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A Description and Comparison of Anthropometrical and Physical Fitness Characteristics in Urban and Rural 7-11 Years Old Boys and Girls in Golestan Province, Iran

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Abstract: The purpose of this study was to describe and compare the anthropometrical and fitness parameters in urban-rural boys and girls in the age of 7-11 years old in Golestan, Iran and consider the relationship between them. 1224 boys and girls (7-11 years old) were selected as sample from three urban areas and siex rural areas in Golestan. Standing height, weight, body mass index, percentage of body as anthropometrical variables and 40 m dash, standing long jump, sit and reach, handgrip, sit-up and 10×4 m running as fitness variables were measured. The data were analyzseds using mean, standard deviation, t test, ANOVA and Pearson correlation ($P<0.05$). The results showed that boys were better than girls in height, weight, standing long jump and sit-up items. The girls, also, had higher scores than boys in percentage of body fat. The urban children were better than rural in weight, standing long jump and sit-up. The rural girls had lower scores in handgrip rather than other groups. Correlation results showed that height positively and weight negatively had a correlation with running and jumping tasks. Weight had a positive correlation with handgrip item. The results are discussed in positive effect of better living condition on growth and fitness on the children in rural areas.

Key words: Anthropometry · Fitness · Urban and rural children

INTRODUCTION

The significant changes that accompany the transition from agricultural to urban societies have greatly impacted the social and biological transformation of populations worldwide. The urbanization process, however, occurs under different circumstances among countries [1]. Living in areas distinguished by population size can be associated with differences in eating habits, access to sport facilities, sanitation and health services and opportunities for physical activities [2].

Urban and rural environmental differences in growth of children have come into focus of interest in the last years. There are several studies which have reported contradictory evidences in samples from various countries and cutures and with various age ranges. Bielicki [3] and Eiben *et al*. [4] reported that within a specific country or cultural group in Europe, children who were living in urban areas have greater size than children in rural areas, while there were no significant differences in the growth status in children who were living in urban and rural areas in United Stated and Canada [5-8] reported significant differences in growth and maturity status in China's` children in urban-rural conditions. Data from Africa, also, revealed that urban-rural contrasts are evident in the growth and body size [9,10].

Malina *et al*. [11] pointed out that body size is related to performance of many physical fitness components. Hence, the size differences commonly observed in urban-rural children may also be related to different levels of physical fitness. In contrast, to consider the growth status of rural and urban children, corresponding comparisons of physical performance are relatively limited, however, these researches have been shown ambiguous evidences within countries.

Matsui and Tamura [12] showed that rural children were superior in their endurance ability compared to urban children from Japan, while Pilicz and Sadowska [13] indicated that urban children from Poland favored the better performance in physical fitness tests such as dash, ball throw and vertical jump. Same results in aerobic fitness reported between youth 12-15 years old in

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Switzerland [14]. Hennenberg and Louw [15] showed that rural children in South Africa had trend towards have a lower grip strength compared to urban peers, but there was no consistent rural-urban differences in neuromuscular reaction time and pulse rate. It has been showed that in a large sample of 3-18 years old boys and girls in Hungary, urban conditions has been influenced on physical fitness, so that urban children had better performance in fitness tests [4]. With adjustment for age and body size, handgrip strength was greater in rural children in Mexico, while explosive power and muscle endurance and strength were better in urban than in rural children [5]. Urban children in Greece were significantly better in basketball throw and vertical jump than rural children, while rural children were significantly better in handgrip strength than urban children [2].There is a positive correlation between distance covered with height and with weight and they suggested that rural girls processing proportionately higher height and weight had better physical performance. According to these results, it is clears that difference in urban-rural children in physical fitness has not been clearly mentioned [16].

Growth and fitness needs to be studied in different climate, economic and cultural context. As a result, investigation of the growth and fitness of children resident in rapidly expanding urban areas and in rural communities in the same general region in difference countries are potentially of interest [17].

Because the special situation of Golestan province in Iran, which has many rural populations near to urban areas, we chose to consider urban-rural differences in anthropometry and fitness in urban-rural communities. The aim of this study, however, is to bring information about growth profile and fitness characteristics of urban and rural children and as well as to determine the relationship between them.

