Age Differences in Health-Related Physical Fitness among Primary School Boys in Okwuato, Abob Mbaise of Imo State, Nigeria: Implications for Health and Physical Education in the UBE Program

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Abstract
Health-related physical fitness of 64 10-year and 64 11-year old randomly selected primary school boys in Okwuato, Abob Mbaise of Imo State, Nigeria was assessed using the modified Army Physical Fitness Test and the Eurofit Battery of Fitness Test. Five test items of pull-ups, push-ups, sit-ups, sit-and-reach and 1.6km run-walk were used to determine the health-related physical fitness of the boys. Means, standard deviations and t-test statistics were used in the data analysis. Results showed muscular strength, muscular endurance and flexibility of the 11-year old boys differed from those of the 10-year old boys and the differences were significant (p < .05), except for push-ups and sit-ups. The 10-year old boys had a better cardiorespiratory endurance index (10-year old, M = 7.98; 11-year old, M = 6.75) as measured from the 1.6km run-walk than the 11-year old, but the difference was not significant. However, the health-related physical fitness scores of the pupils fell short of existing health-related physical fitness scores of their contemporaries in both developed and developing countries. Since health-related fitness scores of the boys are lower than those of their contemporaries elsewhere, primary school Physical and Health Education (PHE) curriculum planners are challenged to re-examine the PHE curriculum so as to include activities that might aid primary school pupils improve on their strength and endurance, among others, in the UBE program. It is suggested that high fitness levels should be the goal of every primary school in the UBE program.

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The benefits of having an appreciable level of fitness are obviously numerous. High risks of cardiovascular disease (CVD) and obesity levels have been documented for individuals who do not possess an appreciable level of fitness (Hansen, Hasselstrom, Gronfeldt, Froberg, & Anderson, 2005; Ozer, 2005). Poor physical fitness profiles of adults (Pitetti & Yarmer, 2001) has been attributed to factors such as physical inactivity, chronotropic insufficiency, poor motivation, less access to physical activities facilities and difficulties in accurate fitness assessment of the population (Fernhall, 1993; Kavale & Forness, 2000).

Physical fitness testing is a highly visible and important part of physical fitness programs. School and other concerned organizations must adopt a logical, consistent, and scientifically sound approach to physical fitness. The focus of physical fitness testing should be health-related rather than athletic-related (American College of Sports Medicine, 1988).

Health-related fitness focuses on optimum health and prevents the onset of diseases and problems associated with inactivity. Maintaining an appropriate level of health-related fitness allows a person to meet emergences, reduce the risk of disease and injury, work efficiently, participate and enjoy physical activity (sports, recreation, leisure), and look one’s physical best (Huang & Malina, 2002). Sharkey (1997) noted that fitness, in whatever form, is more than increased performance or improved safety. The active life and fitness lead to better physical and psychological health, lower risk of degenerative disease, enhanced vitality and longevity, and an improved quality of life. The benefits of fitness extend well beyond those related to one’s job. Activities that lead to improved fitness are associated with reduced risk of heart diseases; hypertension and stroke; reduced incidence and severity of diabetes; reduced risk of certain cancers; reduced incidence of over weight and obesity; strengthened bones, ligaments, tendons and muscles; reduced risk of osteoporosis; reduced risk of injury and illness, and increased energy mobility and even longevity (Beets & Pitetti, 2005; McArdle, Katch, & Katch, 2001).

Data from studies (Chen, Lin, Peng, Li, Wu, Chiang, Wu, & Huang, 2002; Monyeki, Koppes, Kemper, Monyeki, Toriola, Pienaar, & Twisk, 2005; Pena Reyes, Tan, & Malina, 2003) indicated need for physical activities to develop health-related physical fitness of primary school children. According to Pate (1982), the American Alliance for Health, Physical Education, Recreation and Dance in 1980 introduced and designed the health-related physical fitness test to evaluate physical fitness components associated with preventing diseases and promoting physical health. Several studies (Bagnet, Twisk, Kemper, Van Praagh, & Berthoin, 2006; Finkenberg & Dinucci, 1995; Rowland, Kline, Goff, Martel, & Ferrone, 1999) evaluated health-related physical fitness profiles of children in the United States and European countries. Regrettably, little information is available about health-related physical fitness profiles of Nigerian children (Toriola, Ajisafe, Ogunjimi, & Musa, 1992). The little available information on health-related physical fitness of Nigerian children documented those outside Okwuato, Abob Mbaise of Imo State; and did not consider age as a variable of importance in tracking health-related fitness in youth age 9 to 12 (Marshall, Sarkin, Sallis, & McKenzie, 1998). This situation prompted the present study to assess health-related physical fitness of primary school pupils (ages 10 & 11) in Okwuato, Abob.
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Mbaise of Imo State, Nigeria. One hypothesis, which states that there is no significant difference between the mean health-related physical fitness scores of 10 and 11 year old boys was postulated for verification at p < .05.

