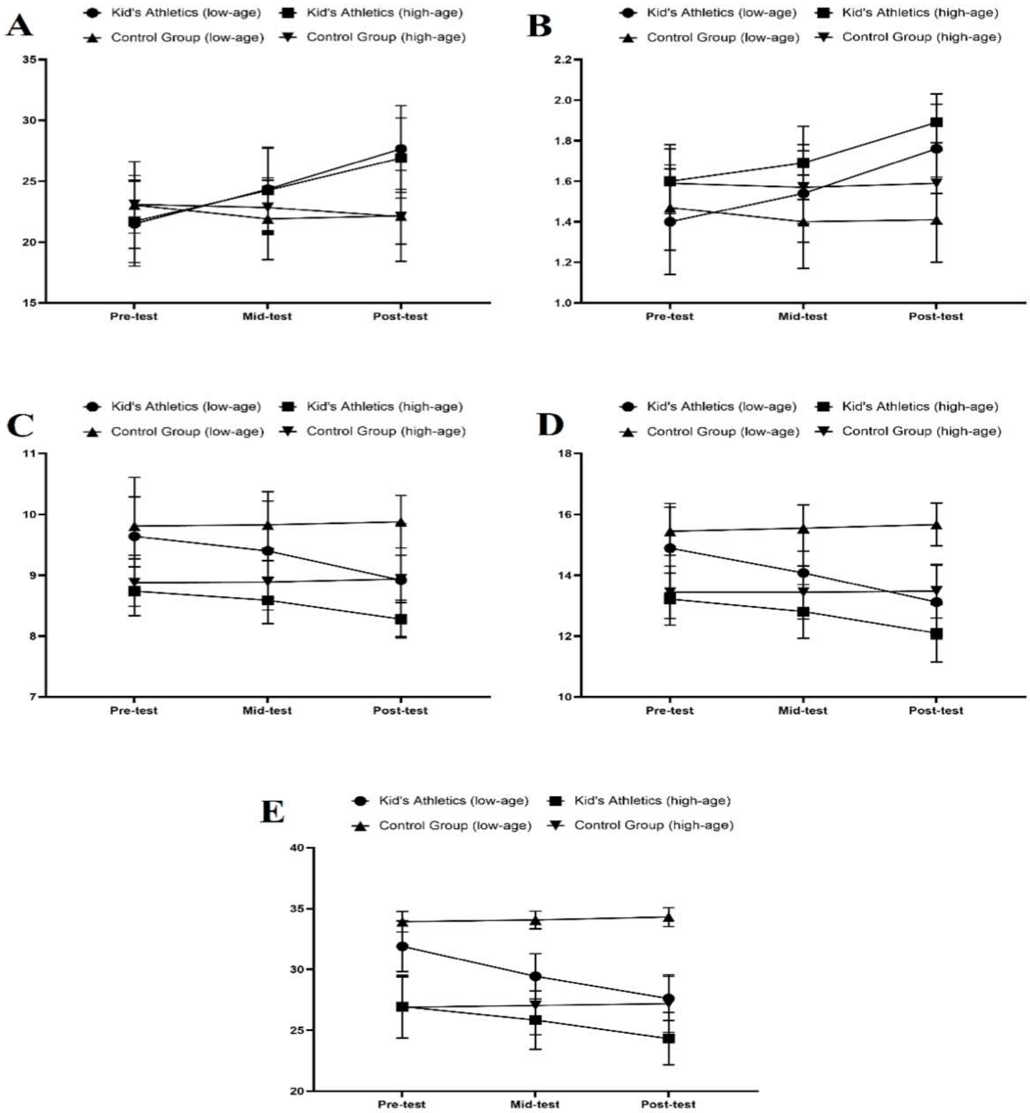


**Fig. 2.** Graphical representation of pre-, mid-, and post- measurement of (A) sit and reach test, (B) standing broad jump, (C) 50m sprint, (D) T-test, and (E) 150m test among low age (10-11 years) and high age (13-14 years) experimental group and control group

realize the importance of this particular sport, while also deriving benefits such as improvement in physical fitness and track and field performance (Fig. 2).

