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Effect of an Educational Traditional Games Program on Primary School Pupils' Health-Related Fitness

أثر برنامج تعليمي بالألعاب التقليدية على عناصر اللياقة البدنية المرتبطة بالصحة لدى تلاميذ الطور الابتدائي

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Abstract:

A high level of Health-Related Fitness (HRF) is associated with successful functioning within daily life and participation in physical activity both in short and long term. Many strategies to increase the HRF of primary school pupils have been studied, noted and implemented.. This study examined the effect of an educational traditional games program on primary school Pupils' health-related fitness. This research followed an experimental pre-test/post-test design including a control group and an experimental group. The study involved 60 pupils from fifth grade of primary school, half of the pupils who formed the experimental group were subjected to the experimental treatment in a period of nine weeks. Fitness was measured using the FITNESSGRAM test battery. The results showed an increase in the HRF of the participants. Therefore, using traditional games is recommended as a positive foundational activity for primary school children, .Additionally, the results can provide useful information in the application of traditional games in physical education classes.

Key Words: Health; traditional Games; primary school; Cardiovascular fitness; Muscular strength.

الملخص :

يرتبط أعلى مستوى للياقة البدنية المرتبطة بالصحة بالأداء الناجح في الحياة اليومية وممارسة النشاط البدني سواء على المدى القصير أو المدى الطويل، العديد من الاستراتيجيات لتحسين اللياقة البنية المرتبطة بالصحة لدى تلاميذ المدارس تمت دراستها ، تسجيلها ومن ثم تنفيذها، ومنه هدفت هذه الدراسة إلى التحقق من تأثير برنامج تعليمي للألعاب التقليدية على عناصر اللياقة البدنية المرتبطة بالصحة لدى تلاميذ المدرسة الابتدائية اتبعت هذه الدراسة المنهج التجريبي بتصميم المجموعتين (ضابطة وتجريبية) (قياس قبلي وبعدي) شملت الدراسة على 60 تلميذ من السنة الخامسة ابتدائي، تم تعريض نصف عينة البحث مكونة المجموعة التجريبية إلى برنامج تجريبي لمدة 9 أسابيع، تم قياس اللياقة البدنية المرتبطة بالصحة باستعمال حقيبة اختبارات. أظهرت النتائج ارتفاع في اللياقة البدنية المرتبطة بالصحة للمشاركين. ومنه نوصي باستعمال الألعاب التقليدية كنشاط أساسي إيجابي لدى تلاميذ المرحلة الابتدائية بالإضافة إلى ذلك يمكن للنتائج أن توفر معلومات عن كيفية استعمال الألعاب التقليدية في حصة التربية البدنية والرياضية.

الكلمات المفتاحية :اللياقة البدنية المرتبطة بالصحة؛ الألعاب التقليدية؛ المدرسة الابتدائية؛ اللياقة القلبية؛ القوة العضلية.

1- **Guezgouz Fatah**

Introduction:

Sport not only provides an opportunity for children to be active, but also provides an environment which may aid in the development of positive healthy behaviors. A sedentary lifestyle is related to health problems and may diminish children's personal development. Nevertheless, the attainment of appropriate physical fitness levels by participating in physical activities and organized sports has been shown to be beneficial for health, reducing morbidity.

Moreover, mortality participation in physical activities has diminished over the last few decades (Stalsberg, R, Pedersen, 2010).

Traditional games formerly were very popular and played in the evening by a range of ages (Ekunsanmi, 2012). They have been recognized as a significant part of nations' cultural heritage. Today, in circumstances of global integration, people's future mostly depends on preservation of their cultural variety. Most of the traditional games and sports, expressions of indigenous cultures, and ways of life contributing to the common identity of humanity are under the threat of waning.

Health-related physical fitness includes the characteristics of functional capacity. It is affected by the physical activity level and other lifestyle factors. Regular participation in moderate and vigorous levels of exercise increases physical fitness, which can lead to many health benefits (Ruiz et al., 2006).