The Universal Basic Education (UBE) program in Nigeria is a federal government effort to provide basic education that should be universally free and compulsory to every Nigerian child of school-going age having formal and non-formal components. The formal component of UBE, which concerns the subjects of the present study, starts from primary one to third year of Junior Secondary School for the children (Aguokogbuo, 2004). Age 10 and 11 are border ages separating end of primary school and beginning of secondary school. Therefore, determining the health-related physical fitness of the boys at this border could serve as a guide for planning Physical and Health Education (PHE) program in the primary school.

Data generated in this study will likely be useful to primary school PHE curriculum planners in the UBE program to re-examine what constitutes PHE curriculum so as to include activities that might aid primary school pupils improve on their muscular strength and endurance, if considered low. It is worth noting that muscular strength helps the body be in proper shape and delays early atrophy. Muscles that are strong could withstand certain levels of strain and stress and do not get fatigued easily. Data emanating from the study could also serve as baseline information on health-related physical fitness of primary school pupils in the area under study; and could be of help to PHE teachers to identify activities to include in school physical and health fitness program in the UBE program.

Methods

Participants and Setting

One hundred and twenty eight randomly selected 10-year (n = 64) and 11-year (n = 64) old boys from eight primary schools in Okwuato, Abob Mbaise, Imo State of Nigeria served as participants. Okwuato, Abob Mbaise is a rural community in Imo State of Nigeria. It is considered a rural community in the sense that it has no government sponsored or provided social amenities such as a central water supply system and electricity. Furthermore, none of the roads leading to Okwuato, Abob Mbaise from the nearest major (Owerri-Umuahia) road are tarred. Presently, the fastest, but costly, means of transportation in this community is the motorcycle, popularly called ‘Okada’ in Nigeria. Because of the poor nature of the community members, the most available and affordable means of transportation for most people is the bicycle. Children, especially boys, learn to ride on the bicycle as early as when they are 6 years old. Most children trek and some ride on their bicycle, to school. The children might also get involved in after-school activities involving long distance trekking and bicycle riding. Experience shows long distance trekking and riding on bicycles could confer some level of fitness on children and even adults.

Sources of Test Items

The test items used in the study were all obtained from two sources, namely: the modified Army Physical Fitness Test (Nwegbu, 1988), and the Eurofit Battery of Fitness Test, which was initially used to test the health-related physical fitness of primary school children in Australia and New Zealand (Eurofit, 1988). The selection of these fitness test items was based on the premise that all the test items could cater for subjects of all ages. Dike, Alor, Nwimo, and Nji (2004) had successfully used these test items in testing health-related physical fitness of primary school pupils. These test items had been found to be appropriate to determine health-related physical of children (Ajiduah & Okuribudo, 1990); and objective, valid, reliable and standardized. Reliabilities of the test items namely: pull-ups \( r = .78 \); push-ups \( r = .96 \); sit-ups \( r = .94 \); sit-and-reach \( r = .86 \) and 1.6 run-walk \( r = .67 \) have been found (Johnson & Nelson, 1982; Rikli, Petray, & Baumgartner, 1992).

Collection of Data

The test batteries consisted of pull-ups; push-ups for one minute; one minute flexed knee sit-ups; sit and reach, and 1.6km run-walk tests. Pull-ups test measured the strength of muscles of arm and shoulder girdle; push-ups test measured muscular endurance of the arms and shoulder girdle; sit-ups test measured abdominal muscle strength and endurance; sit and reach test measured flexibility of the lower back, and 1.6 run-walk measured maximal functional capacity and endurance of the cardiorespiratory system. After permission was sought from head teachers of the primary schools and informed consent was obtained from the subjects, purpose and procedures of the test were explained to the subjects before commencement of the tests. Tests were carried out between 8:30 and 11:30 a.m. each day for 10 school days. Tests were usually preceded by ten-minute warm-up exercises involving simple activities involving pushing pulling, bending, brisk walk and running on the spot. One test was completed before another test was introduced. The best trial out of three was recorded for each participant in any given test.

