

RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY, SELF-PERCEIVED AND ACTUAL INDICATORS OF FITNESS IN ADOLESCENTS

Toivo Jürimäe and Vaido Rego

*Faculty of Exercise and Sport Sciences,
University of Tartu, Tartu, Estonia*

Original scientific paper

UDC 572.5:796.091.23-053.7

Abstract:

The aim of this study was to estimate the relationships between physical activity, self-perceived fitness and actual indicators of fitness in adolescents from Estonia. In total, 161 16 - 18-year-old adolescents were measured: 69 boys and 92 girls. The self-perceived fitness and body composition were assessed using a slightly modified version of a questionnaire by Delignieres et al. (1994) and it is well described by Lamb and Haworth (1998). In addition, physical activity index (PAI) of the children according to Telama et al. (1996) was calculated. Body composition was measured using bioelectrical impedance analysis (Bodystat-500, UK). The following EUROFIT (1988) tests were used to measure the motor ability of the children: sit-and-reach, handgrip dynamometry and 20m endurance shuttle-run. The boys perceived their endurance better than the girls ($r=0.65$ and $r=0.48$, respectively). Strength was perceived significantly by the boys ($r=0.34$) and the girls ($r=0.26$). Flexibility was also perceived significantly by the boys ($r=0.42$) and the girls ($r=0.55$). The girls perceived their body composition better than the boys ($r=-0.47$ and $r=-0.38$, respectively). The physical activity index correlated better with the self-perceived than the actual indicators of motor ability. However, the actual and perceived body composition did not depend on the level of physical activity. In conclusion, the results of our investigation indicated that adolescents significantly perceived their basic motor abilities (endurance, strength, flexibility) and body composition.

Key words: *physical activity, self-perception, motor ability, adolescents*

ZUSAMMENHANG ZWISCHEN SPORTLICHER BETÄTIGUNG UND SELBSTEINGESCHÄTZTEN UND TATSÄCHLICHEN INDIKATOREN DES LEISTUNGSVERMÖGENS BEI JUGENDLICHEN

Zusammensetzung:

Das Forschungsziel war, den Zusammenhang zwischen sportlicher Betätigung und eingeschätzten und tatsächlichen Indikatoren des Leistungsvermögens bei Jugendlichen aus Estland festzustellen. Insgesamt 161 16 – 18jährige Jugendlichen wurden getestet: 69 Jungen und 92 Mädchen. Sowohl das von den Jugendlichen selbsteingeschätzte Leistungsvermögen als auch die selbsteingeschätzte Körperzusammensetzung wurden mittels einer etwas modifizierten Version der Umfrage von Delignieres et al. (1994) (Lamb und Haworth (1998) haben diese Umfrage gut beschrieben) berechnet. Zusätzlich wurde der Index sportlicher Betätigung (PAI) der Kinder laut Telama et al. (1996) errechnet. Körperzusammensetzung wurde mit Hilfe bioelektrischer Impedanzanalyse (Bodystat-500, UK) errechnet. Die folgenden EUROFIT (1988) Tests wurden angewandt, um motorische Fähigkeit der Kinder zu errechnen: Sit-and-Reach, Handgriffdynamometrie und 20-Meter Ausdauerpendellauf. Die Jungen haben ihre Ausdauer besser ($r = 0,65$) eingeschätzt (Mädchen: $r = 0,48$). Kraft wurde sowohl von den Jungen ($r = 0,34$) als auch von den Mädchen ($r = 0,26$) gut eingeschätzt. Gelenkigkeit wurde auch gut von den Jungen ($r = 0,42$) und von den Mädchen ($r = 0,55$) eingeschätzt. Die Mädchen schätzten ihre Körperzusammensetzung besser ($r = -0,47$) (Jungen: $r = -0,38$) ein. PAI korrelierte besser mit eingeschätzten und tatsächlichen Indikatoren der motorischen Fähigkeit. Tatsächliche und eingeschätzte Körperzusammensetzung hingen nicht vom Niveau sportlicher Betätigung ab. Die Forschungsergebnisse zeigen, dass die Jugendlichen sowohl ihre basischen motorischen Fähigkeiten (Ausdauer, Kraft, Gelenkigkeit) als auch ihre Körperzusammensetzung gut eingeschätzt haben.

