MEDICAL SCIENCES (2000), 2, 37–41

Physical fitness and fatness among Omani schoolboys: a pilot study

*Hassan M O,[1] Al-Kharusy W[2]

مستوى اللياقة البدنية والبدانة في شريحة من الطلاب العمانيين: دراسة مبدئية

م. حسن ، و. الخروصي

الملخص: يعتمد هذا البحث المبدئي على مقياسين للياقة البدنية وهما الزمن للعدو أو المشي لمسافة 1.6 كم ومجموع سمك 5 عينات من الجلد من أماكن محددة من الجسم. وقد تمت مقارنة هذين المقياسين بعدة عوامل شخصية وعائلية ذات علاقة باللياقة البدنية والبدانة. وجد أن هناك علاقة قوية وموجبة بين زمن العدو ومجموع سمك عينات الجلد، كما كان لممارسة الوالدين وخصوصا الأب للرياضة علاقة قوية بلياقة الأبن، وكانت لبدانة الوالدين وخصوصا الأم علاقة عكسية بلياقة الأبن. أما العوامل الأخرى مثل نسبة محيط الخصر الى الأرداف وعدد الأشقاء وعدد الأشقاء الذين ينامون في غرفة واحدة وعدد الخدم والساعات التي يقضيها الطفل في مشاهدة التلفاز فلم تظهر هذه العوامل تأثيرا واضحا على قياسات اللياقة المستخدمة في هذا البحث وقد خلصت هذه الدراسة الى أن مثل هذا البحث الميداني البسيط يمكن أن يأتي بمعلومات قيمة عن اللياقة البدنية ويمكن تطبيقه على نطاق واسع في سلطنة عمان.

ABSTRACT: ***Objective –*** To study the applicability of simple field measurements of physical fitness in a sample of Omani boys and their relationships to selected variables. ***Method –*** Two field measures of physical fitness—the time to complete 1.6–km run/walk and the sum of 5 skinfold thicknesses—were correlated with personal and family physical activity–related and other variables in a sample of 109 Omani boys aged 9–11 years. ***Results –*** Obesity in parents, especially in the mother, showed significant correlation with both fitness measures. The waist/buttocks ratio showed no significant correlation with the 1.6–km time. The number of siblings and siblings sharing a room, number of T.V–watching hours and the number of servants in the family showed no correlation with the chosen fitness indices. ***Conclusion –*** The results of this pilot study indicate that simple field fitness tests can be used in children and they can yield valuable information related to physical fitness. The same protocol used in this study could be applied to a national study in Oman.

KEY WORDS: fitness, obesity, anthropometry, questionnaire, exercise, cardiorespiratory endurance, Oman

Physical fitness, essential for a state of general well being, is an important component of health and health education. Precise and reliable measures of physical fitness are of great value to educators and policy makers by providing an essential basis for evolving any programme or policy aimed at improving individual or general levels of fitness.[1]

One of the criteria of positive health is functional capacity. An important aspect of functional capacity is aerobic capacity (the body's ability to do heavy, sustained work), which is dependent on the ability of cardiovascular system to deliver blood to working muscles and the capability of the cells to take up and utilize this oxygen in energy production. Aerobic capacity is measured by determining the body's maximal rate of oxygen (O_2) consumption. Maximal oxygen uptake (VO_{2max}) is the most important indicator of physiological fitness, and is positively correlated with cardiovascular health.[2,3] Studies in developed countries[4,5] tend to show that by improving the levels of physical fitness, the risk of ill health (particularly of cardiovascular disease) could be reduced. However, in developing countries few such studies have been done.[6] Studies show that obesity is increasing at an alarming rate in Arab countries.[7,8]

Although a large number of Arab studies have focused on obesity and its associated risk factors,[7-10] physical activity and fitness in children and adults have received no attention.

The purpose of this pilot project was to study applicability of simple field measurements in a sample of Omani boys and their relationships to selected

[1]Department of Physiology, Sultan Qaboos University, P.O.Box: 38, Postal Code: 123, Muscat, Sultanate of Oman; [2]Department of Orthopaedic Surgery, Khaula Hospital, Ministry of Health, Sultanate of Oman.

*To whom correspondence should be addressed.

variables. The sample was randomly selected from grade 3 and 4 schoolboys attending annual sports summer camp in the Muscat area.

METHODS

The study used simple field measures of physical fitness and a questionnaire to elicit the required data, which were then statistically analysed.