Data Analysis

Descriptive and inferential statistics were adopted to analyze the data, using Statistical Package for Social Sciences (SPSS), version 14.0 for Windows (SPSS, Inc., 2005). Means and standard deviations were used to describe health-related physical fitness of 10-year and 11-year old pupils. Student t-tests (p < .05) were employed to determine whether statistically significant differences existed between means of the two groups of pupils in each of the fitness tests. Participants’ health-related physical fitness scores were compared to established fitness norms in both developed (Ludlowe, 2004) and developing countries (Musa, 1998).

Results

Results of the study are shown in Table 1. It can be observed that both the 10 and 11-year old boys have mean scores which are far below the health-related fitness norms established for their contemporaries in other parts of the world. Specifically, it can be seen that 10-year old boys have a lower mean score in pull-ups than the 11-year old boys. The same trend is observed in push-ups, sit-ups and sit-and-reach. However, a reverse trend is observed in 1.6 km run-walk, where the 10-year old boys have a higher mean score than the 11-year olds. T-tests indicate that difference in means of these 10 and 11-year old boys in pull-ups and sit-and-reach are significant in favor of the 11-year olds.
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firewood and water, among others, which could confer in the older
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experience shows that in Igbo traditional society, the older a child
is, the more out-of-school activities he is likely to engage in, as
level of consistency in both groups of boys at the rate they develop
boys scored above their respective mean. This trend shows some
implication of the above finding for the present study is that the
10-year old boys scored higher than the 11-year old boys. The
comparison showed that the difference in the scores obtained by
10-year old and 11-year olds was not statistically significant.

Discussion
The discussion is presented in terms of two components of
health-related physical fitness namely: muscular fitness and
cardiorespiratory fitness.

Muscular Fitness
In order to assess strength and endurance of muscles of the
arms, shoulder girdle and upper back, pull-ups and push-ups
were used (Table 1). The table showed that the 11-year old boys
obtained higher scores than the 10-year old boys in all muscular
strength, endurance and flexibility measures. The difference
in the scores obtained by 10-year olds and 11-year olds in pull-
ups was statistically significant. However, the differences in the
scores obtained by the two groups in push-ups and sit-ups were
not statistically significant. It is pertinent to note that the health-
related physical fitness scores of both groups of boys were below
the norms for boys of same age group indicated earlier.
The superiority of the 11-year old boys over the 10-year olds in
pull-ups was not surprising. This is because, muscular strength tend
to increase with age (Fortier, Katzmarzyk, Malina, & Bouchard,
2001). The above observation implicated the fact that muscular
strength index of 11-year olds could differ from the 10-year olds.
Experience shows that in Igbo traditional society, the older a child
is, the more out-of-school activities he is likely to engage in, as
routine domestic chores. Such activities might include fetching
firewood and water, among others, which could confer in the older
child more strength than the younger child.

However, the proportion (> 60% in each case) of the boys who
scored above the mean could be an indication that the 10-year olds
were more consistent in their performance than the 11-year olds.
Nevertheless, the superiority in muscular strength of the 11-year
olds over the 10-year olds is consistent with the findings of Baguet,
et al. (2006) that their older subjects showed a superior muscular
strength over their younger subjects.
The fact that there were no significant differences revealed
between the 10-year olds’ and 11-year olds’ scores in sit-ups was
not a welcome revelation. The implication is that the younger
boys could develop strong abdominal muscles, as do the older

Cardiorespiratory Fitness
The results of 1.6 km run-walk for the two groups showed that
10-year old boys scored higher than the 11-year old boys. The
comparison showed that the difference in the scores obtained by
the 10-year olds and 11-year olds was not statistically significant.
It was plausible to note that more than 80% each of the groups of
boys scored above their respective mean. This trend shows some
level of consistency in both groups of boys at the rate they develop
cardiorespiratory endurance. However, the scores both groups of
boys obtained in 1.6km run-walk are below the established health-
related fitness norms for developed and developing countries. All
things being equal, the 11-year olds are expected to possess longer
arms and longer legs, which wouldn’t help with sit-and-reach. The
implication of the above finding for the present study is that the
10-year old pupils be exposed to physical exercises, which might
help them develop ample strength, endurance and flexibility even
before they are 11 years old.