Schlüsselwörter: *sportliche Betätigung, Selbsteinschätzung, motorische Fähigkeit, junge Menschen*

Introduction

One of the most important aims of school physical education is to encourage life-long habitual physical activity. One important rationale for this aim, for example, in physical education can promote public health and well-being of the adult population as well as development in children. It is well known that the physiological effects of physical activity do not remain when the level of physical activity discontinues. For this reason, it is important that physical activity continues from childhood into adulthood (Malina, 1990; Montoye, 1985; Powell & Dysinger, 1987; Telama et al., 1996). However, many children and adolescents are not engaged enough in physical activities associated with benefits to health (Armstrong & McManus, 1994; Crocker et al. 2000). It is very important to know whether physical education in school has accomplished the task - do children, especially those, who have already graduated from secondary school or school leavers, like to be physically active and how well do they feel in their body and its motor abilities?

Self-perception has become a very important indicator to characterise both the physical and psychological adaptation of the world (Lintunen, 1995). In the physical domain, Sonstroem (1974) developed the Psychological Model of Physical Activity, which explains the relationships between exercise, physical ability, perceived competence and self-esteem. According to the model, perception of physical competence is a mediating factor between the objective physical ability and self-esteem. In addition, positive perceptions of physical competence lead to a more positive attitude towards activity, which in turn leads to higher levels of voluntary involvement in physical activity. A high level of physical activity may lead to improved motor ability, followed by improved perceptions of competence and self-esteem. Conversely, low perceptions of competence can lead to a negative attitude and an avoidance of physical activity (Lintunen, 1995).

Using a global question of perceived fitness (relative to others of the same age) in which the possible responses were limited to "not as fit as most", "about average fitness", or "fitter than most", Marsh (1993) reported significant ($p < 0.01$) associations with numerous fitness indicators, including cardiovascular endurance ($r = 0.30$), muscular strength ($r = 0.29$) and body composition ($r = -0.33$) among 9 - 15-year-old Australian schoolchildren. In a subsequent study, Marsh and Redmayne (1994) expanded the perceived fitness construct to include questions on specific fitness components; adolescent girls were asked to indi-

cate which of eight statements best described their self-assessment of their "strength", "balance", "flexibility", and "endurance". Interestingly, of the significant correlations observed with corresponding fitness measures, that for the endurance component was highest ($r = 0.64$), with the strength component following ($r = 0.44$). Correlations for flexibility and balance, though significant ($p < 0.05$) were low ($r = 0.21$ and $r = 0.10$, respectively).

The aim of this study was to estimate the relationships between physical activity, self-perceived and actual indicators of fitness in adolescents.

Materials and methods

In total, 161 16 - 18-year-old children were measured: 69 boys and 92 girls. Children were from several schools in Tartu (about 100,000 inhabitants) or from small towns with fewer than 5,000 inhabitants. All the children were Estonian in origin. Physical education consisted of 2-3 physical education lessons per week, taught by a physical education teacher. All the children, parents and teachers were thoroughly informed about the purposes and contents of the study and written informed consent was obtained for the adolescents. All measurements (including the filling in of a questionnaire) were performed in the mornings during the compulsory physical education lessons.

The body height was measured using a Martin metal anthropometer in cm (± 0.1 cm) and body mass with medical scales in kg (± 0.05 kg) and BMI (kg/m^2) was calculated. The body composition was measured using a bioelectrical impedance analysis (Bodystat 500, UK).

Self-perceived fitness (SPF) was assessed using a slightly modified version of a questionnaire by Delignieres et al. (1994). This questionnaire is well described by Lamb and Haworth (1998). In addition, the physical activity index (PAI) of the children was calculated according to Telama et al. (1996).

To measure the motor abilities of the children, the following EUROFIT (1988) tests were used after a short (about 10 min) standardised warm-up (light running, jumping and stretching exercises): sit-and-reach, handgrip dynamometry and 20m endurance shuttle-run.

Standard statistical methods were used to calculate the mean (\bar{X}) and standard deviation ($\pm \text{SD}$). Statistical comparisons between the boys and girls were made using independent t-tests. Spearman correlation coefficients were used to determine the relationships between the dependent variables. The significance was set at $p < 0.05$.