FITNESS

The main fitness measures used in this study were cardiorespiratory endurance, fatness and fat distribution.

Cardio respiratory endurance

This was measured using the time to complete a 1.6 km run/walk. Concurrent validity of distance-run tests with directly measured maximal aerobic power (VO_{2max}) has been previously established.[11-13]

For administration of the 1.6 km run/walk tests, children were organized into 5 groups of two, each with one observer. They ran as far as possible and then walked to complete the 1.6 km distance on a level 400 m circuit. The time to completion was measured to the nearest second.

Fatness and fat distribution

The body mass index (BMI) was measured by dividing the weight in kilograms by the square of the height in meters. Skinfolds were measured independently by two matched observers using Holden calipers on the right side of the body at five sites: triceps, subscapular, suprailiac, abdominal and thigh. Each site was measured twice. If the two values differed by more than 2 mm, a third was taken. The mean of the two closest measures was used as the score. The scores for the five sites were summed to provide a single value for fatness. Waist and buttocks were measured to the nearest centimeter over light clothing using a tape measure. The waist was measured half way between the lower coastal margin and the iliac crest, and buttocks circumference was measured over the widest part of the gluteal region.[14] The sum of the suprailiac and abdominal skinfolds as well waist /buttock ratios were used as the index of central fatness while the other three skinfolds were used for peripheral fatness.

THE QUESTIONNAIRE

This was a combined simple student and parent questionnaire on obesity, leisure time sports activities as well as some socio-economic markers. Parents' exercise level was measured by number of times per week they spent in any kind of sport: the minimum acceptable was walking for at least 40 minutes twice weekly. Parents recorded the extent of their own obesity as perceived by them or as told to them by their doctors. Parents also scored the number of hours per day their child spent watching TV and/or playing video or computer games. Children recorded their own leisure time activities, number of their siblings, siblings sharing room, and the number of servants in the house. The personal and parental exercise scores were summed as hours per week.

STATISTICAL ANALYSES

All statistical analyses done using the SPSS package (version 7 for Windows). Pearson correlation coefficients were computed between the log of the time to complete the 1.6 km run/walk, the log of the sum of 5 skinfolds as the dependent variables and the other independent variables of the study. Log transformations were performed since the two fitness variables were found to be positively skewed. The Z test was used to compare differences between the means of other studies.

RESULTS

Ninety six percent of the questionnaires were completed, demonstrating the simplicity of its layout as well as the interest of the parents in the physical fitness of their children.

Table 1 shows the personal and parental variables used in the study. The personal variables are: age, the time to complete the 1.6 km run/walk, BMI and fat distribution, leisure time activities and certain socio-economic factors. The parental ones are the exercise habits of the father and mother as well as presence of obesity in the family. Only 68% of the children were able to run the entire distance of 1.6 km; the rest completed part of the distance running and then walking. The mean time of 11.53 minutes achieved by the Omani children was approximately 1 minute longer than the mean of 10.56 minutes by American children of the same age group. Applying the Z test, this difference was found to be significant ($P < 0.05$), although the BMI and skinfolds thickness were similar in both groups.[1] It was seen that 32.5% of the fathers and 8% of the mothers exercised at least twice weekly, mostly by walking (mean time was 0.82 and 0.2 hours per week respectively). Parents estimated the mean time spent by children on watching television or playing computer/video games as 3.2 hours per day.[15,16] The number of siblings, siblings sharing a room and the number of servants in the each family were included in the expectation that these would give indications of the socio-economic status of the family. Parents reported their perception of obesity in the family as 21% in mothers, 11% in fathers and 8% in

TABLE 1

Descriptive data of personal and parental variables of the 109 participants (for details see text)

Variable	Mean	±S.D
Fitness and Fatness		
Age	9.68	0.92
1.6 km run/walk (min)	11.53	4.3
Body mass index (Kg/M^2)	18.9	2.4
Sum of 5 skin folds (mm)	62.5	17.0
Sum central (mm) (subscapular + suprailiac + abdomen)	36.9	15.6
Sum peripheral (mm) (Thigh + triceps)	29.2	14.5
Waist/ buttock ratio	0.91	0.04
Leisure time activities		
Personal activity score (Hours per week)	6.8	3.9
Father Exercise (hours per week)	0.82	1.2
Mother Exercise (hours per week)	0.2	0.17
Television/ video games (parents estimated, hour/day)	3.2	1.5
Socio-economic indicators		
Number of siblings	6.1	2.9
Siblings sharing room	3.2	2.0
Number of servants	1.4	1.0

siblings.

