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RELATIONSHIPS BETWEEN PHYSICAL FITNESS AND PHYSICAL ACTIVITY IN MIDDLE-AGED FEMALES MEASURED BY DIFFERENT QUESTIONNAIRES

Z RAZLIČNIMI VPRAŠALNIKI MERJENA POVEZANOST MED TELESNO PRIPRAVLJENOSTJO IN TELESNO AKTIVNOSTJO PRI ŽENSKAH SREDNJIH LET

Abstract

The aims of this study were to determine the reliability of Physical Fitness Questionnaire (FFB-Mot), International Physical Activity Questionnaire (IPAQ) and rating of perceived exercise capacity scale (RPC), and to investigate the relationships between the results of the questionnaires and the measured motor abilities using Eurofit for Adults tests. The subjects (N=51) of this study were 40-59 years old female teachers and coaches. Body height and mass were measured and body mass index calculated. Body fat percentage was measured using bioelectrical impedance analysis. Physical fitness, physical activity and maximal exercise capacity were assessed using questionnaires. Questionnaires were used twice with one week interval for presenting reproducibility. Handgrip strength, flexibility, plate tapping and 2 km walking test were used to assess motor abilities. Reproducibility coefficients of FFB-Mot were quite high, ranging from r = 0.51 to 0.96. IPAQ reproducibility was moderate (r = 0.01 - 0.78) and RPC reproducibility was ranging from r = 0.51 to 0.74. The study showed that questionnaires' repeatability was high for non-physical education teachers. Test FFB-Mot had a good repeatability, while repeatability of IPAQ was moderate. The correlations of physical activity measured by different questionnaires and Eurofit tests results were moderate.

Key words: physical fitness, physical activity, middle-aged women

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Izvleček

S študijo smo želeli ugotoviti zanesljivost vprašalnika o telesni pripravljenosti (Physical Fitness Questionnaire; FFD-Mot), mednarodnega vprašalnika o telesni aktivnosti (International Physical Activity Questionnaire; IPAQ) in lestvico za oceno zaznane možnosti za vadbo (RPC), ter raziskati razmerja med rezultati vprašalnikov in izmerjenimi gibalnimi sposobnostmi z uporabo testa Eurofit za odrasle. V študiji je sodelovalo 51 učiteljic in trenerk, starih med 40 in 59 let. Merjeni sta bili telesna višina in masa ter izračunan indeks telesne mase. Odstotek telesne maščobe je bil izmerjen z uporabo bioelektrične impedančne analize. Telesna pripravljenost, telesna aktivnost in maksimalna zmožnost vadbe so bile ocenjene na podlagi vprašalnikov. Ponovljivost vprašalnikov smo ugotavljali z dvakratnim testiranjem v intervalu enega tedna. Gibalne sposobnosti so bile ocenjene glede na moč prijema, gibljivost, tapkanje po plošči in 2 km hojo. Koeficienti ponovljivosti FFB-Mot so bili razmeroma visoki (r = 0.51 – 0.96). Ponovljivost vprašalnika IPAQ je bila razmeroma nizka (r = 0.01 – 0.78), ponovljivost RPC pa se je gibala med r = 0.51 in 0.74. Študija je pokazala, da je ponovljivost vprašalnikov boljša pri učiteljicah, ki ne poučujejo telesne vzgoje. Test FFB-Mot je imel ugodne koeficiente ponovljivosti, test IPAQ pa le zmerne. Korelacije telesne aktivnosti, merjene na podlagi različnih vprašalnikov in rezultatov testov Eurofit, so bile razmeroma nizke.