Results

The physical characteristics of the boys and girls are presented in Table 1. The body height and body mass were higher in the boys and the body fat % in girls ($p < 0.001$). There were no statistically significant differences between the boys and girls in BMI and PAI. From the EUROFIT tests the results on handgrip dynamometry and 20 m endurance shuttle-run were better ($p < 0.001$) in boys compared with girls. In contrast, in girls the results were better in the sit-and-reach test ($p < 0.001$). There were not any statistically significant differences between the sexes in self-perceived fitness components except in flexibility ($p < 0.001$) and body composition ($p < 0.001$).

As a rule, self-perceived endurance, fitness, strength, and flexibility are significantly correlated with PAI ($r = 0.28-0.52$, except the endurance in the girls) (Table 3). Body composition did not depend on PAI ($p > 0.05$).

Discussion

The present study demonstrated that Estonian adolescents who are moderately physically active and whose basic motor abilities are at the medium level perceived their fitness and body composition to a satisfactory level. Our study showed relatively high relationships between PAI and self-perceived fitness, strength and endurance.

Table 1. Physical characteristics, measured motor ability (EUROFIT tests results) and self-perceived fitness and motor ability in boys, girls and total group.

Variables	Boys (n=69)			Girls (n=92)			Total (n=161)		
	$\bar{x} \pm SD$	Min	Max	$\bar{x} \pm SD$	Min	Max	$\bar{x} \pm SD$	Min	Max
Age (yrs)	17.3±0.6	16	19	17.4±0.6	16	18	17.3±0.6	16	19
Height (cm)	180.1±6.5	161.8	196.0	166.9±6.2	154.0	183.4	172.6±9.1	154.0	196.0
Weight (kg)	70.3±11.7	49.7	121.0	60.1±8.9	42.1	89.5	64.5±11.4	42.1	121.0
BMI (kg/m ²)	21.8±3.3	17.2	36.3	21.5±2.9	16.2	29.7	21.6±3.1	16.2	36.3
Body fat (%)	8.3±4.7	2.7	31.6	20.0±5.7	8.5	33.8	15.0±7.8	2.7	33.8
PAI*	9.5±1.5	6	13	9.1±1.5	5	13	9.2±1.5	5	13
Eurofit tests:									
Handgrip dynamometry (kg)	49.0±9.1	30	81	27.5±5.2	18	40	36.7±12.8	18	81
20m endurance shuttle-run (min)	9.0±2.0	3	13	5.5±1.9	2	10	7.4±2.1	2	13
Sit-and-reach (cm)	27.0±8.3	9	46	33.3±7.0	5	47	30.6±8.2	5	47
Self-perceived fitness (points):									
Fitness	7.0±2.5	1	11	6.9±1.9	1	12	6.9±2.2	1	12
Strength	6.5±2.0	3	11	6.8±1.6	3	12	6.7±1.8	3	12
Endurance	6.5±2.4	1	11	6.9±1.8	3	11	6.8±2.0	3	11
Flexibility	5.4±2.4	1	11	6.9±2.4	1	13	6.2±2.5	1	13
Body composition	7.6±1.5	3	11	6.6±1.5	3	11	7.0±1.6	3	11

*PAI – physical activity index

The Spearman correlations between perceived endurance, strength, flexibility, body composition and measured motor abilities are presented in Table 2. The adolescents significantly perceived their strength, flexibility, endurance and body composition.

As shown in Table 3, PAI had statistically significant relationships with the measured endurance and flexibility in the boys and with endurance and strength in the girls. In the total group, there are significant relationships with endurance, strength and flexibility.

Investigations with children have found that physical self-perceptions are related to the level of their physical activity (Hagger et al. 1998; Whitehead, 1995). In our study, there were significant relationships between self-perceived endurance, fitness, strength and flexibility with PAI in the total group (Table 3). Similarly with other studies (Sallis et al. 1992; Kowalski et al. 1997), Estonian boys were physically more active than girls (Table 1). However, there were not any differences in the relationships between physical activity and self-perceived motor abilities between

Table 2. Relationships between self-perceived and measured motor ability in boys, girls and total group.