Table 2 shows the two fitness measures; the log transformations of the time to complete the 1.6 km run/walk and the sum of 5 skinfolds and their correlation to the 15 variables used in the pilot project. A negative correlation in relation to a variable indicates a shorter running time and/or less body fat (sum of skinfolds) in relation to that variable. This signifies a better fitness such as personal activity score, which has a strong negative correlation with both time and the sum of skinfolds ($r = –0.40$, $P<0.001$, $r = –0.42$, $P<0.001$ respectively). Similarly, the parents' exercise score, especially that of the father ($r = –0.29$ $P< 0.01$, $r = –0.26$, $P< 0.01$ respectively) has a strong influence on the child's performance and leanness. On the other hand, obesity of parents and specially that of the mother shows a positive correlation and a significant increase in time and sum of skinfolds ($r = 0.27$, $P< 0.01$, $r = 0.39$, $P< 0.01$ respectively). Central fat and peripheral fat show strong positive correlation with time ($r = 0.38$, $P< 0.001$, $r =0.37$, $P< 0.001$) while waist/buttock ratio is not significant but correlates significantly with the sum of skinfolds ($r = 0.39$, $P< 0.01$), as expected. Central fat and peripheral fat have the same significant positive correlation with time ($r = 0.38$, $P< 0.001$, $r = 0.37$ $P< 0.001$ respectively).

However, the number of siblings and siblings sharing a room, the number of servants and TV watching hours have no influence on the child's fitness or fatness in this sample.

DISCUSSION

The declining levels of average physical activity and exertion in the daily life of most children mean that sport and physical education are often the only forms of exercise which they have, and obese children tend to become obese adults.[17] Measuring fitness and providing information and encouragement on how fitness may be improved can promote the use of available sports and recreation facilities provided by most schools, sports clubs and private fitness clubs. This will help to enrich the lives and well being of citizens and reduce their medical bills.[18] In most Arab countries physical fitness receives little attention from authorities and families alike. When recent affluence with its non-energy requiring daily lifestyle is added the result is an alarming increase in obesity and its associated diseases in children and adults.[19] The worst affected is the female gender in whom Arab culture still plays a role in promoting and praising a sedentary way of life and obesity.[8] Although this pilot study represents a small age band in the male gender, does not represent all Oman and may be biased towards children who like sport and whose parents may be supportive of sport, it has provided valuable data for our national study protocol. Firstly the study was easy to conduct, required inexpensive equipment and cost very little. As only 68% of the boys were able to complete the 1.6 km *running*, it may be supposed that few of the girls would be able to complete that distance running. This will necessitate study of a random sample of girls of the same age group using the same protocol. The run/walk distance of the national study will be determined by average time

TABLE 2

Pearson's correlation coefficients of log time to complete 1.6 km run/walk, log sum of 5 skinfolds and the study's 15 variables among Omani boys aged 9–11 years

	Variables	Log time		Log sum of skinfolds	
		Correlation coefficient(r)	*p value*	*Correlation coefficient(r)*	*p value*
1	Body Mass Index (BMI)	0.69	0.0001	0.88	0.0001
2	Central fat	0.38	0.001	0.87	0.0001
3	Peripheral fat	0.37	0.001	0.86	0.0001
4	Waist/buttock ratio	0.17	NS	0.39	0.01
5	Personal activity score	–0.40	0.001	–0.42	0.001
6	Father exercise score	–0.29	0.01	–0.25	0.01
7	Mother exercise score	–0.10	NS	–0.09	NS
8	Father & mother exercise score	–0.34	0.01	–0.24	0.05
9	Father obese	0.24	0.05	0.29	0.05
10	Mother obese	0.27	0.01	0.39	0.01
11	Sibling (s) obese	0.31	0.05	0.41	0.01
12	No. of siblings	0.11	NS	–0.14	NS
13	No. of siblings Sharing room	0.09	NS	0.10	NS
14	T.V hours	0.11	NS	0.08	NS
15	No. of servants	0.12	NS	0.09	NS

n = 109
NS = not significant

achieved by the girls. Central fat, peripheral fat and BMI have the same correlation with the 1.6 km time. This will allow us to consider BMI, peripheral fat and waist/buttock ratio for the national study because central fat measurements may be difficult to obtain in females.