Ključne besede: telesna pripravljenost, telesna aktivnost, ženske srednjih let

INTRODUCTION

There is a strong relationship between physical activity and physical fitness. The main factor which influences an individual's physical fitness is physical activity. In addition, physical fitness can modify the level of physical activity (Blair, Cheng, & Holder, 2001; Bouchard & Shephard, 1994; Erikssen, 2001; Suni, 2000). Factors affecting physical activity and physical fitness are lifestyle, physical and social environment, personal attributes and heredity (Bouchard & Shephard, 1994; Seefeldt, Malina, & Clark, 2002). It is well known that regular physical activity has several health benefits (Afonso, Graca, Kearney, Gibney, & Vaz de Almeida, 2001; Conn, 1998; Howley, 2001; Kesaniemi, Danforth, Jensen, Kopelman, Lefebvere, & Reeder, 2001). The most common physical activities among European adults are walking, gardening, cycling and swimming (McCarthy, Gibney, & Flynn, 2002; Vaz de Almeida, Graca, Afonso, D'Amicis, Lappalainen, & Damkjaer, 1999). The term "physical fitness" has many definitions. Bouchard and Shephard (1994) defined physical fitness as the ability to perform muscular work satisfactorily in a physical, social and psychological environment. The two factors that adjust physical fitness level are body size and composition (Erikssen, 2001). There are several direct and indirect techniques to assess motor abilities, physical fitness and physical activity. Motor abilities are commonly measured using different basic and specific motor ability tests or test batteries. Physical fitness can be assessed by using questionnaires or laboratory and field tests. Physical activity level may be assessed by using calorimetry, physiological markers, motion detectors, behavioural observations, a dietary energy intake and occupational/leisure-time survey instruments (Bouchard, Shephard, & Stephens, 1994). The most popular methods to assess physical activity are different questionnaires. However, many existing questionnaires are limited. Many studies have not asked detailed information about intensity, duration and frequency of physical activities, which are very important components of physical activity. Some of the questionnaires have focused only on one domain - leisure-time or occupational physical activity.

In recent years there have been many studies investigating physical fitness or physical activity in children and adolescents, but there is a lack of data on adults, especially females. Three new questionnaires have been developed in recent years to assess adults' physical fitness and physical activity. The aims of this study are to determine the reliability of these new questionnaires and to investigate the relationships between questionnaire results and measured motor abilities using Eurofit tests for adults.

METHOD

Participants

In total, 51 middle-aged female teachers and coaches aged between 40 and 59, who worked in city schools and sport clubs in Tartu, Estonia, participated in this study. Participants were divided into four groups: group I (n=13) – physical education (PE) teachers and coaches who were 40-49 years old; group II (n=13) – PE teachers and coaches who were 50-59 years old; (control) group III (n=16) - other subjects/teachers (except PE teachers) who were 40-49 years old and (control) group IV (n=9) - other subjects/teachers (except PE teachers) who were 50-59 years old. All participants were healthy.

Instruments

Height of the subjects was measured by the Martin metal anthropometer (± 0.1 cm) and body mass was determined using the medical scales (± 0.05 kg, A&D Instruments Ltd, UK). The body mass

index (BMI) was calculated (kg/m^2). Body fat was assessed by the bioelectrical impedance analysis (Bodystat 500, Isle of Man, UK). Seven motor ability tests from the Eurofit for Adults (Oja & Tuxworth, 1995) test battery were used: handgrip (right and left hand) to assess musculoskeletal fitness, flexibility (forward and lateral side-bending to the right and left side), plate tapping and 2 km walking test to estimate aerobic fitness. Handgrip was measured by using the Lafayette (USA) hand dynamometer. Trunk flexibility (forward) was measured by means of a sit-and-reach test. The test was repeated three times and the best result was recorded. Lateral flexibility was assessed based on the lateral spine bending. The participants had to bend laterally as far as possible from the standing position, first to the right and then to the left side. The plate tapping test assesses the speed and the coordination of limb movement. The subjects had to move their preferred hand left and right (25 full cycles) between the two plates over the hand in the middle as fast as possible. The subjects performed the test twice and the better result was recorded. The maximal aerobic fitness was assessed using a 2 km walking test. The subjects had to walk 2 km as fast as possible in the indoor track. The walking time and the heart rate (HR) were recorded at the end of the test. VO_{2max} was calculated by using the following formula: VO_{2max} (ml/min/kg)= 116.2 – 2.98 × walking time (s) – 0.11 × HR – 0.14 × age – 0.39 ×BMI (Oja & Tuxworth, 1995).