	Boys (n=69)	Girls (n=92)	Total (n=161)
Handgrip dynamometry - perceived strength	0.34*	0.26*	0.18*
Sit-and-reach – perceived flexibility	0.42*	0.55*	0.55*
20m endurance shuttle-run – perceived endurance	0.65*	0.48*	0.55*
Body fat % - perceived body composition	-0.38*	-0.47*	-0.50*

*p<0.05

the boys and the girls (except endurance in girls). In some studies, there is evidence to suggest that boys report higher physical self-perceptions (Biddle & Armstrong, 1992; Whitehead & Corbin 1997), or as in slightly younger children as the children of our study it is quite feasible that children overrate (or underrate) their fitness when measured against a multi-component “objective” construct (March, 1993; March & Redmayne, 1994).

The relationships between self-perceived and measured motor abilities were significant (p<0.05) but moderate in the total group or separately in the boys and girls (Table 2). In the study of Lamb and Haworth (1998) in slightly younger boys, the relationship was highest with endurance (r=0.70). In our study, in the total group of boys, the relationship was about the same level (r=0.65) (Table 2). However, in the girls, the relationship was lower (r=0.48, p<0.05). The perception of strength compared with handgrip dynamometry was significant but low (r=0.34, r=0.26 and r=0.18 in boys, girls and in total group, respectively). Lamb and Haworth (1998) obtained in the boys one of the highest relationships (r=0.73) between perceived and measured strength. Our very low relationship is surprising, but on the other hand, the mean results of handgrip dynamometry in our study were slightly lower than the mean results of the same aged Estonians (Jürimäe & Volbekiene 1998). In our study, the moderate correlation (r=0.42-0.55) was between the perceived and measured flexibility (Table 2). The flexibility is quite a specific health-related physical fitness component which is frequently measured by the sit-and-reach test. However, the validity of this test is rather questionable.

In our study, the boys and girls significantly perceived their body composition (Table 2). In similar studies of Lamb and Haworth (1998) and Fox (1994) the subjects did not significantly perceive their body composition. However, it has to be taken into consideration that the body composition in different studies has been measured using different methods.

The total fitness ratings (Table 1) significantly correlated with endurance, strength and flexibility but not with body composition. The correlation was highest with perceived endurance (r=0.63 and r=0.53 in the boys and girls, respectively). This relationship was expected because the terms “total fitness” and “endurance” are very similar. Surprisingly, body composition was not correlated significantly with total fitness. Probably the reason is that there were only a few overweight children in our groups.

Table 3. Relationships between PAI, self-perceived and actual indicators of motor ability.

Physical activity index (PAI)			
Variables	Boys (n=69)	Girls (n=92)	Total (n=161)
Measured:			
Endurance	0.44*	0.43*	0.38*
Strength	0.21	0.32*	0.22*
Flexibility	0.38*	0.13	0.17*
Body composition	0.18	0.21	0.15
Self-perceived:			
Endurance	0.34*	0.13	0.18*
Fitness	0.52*	0.41*	0.37*
Strength	0.46*	0.32*	0.37*
Flexibility	0.31*	0.28*	0.20*
Body composition	-0.12	-0.08	-0.01

*p<0.05

Conclusions

In conclusion, the results of our investigation indicate that adolescents significantly perceived their basic motor abilities (endurance, strength, flexibility) and body composition. There appears to be a significant relationship between the actual physical activity and measured and perceived motor abilities as a rule. Both measured and self-perceived body composition do not depend on the level of physical activity.

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POVEZANOST IZMEĐU TJELESNE AKTIVNOSTI, SAMOPROCijenjenih I STVARNIH POKAZATELJA TJELESNIH SPOSOBNOSTI (FITNESA) ADOLESCENATA

Sažetak

Uvod

Samoprocjena je vrlo važan pokazatelj koji se karakterizira i fizička i psihološka prilagodba svijetu (Lintunen, 1995). U istraživanju u kojemu su mogući odgovori na opće pitanje o samoprocijenjenim tjelesnim sposobnostima (*fitnessu*), a u odnosu na vršnjake, bili ograničeni na «Nisam u formi toliko koliko ostali», «U prosječnoj sam formi», «U boljoj sam formi od većine drugih», Marsh je (1993) na uzorku australske školske djece u dobi od 9-15 godina utvrdio značajnu povezanost ($p < 0.01$) samoprocjene s brojnim pokazateljima općih tjelesnih sposobnost (fitnessa), kao što su kardiovaskularna izdržljivost ($r = 0.30$), mišićna snaga ($r = 0.29$) i tjelesna građa ($r = -0.33$). U sljedećem su istraživanju Marsh i Redmayne (1994) proširili upitnik samoprocjene tjelesnih sposobnost tako da su uključili i pitanja vezana uz specifične komponente fitnessa; tražili su od adolescentica da odrede koja od osam predloženih tvrdnja najbolje opisuje njihovu samoprocjenu snage, ravnoteže, fleksibilnosti i izdržljivosti.