In addition to the behavior of physical activity, specific components of health-related fitness are important to improve health and wellbeing in children. Health-related fitness consists of five domains including body composition, the cardiovascular fitness (aerobic fitness), muscular strength and endurance, and flexibility; However, body composition and cardiovascular fitness endurance are the two domains that tend to have the strongest relationships with health outcomes (Armstrong N. et al.2011). Because of the established relationships between body composition, cardiorespiratory endurance, and various health markers, improving these components health-related fitness has become a priority to improve wellbeing and attenuate risk of developing chronic diseases (Burns R. D. et al.2015).

However, despite the wide utilization of traditional games in physical education classes, few studies have assessed the effects of intervention programs, based on traditional games, on Health-Related Fitness of primary school Pupils.

The aim of this study was to determine the effect of an educational traditional Games program on primary school Pupils' health-related fitness.

2- Research profile:

The study aimed to identify the effectiveness of the traditional games program in the improvement of the health-related fitness of primary school Pupils. And to determine and document some forms of traditional games of Algeria and giving details on how they were played

2.1- Research questions:

- **Main research question:**

- Does participation in an educational traditional games program improve the health-related fitness of primary school Pupils ?

• Sub-questions:

1. Are there statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Control Group ?
2. Are there statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Experimental Group ?
3. Are there statistically significant differences of Post-Test Values for the health-related fitness between the Experimental and Control Groups ?

2.2- Hypotheses:

• General Hypothesis:

- Participation in the educational traditional games program improves the health-related fitness of primary school Pupils.
- Partial Hypotheses:

1. There are no statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Control Group.
2. There are statistically significant differences between Pre-Test and Post-Test Values of the health-related fitness for the Experimental Group in favour of the post-tests.
3. There are statistically significant differences of Post-Test Values for the health-related fitness between the Experimental and Control Groups in favour of the Experimental Group.

2.3- Significance of the study:

This study may contribute to the understanding of the current health-related physical fitness of primary school Pupils. It will also contribute to the general body of knowledge in Physical Activity. The results can also provide useful information in the application of traditional games in physical education classes.

3- Literature Review:

3.1- Traditional Games:

Traditional games, which were the integral part of our ancestors' childhood, have almost vanished. Our parents' generations still recall some of those, but children in modern society know them poorly.

The older generation sports otherwise identified as traditional games, are succeeded physical activities performed very regularly after harvest season mostly by farmers (Addy Putra, et all, 2014; Ekunsanmi, 2012; Tatira, 2014). Traditional games were taken over from the earlier generation and passed on to the young generation through oral, sound or presentations. It has been reported that these traditional games have a racial and cultural value (Civarello, 2007) and are categorised as part of the recreational activity (Addy Putra et al., 2014).

Among the various types of traditional games played by the older generation in Algeria, were:

Ghomayda (hide and seek), it is a children's game in which one player covers his or her eyes until the other players have hidden themselves, and then he or she tries to find them. There was no equipment and the players used homestead facilities like houses, vegetation and ditches as hiding places and due to its nature of running and hiding, the game of **ghomayda** cultivated fitness, thereby empowering components as endurance, agility, flexibility and speed.

Hop-scotch is also called ***"la marelle"*** is a children's game that can be played with several players or alone. Hopscotch is a popular playground game in which players toss a small object into numbered triangles or a pattern of rectangles outlined on the ground and then hop or jump through the spaces to retrieve the object.