Three recently presented questionnaires of physical fitness and physical activity were used in this study. The first - the Physical Fitness Questionnaire (FFB-Mot), was developed by Bös and colleagues (Bös, Abel, Woll, Niemann, Tittlbach, & Schott, 2002). The aim of this questionnaire is to measure motor fitness status in normal adult population. The FFB-Mot consisted of 28 self-reported items in the categories of strength, cardiorespiratory fitness, flexibility and coordination. Every motor ability has 7 items (5 standard plus 2 additional items). There are 4 different scales to measure motor fitness: Standard, Short, Activities of Daily Living (ADL) and Sport. Standard scale consists of 20 items and the short form of 12 items. Two additional scales – ADL and Sport are used to measure low and high physical fitness. Both additional scales comprise 4 items. Every item has 5 possible answers: I can not perform this activity (1 point); I have many problems in performing this activity (2 points); I have moderate problems in performing this activity (3 points); I have little problems in performing this activity (4 points) and I have no problems in performing this activity (5 points). According to the scale the items' points were summarized. The sum of the standard scale is between 20-100 points, short – 12-16 points, ADL and Sport – 4-20 points. The sum of every motor ability is between 5-25 points (Bös, Abel, Woll, Niemann, Tittlbach, & Schott, 2002).

The International Physical Activity Questionnaire (IPAQ) was developed by an International Consensus Group in 1998-1999 (Craig et al., 2003). The aim of the questionnaire is to measure adults' levels of physical activity around the world and to compare collected data among different countries. In this study, we used the short form of IPAQ questionnaire, which covers four different physical activities: vigorous and moderate physical activity, walking and sitting. Participants had to answer how many days, hours and minutes, or none, they spent doing this activity. The subjects had to take into account only the kinds of activities which lasted at least 10 minutes (except sitting). Data were used to estimate total weekly physical activity by weighting the reported minutes per week within each activity category by a MET energy expenditure estimate assigned to each category of activity. The index of vigorous and moderate physical activity and walking was calculated by using the following formula: duration × frequency per week × MET intensity (MET·min·wk^{-1}). The MET values are the following: vigorous physical activity – 8 METs, moderate physical activity – 4 METs, walking – 3.3 METs and sitting – 1 MET. To obtain the index of

total physical activity during one week, the indexes of vigorous and moderate physical activity and walking were added (Craig et al., 2003).

The aim of the last questionnaire (rating of perceived capacity - RPC) is to predict maximal exercise capacity using a presented scale (Wisén, Farazdaghi, & Wohlfart, 2002). The different levels of physical activities were linked to a metabolic equivalent (MET). The subjects had to choose the most strenuous activity and the corresponding MET value that they could sustain for at least 30 minutes.

Procedure

Data were collected from March to May 2003. After the study had been described to the subjects, all participants gave their informed written consent to participate in this study. During the first visit, the anthropometrical characteristics and body composition were measured, different questionnaires were filled in and some Eurofit for Adults tests were used. One week later, participants completed only the questionnaires for the measurement of reproducibility.

Data were expressed as mean and standard deviations. The test-retest reliability and correlations between Eurofit for Adults tests and questionnaire indexes were calculated using Pearson correlation coefficients. Statistical significance was set at $p<0.05$.

RESULTS

Selected anthropometrical and body composition parameters (age, height, body mass, body mass index, body fat %) and mean career span of the subjects by group are presented in Table 1.

Table 1: Selected anthropometrical body composition parameters and mean career span of the subjects

	GROUP	*Age (years)*		*Height (cm)*		*Body mass (kg)*		*Body mass index (kg/m²)*		*Fat (%)*		*Mean career span (yrs)*	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Age 40-49 yrs	I (n=13)	43.85	2.79	167.05	6.18	64.88	11.16	23.21	3.25	25.19	4.75	18.00	7.88
	III (n=16)	44.50	2.45	164.18	5.50	63.45	6.71	23.54	2.43	27.03	4.50	19.94	3.59
Age 50-59 yrs	II (n=13)	55.62	2.59	165.38	5.50	67.49	9.26	24.60	2.91	30.05	4.62	32.00	3.54
	IV (n=9)	53.00	3.74	166.54	5.51	71.30	4.68	25.79	2.93	31.79	5.39	28.44	6.54

Legend:
M – mean value
SD – standard deviation

The results of the Eurofit tests are presented in Table 2. PE teachers and coaches aged 40-49 years old (group I) had the highest (except handgrip with left hand and forward flexibility) mean and other teachers (except PE teachers) aged 50-59 years old (group IV) had the lowest (except handgrip) mean.