The findings of our study reported that the subjects who were involved in the Kid's Athletics programme improved in all the motor fitness variables than control. This can be partly explained by the fact that the subjects included in our study were sedentary school-going children with no previous experience of systematic training. The 3 days a week Kid's Athletics programme may have induced sufficient stimulus to improve the motor abilities of students. In addition to this, it is worth noting that intervention as low as 6 weeks were sufficient in improving the motor abilities. In fact, it is already known that when a new stimulus as training intervention is applied, the maximum benefits can be extracted. Sports coaches and physical education professionals always look for a new approach to training to benefit the players or students. The improvement in the motor fitness variables can also be explained by the fact that Kid's Athletics programme included a variety of preparation exercises and modified games that were aimed at improving track and field skills. This variety of exercises and games may have benefitted in inducing the improvement by motivating the students to learn track and field (Petros et al., 2016). Previous studies also suggest that including wide varieties of drills and multi-sport activities may result in a positive outcome in physical fitness among students (Kirk, 2005; Pesce et al., 2012). In addition, the structured programme of Kid's Athletics may have helped students to improve the identified regulation which resulted in an increase in the desire to put greater effort (Petros et al., 2016). Previous studies have also suggested that a self-determined profile is positively correlated to motor fitness variables (Mouratidis et al., 2008; Shen et al., 2009). This means a higher self-determination profile would possibly result in higher motor fitness measures.

In addition, our findings also suggest greater improvements in motor fitness variables in the Kid's Athletic group

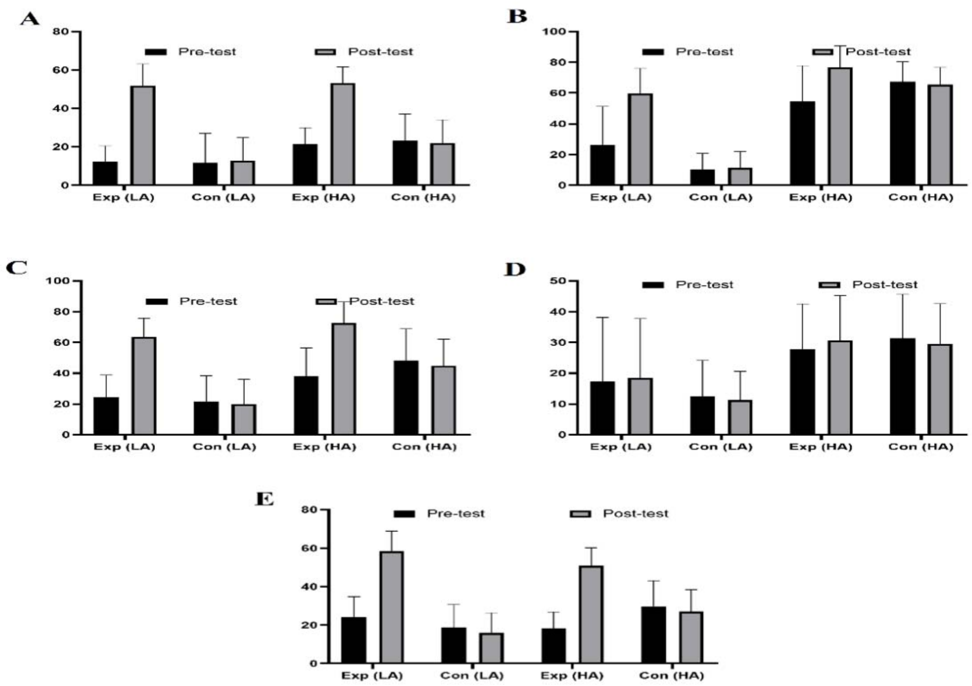


**Fig. 3.** Graphical representation of pre- and post- measurement of (A) stress tolerance reactive, (B) simple motor speed, (C) simple reaction speed, (D) visual perception, and (E) focused attention among low age (10-11 years) and high age (13-14 years) experimental group and control group

were observed after 12 weeks when compared to 6 weeks. This finding is in line with the previous literature (Hands, 2008), where studies have shown a longer duration of training improves motor abilities to a greater level. This may be due to greater physiological and neuromuscular adaptations in sedentary children following a longer duration of Kid's Athletics programme (Fig. 3).