These traditional games are played with no monetary cost.The materials needed for the performance of the games are obtained from the surroundings or recycled. For example, the **courda, skipping the ropes** game uses only ropes. In fact, in some of the traditional games, no materials are needed at all such as **ghomayda, hide and seek**, The aforementioned traditional games are very popular in Algeria and had been played by the older generation.The games involve a lot of movements, which are mostly related to the activations of motor fitness components

- **Importance and Benefits of traditional games :**

Despite the existence of a number of studies and the evidence provided from the studies that traditional games offer numerous benefits such as strengthening coarse and delicate motor skills (Akbari, et all 2009) as well as developing cardiovascular condition (Rauber, et all, 2014) it is growing into more and more unpopular and less engaged in by the younger generations nowadays. The reason is the expeditious industrial advancement, where the young people are more appealing to watching television, playing electronic games and computers at home without considering the time squandered (Akbari et al., 2009; Ekunsanmi, 2012).

A study conducted by (Ekunsanmi, 2012), reported that out of the 77% who used to play the traditional ***Yoruba*** **game of Arin**, only 18% are still practising it. This is due to lack of exposure to traditional games of the current generation on their importance to improving both their health and sporting abilities.

3.2- Health-related Fitness

Physical fitness can also be thought of as an integrated measure of most, if not all, the body functions involved in the performance of daily PA and/or physical exercise (Ortega et al., 2008). Health related fitness includes Cardiovascular Fitness, muscular strength and endurance, body composition and flexibility (Howley, 2001). These characteristics are often referred to as health-related components (Powell et al., 1988), and are associated with disease prevention and health promotion.

- **Cardiovascular Fitness**

Cardiovascular fitness or referred to by some as cardiorespiratory fitness is one of the many types of bodily functions that can be measured and is considered an important aspect of an individual's physical fitness. Cardiovascular fitness is the overall capacity of the cardiovascular system as well as the respiratory system to

provide oxygen and carry out prolonged exercise (Ortega et al., 2008). Cardiovascular fitness can also be defined as the direct measure of maximum oxygen uptake (e.g., VO2max) (Faulkner, 2010). Although there is an important genetic factor involved in cardiovascular fitness, it can be greatly affected by lifestyle (Mori et al., 2009). In regards to children, cardiovascular fitness is a very important aspect of fitness and is often considered an independent marker of health (Ortega et al., 2008).

- **Flexibility**

Maintaining adequate joint flexibility is important in the functional health of the musculoskeletal system. However, children do not typically struggle in the area of flexibility when it comes to their fitness, instead it is something students should be informed about as being important as they age since most students will easily pass a flexibility test, like that which is administered in the FITNESSGRAM, it is questioned whether flexibility is a good portrayer of overall fitness? (Meredith and Welk, 2010).

- **Muscular Strength and Endurance**

Muscular strength and endurance are often combined into one more inclusive fitness category (Meredith and Welk, 2010). It is equally as important as muscular flexibility because of the importance to have strong muscles that can work forcefully over a long period of time (Meredith and Welk, 2010). Although studies show that overweight and obese performed poorer in both push-up and sit-up testing compared to normal weight, such differences must be interpreted cautiously (Deforche et al., 2003; Mak et al., 2010). Lifting a greater body mass by overweight subjects involves higher entry costs compared to normal weight subjects (Deforche et al., 2003).

3.3- research related Studies:

- **First study:**

The study was conducted by Javier Yanci and all (2014) entitled : « Effects of traditional games played in physical education classes with elementary school students ». The aim of this study was to evaluate the effect of an intervention program based on traditional games of tag on change of direction ability in first and third grade elementary education students.

The sample consisted of 42 elementary education students. The study protocol included two evaluation sessions, an initial evaluation (pretest), a final evaluation (posttest) and a three week intervention program of traditional games of tag. The modified agility test showed good coefficient of variation values for all groups. No significant differences were found in the coefficient of variation as a result of gender or age group, or pre and posttest. Significant differences were found between pre and posttest results in the modified agility test for the total sample. These results suggest that physical education classes using games of tag were an effective method for improving change of direction ability in elementary education students and were especially effective for the first grade boys' group and third grade girls' group.