Table 2: The mean results of the Eurofit for Adults tests

		TESTS	*M*	*SD*
Age 40-49 yrs	GROUP I (n=13)	Handgrip-r (kg)	33.46	5.29
		Handgrip-l (kg)	30.00	5.71
		Handgrip (r + l, kg)	63.46	10.56
		Flexibility-for (cm)	38.24	9.17
		Flexibility-r (cm)	21.62	2.96
		Flexibility-l (cm)	22.58	3.36
		Flexibility-lat (cm)	22.10	3.02
		Plate tapping (s)	10.74	1.13
		VO_{2max} (ml/kg/min)	37.92	3.43
	GROUP III (n=16)	Handgrip-r (kg)	31.13	5.38
		Handgrip-l (kg)	28.38	4.29
		Handgrip (r + l, kg)	59.51	9.69
		Flexibility-for (cm)	32.32	10.20
		Flexibility-r (cm)	21.53	2.97
		Flexibility-l (cm)	21.50	3.43
		Flexibility-lat (cm)	21.52	2.89
		Plate tapping (s)	11.76	1.29
		VO_{2max} (ml/kg/min)	35.25	3.91
Age 50-59 yrs	GROUP II (n=13)	Handgrip-r (kg)	31.00	3.98
		Handgrip-l (kg)	27.77	4.55
		Handgrip (r + l, kg)	58.77	6.50
		Flexibility-for (cm)	41.04	8.24
		Flexibility-r (cm)	20.19	2.89
		Flexibility-l (cm)	21.12	4.27
		Flexibility-lat (cm)	20.65	3.19
		Plate tapping (s)	11.21	1.12
		VO_{2max} (ml/kg/min)	34.77	6.02
	GROUP IV (n=9)	Handgrip-r (kg)	31.00	5.43
		Handgrip-l (kg)	31.11	4.04
		Handgrip (r + l, kg)	62.11	9.18
		Flexibility-for (cm)	31.00	8.62
		Flexibility-r (cm)	18.11	3.04
		Flexibility-l (cm)	18.78	3.82
		Flexibility-lat (cm)	18.44	3.30
		Plate tapping (s)	11.88	1.32
		VO_{2max} (ml/kg/min)	32.22	3.35

Legend: r – right; l – left; for – forward; lat – lateral flexibility (mean of the right and left flexibility); VO_{2max} – calculated maximal oxygen uptake

The results of the questionnaires are presented in Tables 3, 4 and 5. Test-retest reliability coefficients, mean and standard deviations for FFB-Mot scales and motor abilities are presented in Table 3. The correlation coefficients of FFB-Mot's scales were quite acceptable, ranging from r = 0.51 (ADL scale in group II) to r = 0.96 (coordination index in group I, strength index in group III and Sport scale in group IV). Quite good test-retest reliability coefficients were recorded in groups I (except cardiorespiratory fitness), III and IV. Standard and Sport scales showed stronger correlations between the 1st and the 2nd measures. The correlation coefficients of motor abilities were quite good, except cardiorespiratory fitness. Strength had higher (r = 0.83 -0.96) and cardiorespiratory fitness lower (r = 0.55 - 0.72) test-retest reliability.

Table 3: The mean, standard deviations and test-retest reliability coefficients of FFB-Mot (different scales of questionnaires and motor abilities)

	GROUP	*Scales of questionnaire and motor abilities*	*1st measurement*		*2nd measurement*		*r*	*p*
			M	SD	M	SD		
Age 40-49 yrs	GROUP I (n=13)	Standard	83.69	6.75	83.62	8.55	0.87	*
		Short	52.46	3.53	52.62	4.63	0.76	*
		ADL	19.77	0.83	19.62	0.96	0.82	*
		Sport	9.23	2.17	9.46	2.26	0.66	*
		Strength	19.08	3.99	18.31	4.35	0.92	*
		Cardioresp. fitness	19.46	2.63	20.38	3.48	*0.55*	
		Flexibility	23.46	1.61	23.46	1.66	0.91	*
		Coordination	21.69	2.14	21.46	1.98	0.96	*
	GROUP III (n=16)	Standard	75.19	9.70	76.50	9.78	0.92	*
		Short	48.13	6.13	49.19	5.92	0.89	*
		ADL	18.81	1.28	19.50	0.73	0.68	*
		Sport	6.44	2.22	6.44	2.50	0.90	*
		Strength	18.06	3.36	17.63	4.49	0.96	*
		Cardioresp. fitness	16.75	3.04	18.06	3.02	0.66	*
		Flexibility	22.25	2.46	21.94	2.77	0.81	*
		Coordination	18.13	3.76	18.88	3.32	0.87	*
Age 50-59 yrs	GROUP II (n=13)	Standard	75.77	5.96	76.92	4.03	0.59	*
		Short	47.92	4.73	49.31	4.21	0.58	*
		ADL	18.92	1.44	19.31	0.95	*0.51*	
		Sport	6.46	1.90	6.38	1.98	0.81	*
		Strength	17.54	3.57	17.31	3.33	0.85	*
		Cardioresp. fitness	15.92	2.69	17.31	1.84	0.66	*
		Flexibility	22.92	2.10	23.38	1.80	0.59	*
		Coordination	19.38	3.25	19.31	2.72	0.88	*
	GROUP IV (n=9)	Standard	67.11	9.56	65.33	11.35	0.83	*
		Short	42.11	6.77	41.44	8.41	0.82	*
		ADL	18.67	1.32	18.67	1.80	0.84	*
		Sport	5.33	1.87	4.89	1.76	0.96	*
		Strength	15.44	4.28	15.11	5.09	0.83	*
		Cardioresp. fitness	14.89	2.98	14.67	2.92	0.72	*
		Flexibility	21.11	3.14	19.78	3.71	0.93	*
		Coordination	15.67	2.50	15.78	3.42	0.79	*