Cardiorespiratory Fitness
The results of 1.6 km run-walk for the two groups showed that
10-year old boys scored higher than the 11-year old boys. The
comparison showed that the difference in the scores obtained by
the 10-year olds and 11-year olds was not statistically significant.
It was plausible to note that more than 80% each of the groups of
boys scored above their respective mean. This trend shows some
level of consistency in both groups of boys at the rate they develop
cardiorespiratory endurance. However, the scores both groups of
boys obtained in 1.6km run-walk are below the established health-
related fitness norms in both developed and developing countries.
Cardiorespiratory fitness had been recognized as the single most
important component of health-related fitness (Otinwa, 2005; Hong,
Chang, & Li, 1998). It has positive effects on cardiorespiratory
health (Leon, 1991) and on the prevention of hypertension, non-
insulin dependent diabetes and obesity (Bouchard & Shephard,
1993; Carrel, Clark, Petterson, Nemeth, Sullivan, & Allen, 2005;
Vouri, 1991). Therefore, the low fitness observed in the boys was not a pleasing.

The findings are not consistent with previous studies (Carrel, et al., 2005; Rowland, et al., 1999) that found there were higher levels of cardiorespiratory endurance in active children than in inactive ones. Other findings of studies (Musa, 1998; Sharkey, 1997) that are not consistent with those of the present study, show that endurance training and regular physical exercises can improve working capacity of cardiovascular and respiratory systems and there is observable improvement on the variables related to cardiorespiratory endurance on previously inactive persons after receiving training. This evidence indicates that physical activity is one of the most important factors, which could influence cardiorespiratory fitness. These evidences have implications for the present study, which could suggest regular physical exercises for children in primary schools in Okwuato, Abob Mbaise of Imo State and elsewhere.

**Conclusion**

The findings of the study showed that the health-related fitness scores the boys obtained were below established norms in both developed and developing countries. However, the 11-year old boys obtained significantly higher scores than the 10-year olds in pull-ups and sit-and-reach. On the other hand, in 1.6 km run-walk, the 10-year old boys scored higher than the 11-year olds, but the difference was not significant. Since physical inactivity does not bestow in individuals the fitness level to enjoy vigorous lifetime activities, it is recommended that high fitness levels should be the goal of every primary school in the UBE program, since there is a significant relationship between activity and health-related fitness (Katzmarzyk, Malina, Song, & Bouchard, 1998).

The high fitness goal could be achieved through a well-developed physical and health education program of activities. In addition to being physically active, children need to learn fundamental motor skills to aid the development of health-related physical fitness. Physical education provided at school is an ideal way to encourage activity and develop fitness among children and, for many children, will be their only preparation for an active lifestyle (Summerfield, 1998).

**Implications for Health and Physical Education in the UBE Program**

The findings of the study present, among others, the following challenges for PHE in the UBE program:

1. Since health-related fitness scores of the boys are lower than those of their contemporaries elsewhere, primary school PHE curriculum planners are challenged to re-examine the PHE curriculum so as to include activities that might aid pupils improve on their strength and endurance, among others, in the UBE program;

2. Primary school teachers are challenged to identify and include in the primary physical and fitness program, activities that might help pupils develop an appreciable level of health-related fitness in the UBE program;

3. Since a pattern of inactivity (U.S. Department of Health and Human Services, 1996), begins early in life promotion of physical activity for development of health-related fitness among primary school pupils in UBE program becomes a necessary challenge for the program planners;

4. Among children and adolescents, physical activity can prevent or delay the development of hypertension and can reduce blood pressure in those young people who already have hypertension (U.S. Department of Health and Human Services, 1996). Therefore, the provision of a well-developed activity program, which could help primary school pupils develop health-related fitness in the primary school UBE program, becomes a necessary challenge, and

5. Physical and health education, provided at school, is an ideal way to encourage activity and development of health-related fitness among children and, for many children, will be their preparation for an active lifestyle. For this reason, the Centers for Disease Control and Prevention (CDC), the National Association for Sport and Physical Education (NASPE), and the American Heart Association (AHA) all recommend comprehensive daily physical education for children in order to develop encouraging levels of health-related fitness (Summerfield, 1998). This recommendation also affects in-school primary children in Nigeria in the UBE program.

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**References**