MATERIALS AND METHODS

Study Area: Golestan is one of the 31 provinces of Iran, located in the north-east of the country, south of the Caspian Sea. It has a population of 1.9 million (2009) and an area of 20,380 km². Recent decades haves seen a huge migration to this province, especially from Zabol northest city of Sistan and Baluchestan. They are a sizable minority at cities such as Gorgan, Ali Abad, Kalaleh and many of the eastern townships and most of them live in urban areas around the towns.the Golestan enjoys mild weather and a temperate climate most of the year. Geographically, it is divided into two sections: The plains and the mountains of the Alborz range. Statistics provided from Iran Statistical Center have shown that in Golestan province socioeconomic status has changed during the past few decades as an improvement in living conditions, with greater availability of schools and universities, electricity, safe drinking water, telephone communication and roads.

Subjects and Data Collection: The subject population consisted of 632 (320 urban and 312 rural) boys and 592 (302 urban and 290 rural) girls aged 7-11 years old who were selected from three urban and six rural regions in Golestan state where was represented a large range of socioeconomic status and living conditions. This sample was selected from healthy school children using a multistage, proportional cluster sampling from a total of 74,403 school children in the region of Golestan state, Iran. Procedures took place during morning and afternoon visits from October 2009 to April 2010. Demonstrations of each test were given to children prior to testing. All measurements and tests were being presented in the order in which they were conducted. Information was collected by an expert team of researchers and technicians including physicians, physical educators, child development experts and sport science students who were only trained for the purpose of present research.

Measurements: Standing height (SH) to the nearest centimeter and weight (W) to the nearest 100 grams were measured in the upright position, barefoot and in light clothing by experimenters, following the National Health and Nutrition Examination Survey protocol. Body mass index (BMI) was derived by Quenelle's index from weight (kg) / height squared (m^2). Percentage body fat (BF) was computed from two skinfolds, triceps and subscapular (average of two measurements), using a Harpenden caliper (British Indicators, St Albans, UK).

Physical fitness was assessed according to a battery of standardized tests that contained those for performance-related physical fitness tests including 40 m dash and standing long jump and health-related physical fitness tests including sit and reach, handgrip, sit-up and 10×4 m running. In the 40 m dash, the child started the test from a standing position with one foot on the starting line. The timer stood at the finish line, called ready and signaled the start of the dash. Timing was initiated by the first movement of the subject. Time was recorded to the nearest 0.1 s. The standing long jump was measured to the nearest cm as the distance from the take-off line to the point where the heels touched the ground. Three trials

were administrated and the best was retained for analysis. Sit and reach was used to assess low back flexibility, in which the child, with shoes removed, was seated at the test apparatus with the legs fully extended and the feet flat against the end board. The child was instructed to lean forward, extending the finger tips, with palms facing downward, as along the ruler as possible without jerking or bounding. The distance of the stretch was recorded to the nearest cm. Three trials were recorded and the best was retained for analysis. The handgrip was measured by a dynamometer that shows the maximal force developed by the forearm. This consisted of squeezing a rubber bulb connected to a manometer. The children were given three tries using both hands and the highest readings are those analyzed. Timed sit-ups were carried out to gauge abdominal muscular strength and endurance. Participants performed the sit-up test with knees bent at 90 degrees and feet flat on the floor. The number of completed sit-ups in 30 s was recorded. A 10×4-m shuttle running and turning test at maximum speed were completed for all subjects and used to assess agility. Two parallel lines were drawn on the floor separated by 10 m. Both feet had to cross the line each time. The time needed to complete four cycles was recorded as the final score. All children were motivated to run as fast as they could.

Statistical Analyses: All statistical analyses were performed with SPSS (Statistical Package for Social Science, version 10.0). Descriptive statistics including means and standard deviations were computed for all variables. Group differences in anthropometric characteristics and fitness parameters were assessed using unpaired Student`s *t*- test. The age-related differences in anthropometric characteristics and physical fitness were analyzed using one-way ANOVA and post-hoc follow-up test. Pearson correlations were used to determine the degree of association among anthropometric and fitness characteristics. A value of $P < 0.05$ was considered as significant.