*Legend: M – mean value; SD – standard deviation; r – test-retest reliability coefficient; * p<0.05*

The results of the IPAQ questionnaire are presented in Table 4. There were not many significant correlations between the 1st and the 2nd measures. The test-retest reliability coefficients were not good, ranging from r = 0.01 (vigorous PA in group III) to r = 0.78 (vigorous PA in group IV). There was only one significant correlation in group I (total PA) and in group II (walking). Groups III and IV had three significant correlations: vigorous PA (groups III and IV), sitting (groups III and IV), walking (group III) and total PA (group IV).

Table 4: The mean, standard deviations and test-retest reliability coefficients of IPAQ questionnaire different intensity levels of physical activity (PA) in groups I, II, III and IV

		Intensity levels of PA	*1st measurement*		*2nd measurement*		*r*	*p*
		(MET·min·wk^{-1})	M	SD	M	SD		
Age 40-49 yrs	GROUP I (n=13)	Vigorous PA	1070.77	879.72	1218.46	685.78	*0.16*	
		Moderate PA	1172.31	619.54	1286.15	1046.37	*0.40*	
		Walking	777.96	565.01	809.77	513.65	*0.09*	
		Sitting (min·wk^{-1})	1119.23	508.73	1528.85	803.32	*0.48*	
		Total PA	3021.12	1341.07	3314.38	1407.02	0.58	*
	GROUP III (n=16)	Vigorous PA	552.50	494.93	932.50	1101.83	0.62	*
		Moderate PA	1143.75	875.48	960.00	827.40	*0.14*	
		Walking	842.69	723.94	862.13	638.97	0.64	*
		Sitting (min·wk^{-1})	1170.00	586.86	1426.88	579.03	0.69	*
		Total PA	2562.88	1062.92	2747.63	1248.50	*0.33*	
Age 50-59 yrs	GROUP II (n=13)	Vigorous PA	578.46	640.96	670.77	661.14	*0.01*	
		Moderate PA	1033.85	1138.72	746.15	447.47	*0.25*	
		Walking	646.04	569.26	594.00	419.54	0.71	*
		Sitting (min·wk^{-1})	1335.77	627.60	1455.00	854.69	*0.18*	
		Total PA	2258.35	1361.07	2010.92	771.47	*0.36*	
	GROUP IV (n=9)	Vigorous PA	266.67	640.00	515.56	617.23	0.78	*
		Moderate PA	797.78	506.01	573.33	321.25	*0.35*	
		Walking	962.50	437.09	663.67	381.18	*0.45*	
		Sitting (min·wk^{-1})	1983.33	741.92	1793.33	457.38	0.74	*
		Total PA	2026.94	822.78	1805.89	1236.87	0.77	*

Legend:
M – mean value
SD – standard deviation
r – test-retest reliability coefficient
** p<0.05*

The MET values which are linked to activities are presented in Table 5. The test-retest reliability coefficients were quite good and similar, ranging from r = 0.60 to r = 0.74.