Another finding of our study was the psychological improvement in the Kid's Athletics group than the control. Due to a lack of studies in Kid's athletics for psychological variables a comparison could not be made. In view of this, the available literature does acknowledge the relationship between motor and cognitive skills (Gethell et al., 2005; Gioti et al., 2006; Haines, 2003; Kambas et al., 2002; Spanaki et al., 2016). Previous studies also highlighted the importance of the organized motor programme with supporting evidence that a structured programme may increase the activation level of cognitive skills among children (Pascual-Leone & Irwin, 1994).

Lastly, the findings of our study suggest no difference in the effect of the intervention among both low (10 to 11 years) and high (13 to 14 years) age. Both the age groups significantly improved in all the measured variables after the Kid's Athletics programme, suggesting a beneficial effect for both age groups.

## Conclusions

In conclusion, the findings of our study suggest that both psychological measures and motor fitness can be improved in sedentary school-going children to a larger extent following a Kid's Athletics programme as recommended by IAAF. In addition, both 6 weeks and 12 weeks duration are sufficient in inducing the changes in all the motor fitness components. Of note, physical education professionals may include Kid's Athletics programme in conjunction with other programmes to facilitate the students. Also, the Kid's Athletics programme as recommended by IAAF may be included in the physical education curriculum pertaining to its beneficial effect both psychologically and physically.

## Conflict of interest

The authors declare that there are no conflict of interest.

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# ВПЛИВ ПРОГРАМИ ІААФ З ДИТЯЧОЇ ЛЕГКОЇ АТЛЕТИКИ НА ПСИХОЛОГІЧНІ І РУХОВІ ЗДІБНОСТІ ДІТЕЙ, ЯКІ ВЕДУТЬ СИДЯЧИЙ СПОСІБ ЖИТТЯ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 3 табл., 2 рис., 30 джерел.

**Мета дослідження** – визначити вплив 12-тижневої програми дитячої легкої атлетики ІААФ на психологічні і рухові здібності дітей, які ведуть сидячий спосіб життя.

**Матеріали та методи.** У дослідженні взяли участь 40 школярів (віком від 10 до 14 років), які раніше не проходили систематичне навчання. Школярі були додатково розділені на підгрупи в залежності від віку, підгрупа від 10 до 11 років і підгрупа від 13 до 14 років, а потім випадковим чином були розподілені в експериментальну групу (дитяча легка атлетика) і в контрольну групу. Як психологічні змінні були обрані реактивна стійкість до стресу, швидкість простої моторики, швидкість простої реакції, зорове сприйняття і сфокусована увага, в той час як вибрані моторні змінні включали тест «сидіти і дотягнутися», стрибок в довжину з місця, спринт на 50 м, Т-тест і спринт на 150 м. Тести на рухові змінні проводилися до, в середині і після тренування, в той час як тести для психологічних змінних проводилися тільки до і після тренування.

**Результати.** Двосторонній змішаний дисперсійний аналіз показав значну різницю у всіх обраних змінних (рухові і психологічні) у взаємодії група × час (p = 0,001 до <0,001) з великою величиною ефекту. Більша величина ефекту в змінних рухової підготовленості спостерігалася через 12 тижнів (ES = 2,09-5,72), ніж через 6 тижнів (ES = 1,92-3,47) порівняно з вихідним рівнем в експериментальній групі.

**Висновки.** Дослідження показує, що дитяча легка атлетика, рекомендована ІААФ, може розглядатися як ефективна програма для поліпшення психологічних, а також рухових здібностей у дітей, які ведуть сидячий спосіб життя.

**Ключові слова:** фізична підготовка, фізичне виховання, Віденська тестова система спорту, спринт, стрибок, спритність.

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