RESULTS AND DISCUSSION

The mean and standard deviations of the anthropometrical characteristics and fitness parameters are summarized in Tables 1-4. The mean height was significantly different between boys and girls, with boys were taller than girls in all age groups ($P<0.05$). However, there was no significant difference between urban and rural children ($P<0.05$). In the case of weight, boys and urban children were significantly heavier than girls and rural children in all age groups, respectively ($P<0.05$).

Table 1: Mean and standard deviations for urban girls in anthropometry and fitness scores

Age (yr)	Height (m)	Weight (kg)	BMI (kg/m)	BF (mm)	Dash (s)	SLJ (cm)	SR (cm)	Handgrip (kg)	Sit-up (n)	10×4 m(s)
7	1.15±0.08	20.1±1.9	16.2±1.2	7.7±1.5	9.2±0.5	85.3±15.1	24.5±2.9	10.4±1.9	7.7±4.1	14.3±0.9
8	1.22±0.06	22.4±2.2	16.9±2.0	8.1±2.3	8.8±0.4	97.5±11.7	24.4±3.8	11.1±2.5	8.4±4.4	13.2±1.7
9	1.29±0.05	24.4±2.7	17.3±1.8	8.6±2.8	7.8±0.6	109.4±13.6	25.9±3.8	12.7±2.2	9.8±4.5	12.1±1.5
10	1.33±0.04	25.8±2.9	17.2±2.2	8.7±2.4	6.9±0.5	119.9±14.8	23.7±4.5	14.8±2.8	10.6±3.3	11.4±1.3
11	1.38±0.06	28.1±2.5	18.1±2.1	9.4±1.9	6.0±0.4	123.7±12.8	24.4±4.9	16.2±3.6	11.4±4.6	10.5±1.6

Table 2: Mean and standard deviations for rural girls in anthropometry and fitness scores

Age (yr)	Height (m)	Weight (kg)	BMI (kg/m)	BF (mm)	Dash (s)	SLJ (cm)	SR (cm)	Handgrip (kg)	Sit-up (n)	10×4 m(s)
7	1.15±0.05	18.7±2.1	15.4±1.5	7.8±2.2	9.3±0.5	81.3±12.9	23.9±2.5	8.5±1.9	6.6±3.4	14.6±1.1
8	1.20±0.05	21.6±2.3	16.6±1.6	7.9±2.5	8.5±0.4	90.5±11.1	24.3±2.4	9.7±1.7	7.4±4.2	13.4±1.8
9	1.28±0.04	22.9±2.5	17.1±1.3	8.4±1.8	7.7±0.6	98.4±12.5	24.6±3.1	10.6±2.5	7.6±3.8	12.2±1.5
10	1.33±0.06	24.6±2.2	16.9±1.7	8.8±2.5	7.1±0.5	112.9±12.7	25.1±3.7	12.4±2.3	9.5±4.1	11.5±1.4
11	1.37±0.05	26.7±2.4	17.7±1.6	9.7±2.3	6.2±0.4	117.7±13.4	24.9±3.4	14.3±2.1	9.9±4.4	10.5±1.5

Table 3: Mean and standard deviations for urban boys in anthropometry and fitness scores

Age (yr)	Height (m)	Weight (kg)	BMI (kg/m)	BF (mm)	Dash (s)	SLJ (cm)	SR (cm)	Handgrip (kg)	Sit-up (n)	10×4 m(s)
7	1.19±0.04	22.6±2.5	16.2±1.9	6.8±1.4	9.5±0.7	94.2±13.4	24.8±3.3	10.5±2.6	9.3±3.7	14.4±1.1
8	1.25±0.07	24.1±2.8	16.4±2.5	7.3±1.8	9.1±0.4	106.8±11.3	25.4±3.1	11.3±2.5	10.4±4.3	13.2±1.5
9	1.32±0.06	26.3±3.1	16.7±1.5	7.4±2.1	8.2±0.5	117.1±14.3	25.1±4.9	13.3±2.8	12.7±3.9	12.6±1.4
10	1.37±0.06	28.4±3.8	17.3±2.1	8.5±1.6	7.1±0.5	124.6±12.9	24.6±4.4	15.5±3.5	12.9±3.6	11.5±1.2
11	1.43±0.05	30.6±4.2	17.8±1.7	8.4±2.4	6.1±0.6	128.7±14.3	24.7±5.3	16.8±4.6	13.6±3.1	10.9±0.9