Table 5: The mean standard deviations and test-retest reliability coefficient of the perceived capacity scale (RPC scale)

		GROUP	1st measurement		2nd measurement		r	p
			M	SD	M	SD		
MET value	Age 40-49 yrs	I (n=13)	10.08	2.22	9.46	1.90	*0.51*	
		III (n=16)	7.81	2.04	7.38	2.16	0.71	*
	Age 50-59 yrs	II (n=13)	7.23	1.88	7.38	1.76	0.60	*
		IV (n=9)	7.33	1.32	7.67	1.66	0.74	*

*Legend: M – mean value; SD – standard deviation; r – test-retest reliability coefficient; * p<0.05*

The relationships between Eurofit for Adults tests and questionnaires (FFB-Mot, IPAQ, RPC scale) are presented in Table 6. There were only a few statistically significant relationships. The correlation coefficients ranged between r = 0.56 (group I) and r = 0.84 (group II). More correlations with questionnaires indexes were recorded in handgrip strength with right hand and total physical activity.

Table 6: Relationships between Eurofit for Adults tests results and different questionnaires (FFB-Mot, IPAQ and RPC scale) indexes (only statistically significant relationships presented)

	GROUP		HS (r)	HS (l)	HS	FB (f)	HM	VO_2
Age 40-49 yrs	I (n=13)	Strength	0.58		0.57			
		Flexibility				0.73		
		Total PA	0.69	0.56	0.65			
		Activity		0.59				
	III (n=16)	Flexibility					0.59	
		Cardioresp. fitness					0.68	
		Total PA					0.58	0.63
Age 50-59 yrs	II (n=13)	Flexibility				0.59		
		Cardioresp. fitness	0.84					
		Total PA	0.58		0.57			
	IV (n=9)	Strength		0.76	0.72	0.78		
		Flexibility	0.70					0.69
		Activity						

Legend:
HSr – handgrip with right hand
HSl – handgrip with left hand
HS – handgrip (right + left hand)
FBf – forward flexibility
HM – hands movement
VO_2 – maximal oxygen uptake
Strength – strength index from FFB-Mot
Flexibility – flexibility index from FFB-Mot
Cardioresp. fitness - cardiorespiratory fitness index from FFB-Mot
Total PA – total physical activity index during one week from IPAQ questionnaire
Activity – chosen activity from rating of perceived capacity (RPC scale).

DISCUSSION

The test-retest reliability coefficients of different questionnaires among the four groups were very different, even in the same age-group. The correlation coefficients of FFB-Mot scales and four motor abilities among the different groups were quite high, i.e. r = 0.51 - 0.96 (see Table 3). However, in our study the correlations between the 1st and the 2nd measures were lower than recorded in Bös et al. (2002), who were the authors of this questionnaire. The correlation coefficients in the original report were the following: Standard r = 0.89, Short r = 0.90, ADL r = 0.78 and Sport scales r = 0.77. In both studies the ADL and Sport scales had lower correlation coefficients, although the ADL scale is composed of activities in daily living. The possible reason why the correlation coefficients were in this study lower may be the fact that the participants in our study were teachers and teaching seems to be quite stressful and intense (Dick & Wagner, 2001), while in the Bös al. (2002) report the subjects had different occupations. An important factor that influenced the results of this study is the earlier physical activity of participants. Many of the PE teachers and coaches were former athletes. Now the activity and fitness level might have decreased. Also, we cannot forget the fact that subjects might not have understood the questions or rushed their answers and did not go into detail. The correlation coefficients between the 1st and the 2nd measures of motor abilities in our study were quite good, except cardiorespiratory fitness, which was surprisingly low. The low repeatability of cardiorespiratory fitness may partly be caused by the teachers' sedentary lifestyle. The physical activity of the control group (teachers except PE teachers and coaches) is very low, especially from 8 am to 3 pm. A quite good correlation coefficient (r = 0.72) of the cardiorespiratory fitness was recorded only in group IV. Older people love walking and some of the activities from the questionnaire were related to walking. Eyler, Brownson, Bacak, & Houseman (2003) reported that walking is popular among groups that are typically sedentary (older people). The reliability coefficients of flexibility were good, except in group II. The mean of flexibility was highest, which shows that the items were quite easy to perform. The lower correlation coefficient of group II may partly be associated with the fact that older PE teachers and coaches (group II) might have some health problems which influence flexibility. The results of our study were not quite similar to the Fortier, Katzmarzyk, Malina, & Bouchard's (2001) report. They reported that the components of muscular strength and endurance are moderately stable and trunk flexibility has generally higher stability. In our study highest correlations were recorded in strength and coordination and lowest in cardiorespiratory fitness. But we cannot forget that the subjects of this study live in quite a small town and their activities are different than in some other cities or countries in Europe. The possibilities to perform different intensity levels of regular physical activity are also diverse.