- **Second study:**

The study was conducted by Mohamad Razali Abdullah and all (2017) entitled : «The Effect of Traditional Games Intervention Program in the Enhancement of School-age Children's Motor Skills: a Preliminary Study ». The aim of the study was to explore the effectiveness of a traditional games intervention program in the enhancement of school-age children's motor skills. The quasi-experiment method is applied. The sample consisted of 40 Malaysian children who were randomly selected for the study]. The children went through the traditional games intervention which consisted of performing selected traditional games for 60 minutes, three times weekly for a period of eight weeks. Motor fitness performance tests were conducted three times (pre, mid, and post-test). The data were collected and analysed using MANOVA repeated measurement. The results showed that traditional games intervention was effective in the improvement of motor performance. The result from this initial study demonstrated that Malaysian based traditional games could be efficient in improving the motor skills of school-age children.

- **Third study:**

The study was conducted by Liana Webster (2014)) entitled : « Impact of an Educational Gymnastics Course on the Motor Skills and Health-Related Fitness Components of Physical Education Teacher Education Students». The aim of the study was to examine the impact of an educational gymnastics course on PETE students' motor skill proficiency and health-related fitness. A mixed method, pre-post no control group design was used. Participants (N = 22) included PETE students enrolled in a 16-week educational gymnastics course. Data were collected from three primary sources including, 1) four individual skills tests 2) the FITNESSGRAM test battery, and 3) a survey (with a Likert scale and open ended questions). Pre-test and post-test scores on motor skills assessments were analyzed in separate related-samples Wilcoxon signed rank nonparametric tests. The pre-test and post-test scores on each item of the FITNESSGRAM fitness test battery were analyzed using separate, repeated measures within-subjects analysis of variance (ANOVA) tests. A Spearman's rho correlation coefficient was used to analyze whether any relationships existed between motor skill level and fitness. Responses to the two Likert Scale survey questions were analyzed using separate, repeated measures ANOVA tests. The open-ended survey data were analyzed qualitatively using constant comparison. Primary findings suggest that an educational gymnastic course can improve the content knowledge/motor skill proficiency of PETE students, The results of this study may be used by PETE programs to make decisions regarding the inclusion of an educational gymnastics course in their programs .

- **Fourth study:**

The study was conducted by Nebojša Trajković1 and all (2014) entitled : «Impact of Gymnastics Program on Health Related Fitness in Adolescent Pupils». The aim of this study was to determine the effects of gymnastics program in school on health related fitness in adolescent pupils. The study involved 58 adolescent pupils attending the first grade at high school involved in a 12 weeks of gymnastics

classes. The variables were selected within the battery of tests Eurofit, measuring abdominal strength, flexibility, aerobic fitness and upper and lower body strength, speed and agility. The results showed average initial level and later dynamic increase in the physical fitness of the participants. Pre-test to post-test values showed significant improvements in all tested variables ($p<0.05$), except for the 4x10m test. Therefore, participation in gymnastics must be recommended as a positive foundational activity for school-aged children, from early childhood to adulthood. Additionally, the results can provide useful information in optimizing the training loads of pupils involved in gymnastic training throughout physical education classes.

Based on the above related studies, we find that the current study is consistent with these related studies in its main topic and its general goal, but it differs from them in several aspects that represent the scientific gap that the current study addresses, as it targeted: the health related fitness of primary school pupils, and the educational program was designed by using traditional games originating from the Algerian environment.

4- Materials and Methods:

4.1-Research Design:

This study examined the effect of an educational traditional games program on primary school Pupils' health-related fitness. Thus, the experimental approach was used. with an experimental pre-test/post-test design including a control group and an experimental group.

4.2- Population and study sample:

The Population of this study consists of primary school pupils in Bouira province-Algeria, the subjects selected consisted of 60 pupils enrolled in the fifth grade of the primary school "Ben Amer Mohammed". They were selected in a purposive way, Half of the 60 children incorporated into the research comprised the control group, while the other half formed the experimental group.