Table 4: Mean and standard deviations for rural boys in anthropometry and fitness scores

Age (yr)	Height (m)	Weight (kg)	BMI (kg/m)	BF (mm)	Dash (s)	SLJ (cm)	SR (cm)	Handgrip (kg)	Sit-up (n)	10×4 m(s)
7	1.18±0.06	21.0±2.3	16.0±1.5	6.5±2.4	9.4±0.5	88.3±13.4	23.5±4.2	10.6±2.2	7.8±3.5	14.8±1.2
8	1.24±0.05	22.7±2.5	16.3±1.6	6.8±2.1	9.1±0.4	99.5±12.5	24.4±3.5	11.2±2.4	8.6±3.7	13.9±1.4
9	1.30±0.06	24.6±2.1	16.7±1.3	7.3±1.7	8.4±0.5	111.4±12.7	24.9±4.1	13.1±2.7	10.1±3.8	13.0±1.3
10	1.36±0.04	26.2±2.6	17.4±1.1	8.7±2.7	7.5±0.4	120.9±13.6	24.7±4.7	15.2±2.6	10.5±4.6	12.1±1.6
11	1.42±0.05	28.5±2.4	17.6±1.8	9.0±2.4	6.6±0.4	124.7±14.3	24.4±3.8	16.9±2.9	11.8±3.1	11.1±1.4

BMI found to be not statistically significant when comparing urban and rural boys and girls ($P<0.05$). Although no significant difference was found between urban and rural children, girls had higher body fat, as compared with boys ($P<0.05$). Comparison of fitness parameters revealed no significant differences between boys and girls as well as between urban and rural children in 40 m dash, sit and reach and 10×4 m run tests ($P<0.05$). Boys and urban children had better scores in standing long jump and sit-ups tests, as compared with girls and rural children, respectively ($P<0.05$). In handgrip, rural girls had significantly lower scores than others ($P<0.05$).

Age-related functions among anthropometric characteristics and physical fitness were varied among characteristics and also tasks. The height, weight and body fat were consistently increased along with age between urban and rural boys and girls ($P<0.05$). In the case of BMI, although gradual increase was observed with age, but no significant differences were found in 7-9 years old urban boys, 7-8 years old urban boys and 7-9 years old urban and rural girls ($P<0.05$). Both urban and rural children had better performance in dash run, standing long jump, handgrip, sit-up and 10×4 run tasks along with age, but no significant difference was found between age-groups in sit-reach ($P<0.05$).

The results of Pearson correlation test showed positive and significant correlation between height and fitness on 40 m dash, standing long jump, handgrip and 10×4 m run ($r=0.12$ to 0.64, $P<0.05$). A very low and no significant correlation was found between height and sit-up as well as sit-and-reach ($r=0.01$ to 0.08, $P<0.05$). Weight had negative and significant correlation with 40 m dash, standing long jump and 10×4 m run ($r=-0.46$ to -0.12, $P<0.05$), while positive and significant correlation was observed between weight and handgrip ($r=0.19$ to 0.71, $P<0.05$). No significant correlation was found between weight and sit-up as well as sit-and-reach ($r=-0.03$ to 0.04, $P<0.05$). Correlation between body fat and fitness parameters such as 40 m dash, standing long jump, sit-up, sit-and-reach and 10×4 m run was consistently negative and low to moderate ($r=-0.59$ to -0.03, $P<0.05$), while this correlation with handgrip was consistently positive and low to moderate ($r=0.07$ to 0.62, $P<0.05$). No significant association was found between BMI and fitness parameters ($r=-0.02$ to 0.03, $P<0.05$).

DISCUSSION

The present study reports rural and urban differences in anthropometry and physical fitness for 7-11 years old children. Despite boys were taller than girls, but no significant difference observed between urban and rural children. This finding is not in agreement with previous studies [4,5,7,18,19] and is in agreement with others [20,21]. Urban children were heavier than rural children and boys were heavier than girls. Boys and girls as well as urban and rural children had no significant differences in the case of BMI [4,5,7,9,11,22,23]. Our BMI values are similar to other studies [2,5] butand are not similar to the research of Hodgkin *et al*. [21]. Girls had higher body fat than boys and no significant difference was found between urban and rural children. In fact, the body fat percentage values found for subjects in this study was not similar to those found in other studies [20,21] and was similar to those found in other studies [2].