The assessment and measurement of physical activity are due to its complexity quite complicated and difficult. The measuring is especially problematic in older persons and women (Paffenbarger, Blair, Lee, & Hyde, 1993; Pols, Peeters, Kemper, & Collette, 1996; Seefeldt, Malina, & Clark, 2002; Wilbur, Miller, Dan, & Holm, 1989). There are some different opinions about the level of physical activity. In 1994, a group of experts suggested that every U.S. citizen has to perform moderate-intensity physical activity on most days for at least 30 minutes or more per day. In 1998, the Canada's Physical Activity Guide was published: every day, at least 60 minutes of physical activity (light intensity) should be performed by every adult (Bouchard, 2001). There was one more suggestion: to experience health benefits people should exercise for 20 minutes continuously three times in one week with vigorous-intensity (Kesaniemi et al., 2001). Table 4 presents the test-retest reliability coefficients of different intensity levels of physical activity, which are low

(IPAQ questionnaire). There were many non-statistically significant correlations between the 1st and the 2nd measures, especially in groups I and II (PE teachers and coaches). The low repeatability coefficient in groups I and II may be partly caused by the lifestyle specialty, which is quite variable. High correlation coefficients were recorded in group IV (r = 0.74 - 0.77). The results of this study showed that physical activity was very diverse in middle-aged females during a period of one week or the subjects' opinion about their physical activity level was inaccurate. In the Craig et al. (2003) study the correlation coefficients ranged from r = 0.32 to r = 0.88, which is higher than in our report. Our study confirmed the Fortier et al. (2001) study, where they reported that physical activity is more plastic and doesn't track as well as good musculoskeletal fitness.

The correlation coefficients of RPC scale are not very good, although the subjects had to choose only one activity which they could sustain for at least 30 minutes (see Table 5). There were no significant correlations between the 1st and the 2nd measures in group I. The fact that groups I and II had lower correlation may partly be caused by the subjects' attitude – this question is so easy for them. Also they could change their mind during the last seven days (between the 1st and the 2nd measures).

There are few studies which focused on the relationships between physical activity and physical fitness. Also, the relationships between questionnaires and motor tests are poorly investigated. In this study, the relationships between questionnaires and Eurofit tests were investigated. Results showed that the correlations were not high. Handgrip with the right hand had the highest correlations with cardiorespiratory fitness (r = 0.84) from FFB-Mot questionnaire and chosen activity from the RPC scale (r = 0.70). Handgrip with the left hand and handgrip (right + left hand) had good correlation with the strength index from the FFB-Mot questionnaire. Strength is the main motor ability, which is strongly correlated with other motor abilities. Flexibility, which may together with strength be related with increased risk of back problems, had a good correlation with flexibility (r = 0.73) and strength (r = 0.78) indexes from the FFB-Mot questionnaire.

We agree with the statement of Pols et al. (1996), saying that the questionnaires' repeatability can vary not only among questionnaires, but also among different populations. In this study the correlation coefficients varied widely also among the small groups.

The following conclusions were made:

1. Non-physical education teachers had better questionnaires repeatability than physical education teachers;
2. The FFB-Mot questionnaire had a good repeatability. Standard scale had higher test-retest repeatability and it is the most suitable questionnaire scale to assess physical fitness level in middle-aged females;
3. The repeatability of IPAQ was low;
4. The repeatability of RPC scale was statistically significant, except in group I;
5. Relationships between used questionnaires and Eurofit for Adults tests were not strong.

REFERENCES

Afonso, C., Graca, P., Kearney, J. M., Gibney, M. J., & Vaz de Almeida, M. D. (2001). Physical activity in European seniors: attitudes, beliefs and levels. *Journal of Nutrition, Health, and Aging*, 5, 226-229.

Blair, S. N., Cheng, Y., & Holder, S. (2001). Is physical activity or physical fitness more important in defining health benefits?. *Medicine and Science in Sports and Exercise*, 33, 379-399.