- **Homogeneity and equivalence :**

- **Homogeneity**: homogeneity was tested as regards age, height, weight, cardiovascular fitness, muscular strength and endurance, flexibility and the Coefficient of variation (CV) was used where the percentage was less than 30%.
- **Equivalence** : equivalence between the two research groups was conducted according to the variables age, height and weight, cardiovascular fitness, muscular strength and endurance, flexibility, where the results showed that there are No significant differences were found in the Coefficient of variation (CV) as a result of gender or age group and cardiovascular fitness muscular strength and endurance and flexibility.

4.3- Study variables:

based on the title of the study and in light of the hypotheses we can determine the study variables as follows:

A-**The independent variable:** The educational traditional Games program.
B-**Dependent variable**: health-related fitness.

4.4- Study Instruments and Procedures:

A- Health-related fitness tests:

Fitness was measured using the FITNESSGRAM test battery, which is a physical fitness assessment program that includes a variety of health-related fitness tests designed to assess cardiovascular fitness, muscular strength and endurance, flexibility, and body composition (Meredith and Welk, 2010). The specific tests selected for this study were the PACER 20 m Shuttle Run test for cardiovascular fitness, and 90° Push-Up test for muscular strength and endurance, the Back-Saver Sit and Reach test for flexibility, the **health-related fitness** test battery was introduced to all the pupils, who did three test trials. Pupils were measured, after standard warm up (5 minutes of running, and 10 minutes of dynamic stretching).

- **Psychometric test properties:**

- **Test validity and reliability:**

Validity refers to the degree in which our test or other measuring device is truly measuring what we intended it to measure.

The reliability and validity of the FITNESSGRAM assessments are thoroughly documented in the FITNESSGRAM Reference Guide (Welk and Meredith, 2008). Many experts consider the FITNESSGRAM test battery to be the most psychometrically sound assessment of fitness available for fitness testing in youth.

- **Test Objectivity:**

In this study, the process of filtering the tests that measure the health related fitness components of primary school pupils , by experts and specialists, is as follow

Table 1: The final tests that have been nominated in the filtering process:

HRF components	HRF tests	Degree of preference
cardiovascular fitness	PACER 20 m Shuttle Run test	52.22%
muscular strength and endurance	90° Push-Up test	45%
Flexibility	Back-Saver Sit and Reach test	43%
Number of experts and specialists (10)		

4.5- Data Analysis:

Basic descriptive statistics were calculated (mean value and standard deviation). The coefficients of variation (CV), "independent t" test , "paired samples t" . All data analyses were performed in IBM SPSS Statistics 19.0 statistical program.

5- Results And Discussion

5.1- Results:

The purpose of this study was to examine the effect of an educational traditional Games program on primary school Pupils' health-related fitness.. This study sought to examine the following research questions: Are there statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Control Group ? Are there statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Experimental Group ? Are there statistically significant differences of Post-Test Values for the health-related fitness between the Experimental and Control Groups ? this chapter is divided into two sections. The first section includes the results of the study. The second section includes the discussion of the results.

Table 2 : Pre-Test and Post-Test Values for the health-related fitness of the Control Group.

Test	group	N	mean	SD	T test		
					T	Df	P
PACER	Pre-test	**30**	**23.70**	**3.04**	**0.90**	**29**	**0.37**
	Post-test	**30**	**23.60**	**2.88**			
90° Push-Up	Pre-test	**30**	**6.46**	**1.97**	**1.68**	**29**	**0.10**
	Post-test	**30**	**6.33**	**2.02**			
B-Saver Sit and Reach	Pre-test	**30**	**21.03**	**1.66**	**1.46**	**29**	**0.15**
	Post-test	**30**	**21.20**	**1.66**			

As shown in Table 2, according to the pre- and post-test findings of "paired samples t" test of the control group, the difference between group averages was found to be statistically insignificant ($p>0.05$). therefore the first hypothesis that states "there are no statistically significant differences between Pre-Test and Post-Test Values for the health-related fitness of the Control Group" is confirmed.