The result of the present study in the case of 40 m dash, sit-and-reach was similar with Tsimeas *et al*. [2] only in urban-rural differences. They found boys performed better of girls and we found no significant difference between them. In those study participants were younger than our subjects (about 12 years old) and it can affect that finding. Also, these findings are not in according with Pena Reyes [5], who found that urban children had greater flexibility in the lower back and upper thighs (sit and reach) at ages 6-13 years old children. Our results in the case of 10×4 m run item wereas similar to results from Tsimeas *et al*. [2], which revealed no significant difference between urban and rural as well as boys and girls children. In handgrip, rural girls had significantly lower scores than others, which this finding is not consistent with Pena Reyes [5] and Tsimeas *et al* . [5]. In line with previously published reports on urban and rural children [5], the our data have demonstrated that boys and urban children had better scores in standing long jump and sit-up than girls and rural children.

The results of the present study showed that urban and rural children in both sexes improved in size of body and motor tasks with age. This emphasizes the role of neuromuscular maturation and experience in the size of body and performance of motor tasks.

Height is positively and body weight is negatively correlated with performance on jumping and running tasks [22-24]. Our results report same correlations between weight and height with jumping and running fitness tasks. These trends imply that taller and lighter children perform better in activities involving movement or projection of the body through space (jumping or running) compared to smaller and heavier peers. Body fat is negatively related to performance, especially items that require displacement of projection of the body and body fat is positively associated with static strength [22-25]. Our results are also similarame to these results, inso that there was a negative correlation between body fat and jumping and running fitness tasks and a positive correlation between body fat and handgrip. Since fatter children tend to be heavier [26,27], our finding revealed a positively association between weight and handgrip. In contrast to Pate *et al*. [28], we found that height and weight have not a significant correlation with sit-up. Findings also showed no significant relationship between height and weight with sit-and-reach item. These results are linked to the fact that sit-up and sit-and-reach tasks do not require great displacement of the body.

In comparison to the findings from other countries in Latin America, Europe, Africa and Asia, although we found somewhat the same differences and correlations between urban and rural of both sexes in anthropometric and fitness indexes, but we found some contrasts with those results. These consistencies and contrasts are linked to the fact that growth is a multifaceted dimension influenced by many determinants like genetic, living condition, nutrition, socioeconomic situation, environmental factors and so on.

Obviously, in the last decades there has been a certain difference in the mode of life in towns and villages in Iran. With rRegards to a political will in the 1990s from government to eliminate the disadvantageous difference prevailing in rural areas, it is observed true for nutrition, medical care and treatment, physical education and sports or even improvement in parent`s educational level, etc. offered to the children in rural areas during last two decades. The better life conditions in rural areas rather than in the past are positive, well-perceptible factors influencing growth and maturation of children. They promptly effect or work and the children's organism areis highly susceptible to them.

No significant differences in such anthropometrical and fitness items in the present study can be considered as an improvement in living factors in rural areas during last years. Nevertheless, according to other studies, our results showed significant differences in some anthropometrical and fitness parameters between urban and rural children, which it makes a question in mind. How would it would be possible to create equal chances in growth and physical fitness for rural children? It seems that there is a need to elaborate a better and more equitable distribution, a better and well-considered health and welfare politics as well as a fair children-politics overfor a long period of time. We can only hope that governments will take notice of this problem and will find a correct solution for it.

The present study has some implications. First, our study is a primaryfirst study to underline the urban-rural differences in the case of anthropometry and physical fitness in Iran. The results provide the scores of urban and rural children in anthropometry and physical fitness in a different geographical and cultural area, compared to other studies. Finally, this research shows that it is possible to involve large samples of children in the assessment of their level of anthropometry and fitness. Such surveys provide physical education teachers with a pedagogic and scientific basis for designing their activities and for monitoring their impact on children's health and well-being.

In the future, more research on urban and rural children linked to various kinds of anthropometry and physical fitness parameters among the different states and provinces in Iran should be undertaken to achieve a better understanding their differences in Iranian children.

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