Cilj ovog istraživanja bio je procijeniti odnos između tjelesne aktivnosti, samoprocijenjenih i stvarnih pokazatelja tjelesnih sposobnosti adolescenata oba spola.

Materijali i metode

Skupinu od 161 ispitanika u dobi od 16-18 godina činilo je 69 momaka i 92 djevojke. Mladići i djevojke izabrani su iz nekoliko škola u Tartuu, Estonija, (oko 100 000 stanovnika) ili iz manjih okolnih gradova sa manje od 5000 stanovnika. Sastav tijela procijenjen je metodom bioelektrične impedancije (Bodystat 500, UK).

Vlastiti tjelesni status (*self-perceived fitness*: SPF) ispitanici su procjenjivali ponešto modificiranom verzijom upitnika Delingnieres i suradnika (1994). Taj su upitnik detaljno opisali Lamb i Haworth (1998). Osim toga, indeks tjelesne aktivnosti (*physical activity index*: PAI) izračunat je prema Telami i suradnici (1996).

Za mjerenje motoričkih sposobnosti korišteni su testovi EUROFIT (1988). Nakon kratkog zagrijavanja (oko 10 min), koje se provodilo uvijek na isti način (lagano trčanje, skokovi i vježbe istezanja), ispitanici su izvodili tri testa: dohvat u sjedu (*sit-and-reach*) za mjerenje fleksibilnosti, jakost stiska šake (*handgrip dynamometry*) za mjerenje jakosti te izmjenično i trča-

nje na 20 m (*endurance shuttle run*) za procjenu opće anaerobne izdržljivosti.

Rezultati

Dječaci su vlastitu izdržljivost procijenili objektivnije od djevojaka ($r_M = 0.65$ i $r_Z = 0.48$). Dobivena je i statistički značajna povezanost samoprocjena i aktualnoga stanja i u poduzorku mladića ($r = 0.42$) i u skupini djevojaka ($r = 0.55$). Isto vrijedi i za samoprocjenu fleksibilnosti mladića ($r = 0.42$) i djevojaka ($r = 0.55$), a djevojke su sastav vlastita tijela bolje procijenile od momaka ($r_Z = -0.47$ i $r_M = -0.38$). Za indeks tjelesne aktivnosti dobivene su veće korelacije sa samoprocjenama nego s motoričkim sposobnostima. Ipak, ni stvarni pokazatelji sastava tijela ni samoprocjene nisu ni na koji način ovisile o razini tjelesne aktivnosti.

Kao pravilo vrijedi da samoprocjene izdržljivosti, snage i fleksibilnosti statistički značajno koreliraju s indeksom tjelesne aktivnosti ($r = 0.28$, -0.52 , osim izdržljivosti kod djevojaka) (tablica 3). Samoprocjena tjelesne građe ne ovisi o indeksu tjelesne aktivnosti; dobivena povezanost nije statistički značajna ($p > 0.05$).

Zaključak

Rezultati istraživanja ukazuju na to da su adolescenti prilično točno procjenjivali vlastite motoričke sposobnosti (izdržljivost, snagu, fleksibilnost) te tjelesnu građu, što potvrđuju statistički značajni koeficijenti korelacije njihovih samoprocjena sa stvarnim, izmjerenim stanjem. U pravilu se pojavljuje statistički značajna povezanost između stvarnog stanja tjelesnih sposobnosti te mjerenih i samoprocijenjenih motoričkih sposobnosti. Ni rezultati mjerenja ni samoprocjene tjelesne građe ne ovise o razini tjelesne aktivnosti.

Received: September 15, 2001

Accepted: October 15, 2002

Correspondence to:

Prof. Toivo Jürimäe, Ph.D.

Faculty of Exercise and Sport Sciences

University of Tartu

18. Ülikooli Street, 50090 Tartu, Estonia

Phone: +372 7 375 372

Fax: +372 7 375 373

E-mail: toivoj@ut.ee