Table 3 :Pre-Test and Post-Test Values for the health-related fitness of the Experimental Group

Test	Group	N	Mean	SD	T test		
					T	Df	P
PACER	Pre-test	30	24.26	3.13	15.78	29	0.000
	Post-test	30	28.23	3.03			
90° Push-Up	Pre-test	30	8.56	2.48	24.81	29	0.000
	Post-test	30	16.70	3.36			
B-Saver Sit and Reach	Pre-test	30	21.04	1.56	9.31	29	0.000
	Post-test	30	22.54	1.13			

As shown in Table 3, according to the pre- and post-test findings of "paired samples t" test of the experimental group, a statistically significant difference was found ($p<0.05$). The differences in question showed up in favour of the post-tests, therefore the second hypothesis that states "there are statistically significant

differences between Pre-Test and Post-Test Values of the health-related fitness for the Experimental Group in favour of the post-tests." is confirmed.

Table 4 : Post-Test Values for the health-related fitness of the Experimental and Control Groups.

Test	Group	N	mean	SD	T test		
					T	df	P
PACER	Control	**30**	**23.60**	**2.88**	**2.69**	**58**	**0.009**
	Experimental	**30**	**20.05**	**6.60**			
90° Push-Up	Control	**30**	**6.33**	**2.02**	**10.54**	**58**	**0.000**
	Experimental	**30**	**19.83**	**6.71**			
B-Saver Sit and Reach	Control	**30**	**21.20**	**1.66**	**3.64**	**58**	**0.001**
	Experimental	**30**	**22.54**	**1.13**			

As shown in Table 4, among the post-test values of the "independent t" test of the experimental and control groups, a statistically significant difference on the level of 0.05 ($p<0.05$) was found among the mean test values of PACER, 90° Push-Up, and B-Saver Sit and Reach. The differences in question showed up in favour of the experimental group. Hence the third hypothesis that states "There are statistically significant differences of Post-Test Values for the health-related fitness between the Experimental and Control Groups in favour of the Experimental Group." is confirmed.

5.2- Discussion:

It was tested the hypothesis that participation in the educational traditional games program would lead to significant improvements in health-related fitness of primary school Pupils. It was observed that pupils who engaged in 9 weeks traditional games program were able to achieve great improvements in health-related fitness testing battery.

The results show significant improvement in the PACER 20 m Shuttle Runtest for cardiovascular fitness after the 9 weeks of traditional games program. This finding is an indicator that participating in this kind of games activities could regularly improve cardiovascular fitness. Similar results were found in other studies conducted on European adolescents (Ortega et al., 2008; Ortega et al., 2011). Previous research asserts that traditional games offer numerous benefits such as developing cardiovascular condition (Rauber, Boullosa, et all., 2014), Therefore, similar programs for increasing cardiovascular fitness should be implemented in primary school classes.

Very high performance was observed in the test of Back-Saver Sit and Reach test for flexibility, showing very high progress at post-test. The results of 90° Push-Up test for muscular strength and endurance were significantly higher in post-test compared to Pre-Test. One of the major benefits of children's participation in traditional games program compared to the participants who were not involved in

the program is enhanced muscular strength and endurance, that is what (Clement Mubanga, 2004) believes that the value of taking part in the traditional games is Strengthening the muscles and improving flexibility so making every day tasks easier, in addition due to the nature of running and hiding, the game of **ghomayda (hide and seek)** cultivated fitness, thereby empowering components as endurance, flexibility, agility and speed.

Nine weeks of traditional games program implemented in PE classes of primary school had a beneficial effect on cardiovascular fitness, flexibility, muscular strength and endurance in primary school pupils. Similar results were found in other studies examining the effect of intervention programs based on applied games on abdominal muscle strength(Vera-García et al., 2005) and aerobic capacity (Gatch, W., Byrd, R., 1979) Therefore, using traditional Games is recommended as a positive foundational activity from early childhood. Data provided from this study can provide useful information in the application of traditional games in physical education classes and it represents useful information, which should be helpful for them conducting similar physical function testing in the future.