The time spent on watching TV and/or playing computer games was slightly less than their American counterparts.[15] Although the number of siblings, siblings sharing a room, the number of servants and T.V watching hours, did not have significant influence on the child's fitness or fatness in this sample, these may show some effect on a larger sample especially after applying more advanced statistical methods such as stepwise multiple regression analysis.[14]

The questionnaire, though not validated in this pilot study, proved to be simple to administer to both children and parents as shown by the high response rates. We would like to point out that the information obtained using a questionnaire in this study should be interpreted with care. A direct interview of parents would have yielded more reliable information but this was technically difficult in the conditions of this pilot study.

In conclusion, these preliminary results show that fitness in youth can be studied using simple field tests, and suggest that personal and parental factors are the main contributors to fitness levels in children.

REFERENCES

1. **European Tests of physical fitness** 2nd Edition, 1993, 12–13.
2. **Pate RR, Dowda M, Ross JG.** Associations between physical activity and physical fitness in American children. *Am J Dis Child*, 1990, **144**, 1123–9
3. **Shephard RJ, Allen C, Benade AJ, Davies CT, Di Prampero PE, Hedman R, Merriman JE, Myhre K, Simmons R.** The maximal oxygen intake. An international reference standard of cardiorespiratory fitness. *Bull World Health Organ* 1968, **38**, 757–64.
4. **Feinleib M.** Epidemiology of obesity in relation to health hazards. *Ann Intern Med* 1985, **103,** 1019–24.
5. **Gunnell DJ, Frankel SJ, Nanchahal K, Peters TJ, Smith GD.** Childhood obesity and adult cardiovascular mortality: a 57-y follow-up study based on the Boyd Orr cohort, *Am J Clin Nutr* 1998, **67**, 1111–8.
6. **Chu NF, Rimm BE, Wang DJ, Liou HS, Sheih SM.** Clustering of cardiovascular disease risk factors among obese schoolchildren: the Taipei children heart study. *Am J Clin Nutr* 1998, **67**, 1141–6.
7. **Al-Nuaim AR, Al-Rubeaan K, Al Mazrou Y, Al-Attas O, Al-Daghari N, Khoja T.** High prevalence of overweight and obesity in Saudi Arabia. *Int J Obes Relat Metab Disord* 1996, **6,** 547–52.
8. **Al-Shammari SA, Khoja TA, Al-Maatoug MA, Al-Nuaim LA.** High prevalence of clinical obesity among Saudi females: a prospective, cross-sectional study in the Riyadh region. *J Trop Med Hyg* 1997, 183–8.
9. **Moussa MA, Shaltout AA, Nkansa-Dwamena D, Mourad M, Alsheikh N, Agha N, Galal DO.** Factors associated with obesity in Kuwaiti children. *Eur J Epidemiol* 1999, **15**(1), 41–9.
10. **Musaiger AO, Al-Roomi KA.** Prevalence of risk factors for cardiovascular disease among men and women in an Arab Gulf Community. *Nutr Health* 1997, **11**, 149–57.
11. **Jackson AS, Coleman AE**. Validation of distance run tests for elementary school children. *Res Quart* 1976, **47**, 86–94.
12. **Safrit J**. The validity and reliability of fitness tests of children: a review. *Pediatr Exerc Sci* 1990, **2**, 9–28.
13. **Sloniger MA, Cureton KJ, O'Bannon PJ**. One-mile run-walk performance in young men and women: role of anaerobic metabolism. *Can J Appl Physiol* 1997, **22**, 337–50.
14. **Gutin B, Basch C, Shea S, Contento I et al.** Blood Pressure, Fitness and Fatness in 5 and 6 year old children. *JAMA* 1990, **264,** 1123–27.
15. **Armstrong CA, Sallis JF, Alcaraz JE, Kolody B, McKenzie TL, Hovell MF.** Children's television viewing, body fat and physical fitness. *Am J Health Promot* 1998 **12**, 363–8.
16. **Katzmarzyk PT, Malina RM, Song TM, Bouchard C**. Television viewing, physical activity and health-related fitness of youth in the Quebec family study. *J Adolesc Health* 1998, **23**, 318–25.
17. **Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH.** Predicting obesity in young adulthood from childhood and parental obesity. *N Eng J Med* 1997, **25,** 869–73.
18. **Wolf AM, Colditz GA.** Current estimates of the economic cost of obesity in the United States. *Obes Res* 1998, **6**, 97–106.
19. **Al Nuaim AA, Bamgboye EA, Al Rubeaan KA, Al Mazrou Y.** Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. *J Community Health* 1997, **22**, 211–23.