Bouchard, C. (2001). Physical activity and health: introduction to the dose-response symposium. *Medicine and Science in Sports and Exercise*, 33, 347-350.

Bouchard, C., & Shephard, R. J. (1994). Physical Activity, Fitness, and Health: The Model and Key Concepts. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.) *Physical Activity, Fitness, and Health: international proceedings and consensus statement* (pp 77-88). Champaign: Human Kinetics.

Bouchard, C., Shephard, R., & Stephens, T. (1994). The Consensus Statement. In C. Bouchard, R. J. Shephard, & T. Stephens (Eds.) *Physical Activity, Fitness, and Health: international proceedings and consensus statement* (pp 9-76). Champaign: Human Kinetics.

Bös, K., Abel, T., Woll, A., Niemann, S., Tittlbach, S., & Schott, N. (2002). Der Fragebogen zur Erfassung des motorischen Funktionsstatus [The questionnaire for the evaluation of the motor function status]. *Diagnostica*, 48, 101-111.

Conn, V. S. (1998) Older women's beliefs about physical activity. *Public Health Nursing*, 15, 370-378.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-Country reliability and validity. *Medicine and Science in Sports and Exercise*, 35, 1381-1395.

Dick, R., & Wagner, U. (2001). Stress and strain in teaching: a structural equation approach. *British Journal of Educational Psychology*, 71, 243-259.

Erikssen, G. (2001). Physical fitness and changes in mortality: The survival of the fittest. *Sports Medicine*, 31, 571-576.

Eyler, A. A., Brownson, R. C., Bacak, S. J., & Houseman, R. A. (2003). The epidemiology of walking for physical activity in the Unites States. *Medicine and Science in Sports and Exercise*, 35, 1529-1536.

Fortier, M. D., Katzmarzyk, P. T., Malina, R. M., & Bouchard, C. (2001). Seven-year stability of physical activity and musculoskeletal fitness in the Canadian population. *Medicine and Science in Sports and Exercise*, 33, 1905-1911.

Howley, E. (2001). Type of activity: resistance, aerobic and leisure versus occupational physical activity. *Medicine and Science in Sports and Exercise*, 33, 364-369.

Kesaniemi, Y. A., Danforth, Jr. E., Jensen, M. D., Kopelman, P. G., Lefebvere, P., & Reeder B. A. (2001). Dose-response issues concerning physical activity and health: An evidence-based symposium. *Medicine and Science in Sports and Exercise*, 33, 351-358.

McCarthy, S.N., Gibney, M. J., & Flynn, A. (2002). Overweight, obesity and physical activity levels in Irish adults: Evidence from the North/South Ireland food consumption survey. *Proceedings of the Nutrition Society*, 61, 3-7.

Oja, P., & Tuxworth, B. (1995). *Eurofit for Adults: Assessment of health-related fitness*. Tampere: Council of Europe Publishing.

Paffenbarger, Jr. R. S., Blair, S. N., Lee, I-M., & Hyde, R. T. (1993). Measurement of physical activity to assess health effects in free-living populations. *Medicine and Science in Sports and Exercise*, 25, 60-70.

Pols, M. A., Peeters, P. H. M., Kemper, H. C. G., & Collette, H. J. A. (1996). Repeatability and relative validity of two physical activity questionnaires in elderly women. *Medicine and Science in Sports and Exercise*, 28, 1020-1025.

Seefeldt, V., Malina, R. M., & Clark, M. A. (2002). Factors affecting levels of physical activity in adults. *Sports Medicine*, 32, 143-168.

Suni, J. (2000). *Health-related fitness test battery for middle-aged adults with emphasis on musculoskeletal and motor tests*. Unpublished doctoral dissertation. Jyväskylä: University of Jyväskylä.

Vaz de Almeida, M.D., Graca, P., Afonso, C., D'Amicis, A., Lappalainen, R., & Damkjaer, S. (1999). Physical activity levels and body weight in a nationally representative sample in the European Union. *Public Health Nutrition*, 2,105-113.

Wilbur, J., Miller, A., Dan, A. J., & Holm, K. (1989). Measuring physical activity in midlife women. *Public Health Nursing*, 6, 120-128.

Wisén, A. G. M., Farazdaghi, R. G., & Wohlfart, B. (2002). A novel rating scale to predict maximal exercise capacity. *European Journal of Applied Physiology*, 87, 350-357.