6. Conclusion:

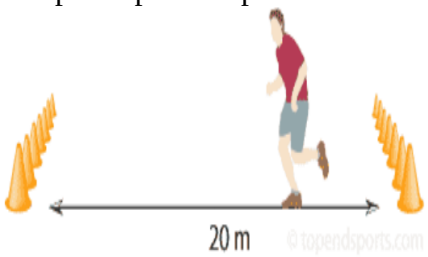
The main findings of this study were: 1) no significant differences were found between pre- and post-test findings in the Health-Related Fitness test for the control group, 2) significant differences were found between Pre-Test and Post-Test of the health-related fitness for the Experimental Group in favour of the post-tests.3) significant differences of Post-Test Values for the health-related fitness between the Experimental and Control Groups in favour of the Experimental Group. The study revealed that traditional games programe which are **ghomayda is hide and seek**, **Elkado the gift**, **courda the rope**, and **Hop-scotch la marelle,** could be efficient in the improvement of Health-Related Fitness.The traditional games applied in physical education sessions are suitable for improving the **Cardiovascular Fitness, Flexibility Muscular Strength and Endurance** of pupils from fifth grade of primary school. The traditional games can be a useful method for physical education teachers to improve Health-Related Fitness of pupils from fifth grade of primary school it is recommended to physical education teachers to apply these traditional games intervention programme to increase their pupils' Health-Related Fitness. The traditional could also be revived by allowing children to play every evening as it has been practised initially by the older generation.

Despite the existence of these studies and the evidence provided that traditional games offer numerous benefits such as developing motor skills and health-related fitness it is growing into more and more unpopular and less engaged in by the younger generations nowadays. The reason slightly, for the declining the reputation of the games among the younger generation today is the expeditious industrial advancement, where the young people are more appealing to watching television, playing electronic games. video and computers, at home without considering the time squandered. However, because of the limited number of studies we have found, further research is needed to corroborate the effects of traditional games on different Health-Related Fitness components in children of similar ages to confirm and elucidate further the findings discovered in this study.

Appendix : Health-related fitness tests

PACER 20 m Shuttle Run test for cardiovascular fitness:

Aerobic fitness was assessed using the **20 m Shuttle Run Test**. Pupils are required to run between two lines 20 m apart (one "lap"), starting at 8.5 km/h and increasing by 0.5 km/h every two minutes, in synchrony with a cadence tape. The test was supervised by at least two of the field team. The number of laps completed was determined by the student failing to keep pace with the cadence tape on two consecutive laps or voluntarily withdrawing. The last completed stage or half-stage at which the participant drops out was scored.

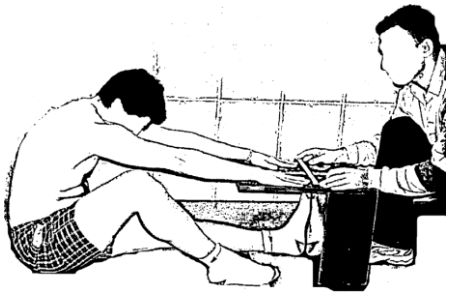


90° Push-Up test for muscular strength and endurance:

Pupils did a push - up position on the mat with hands placed wider than the shoulders; fingers stretched out and whole body went straight on the mat. Then the subject lowered the body using the arms until the elbows bent at a 90 degree angle, and upper arms were parallel to the floor. The subject pushed up and continued in the movement until the arms were straight on each repetition. The score was the number of 90 degree push – ups performed.

The Back-Saver Sit and Reach test for flexibility:

Children were seated on the floor with one leg out straight and the other leg with the knee bent and its foot flat on the floor (see image). The outstretched foot is placed flush against the measurement box. the subject reaches slowly forward along the measuring line as far as possible. After three practice reaches, the fourth reach is held for at least one second while the distance is recorded. The subject may repeat the test three times and the best score taken.



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