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Internal Consistency and Retest Reliability of the Croatian Version of PAQ-C

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Abstract

The aim of the study was to determine internal consistency and retest reliability of the Croatian version of PAQ-C on a sample of 6-10 years old children and to report physical activity levels of elementary school pupils. The same set of questions was administered to the pupils on two different occasions, three weeks apart. Both testing rounds for 8-10 years old pupils were conducted at school in the presence of an experienced researcher. In contrast, the 6-8 years old pupils took the questionnaires home and completed them with parental help. A total of 81 pupils (participation rate 65%) filled out the questionnaire at both time points. Internal consistency for the 6- to 8-year-old group, as assessed by Cronbach's alpha, was .51 and .69 for the first and second measure, respectively. For the 8- to 10-year-old group, Cronbach's alpha for the first and second measure was .77 and .75, respectively. Average Intraclass Correlation Coefficient (ICC) between total physical activity levels of the first and second measure was .56 (95% IC .05 – .76) and .75 (95%CI .54 – .86) for the 6- to 8-year-old and 8- to 10-year-old group, respectively. Results of the present study support the use of the Croatian version of PAQ-C to assess the physical activity levels of 8- to 10-year-old pupils. In contrast, the current evidence indicates that PAQ-C will not reliably assess parental-reported physical activity levels of children younger than 8 years.

Key words: *elementary school pupils; physical activity levels; repeatability.*

Introduction

Physical activity plays an important role in children's body weight regulation and even in childhood it is related to many health behaviors (e.g. drug use, smoking,

diet, etc.; Goran, Reynolds, & Lindquist, 1999). Even though the benefits of regular physical activity are well known (Biddle, Gorely, & Stensel, 2004), evidence of decline of physical activity during childhood has been presented in many studies (Nader, Bradley, Houts, & McRitchie, 2008; Riddoch et al., 2004). According to the World Health Organization (WHO, 2012), children should participate in at least 60 minutes of moderate-to-vigorous physical activities every day. However, due to the prevalence of obesity in children, new recommendations state that children should engage in one to two hours of various physical activities daily (Gråstén, Liukkonen, Jaakkola, & Tammelin, 2014). To prevent the current epidemic of obesity and other diseases associated with sedentary lifestyles, the level of children's physical activity should be significantly increased (Bervoets et al., 2014).

Physical activity has a fundamental role in the prevention and treatment of chronic disease (Warren, Ekelund, Besson, Mezzani, Geladas, & Vanhees, 2010), therefore the assessment of the levels of physical activity has a great importance. Physical activity is a complex behavior and it is difficult to measure it objectively. Accurate assessment of children's physical activity level is a difficult task because of cognitive changes during growth and the fact that children do not have constant pattern of habitual physical activity (Corder, Ekelund, Steele, Wareham, & Brage, 2008). When modern methods for objective assessment of physical activity are not available (accelerometers, pedometers, indirect calorimetry, etc.), the questionnaires are the most practical choice because of their low cost and suitability. Nevertheless, they should be used advisedly (Helmerhorst, Brage, Warren, Besson, & Ekelund, 2007) and every physical activity questionnaire must meet the basic criteria, such as practicability, applicability, repeatability, and accuracy (Caspersen et al., 1998; taken from Platat & Jarrar, 2012).

One of the promising questionnaires for children, which meets these criteria is Physical Activity Questionnaire for Children (PAQ-C), designed to assess general levels of physical activity for children aged approximately 8–14. Its reliability and validity has been confirmed in many studies with subjects being 8 years old or older (Chinapaw, Mokkink, van Poppel, van Mechelen, & Terwee 2010; Crocker, Bailey, Fulkner, Kowalski, & McGrath, 1997; Currie et al., 2008; Kowalski et al., 1997; Martinez-Gomez et al., 2011). The Croatian version of the PAQ-C also indicated satisfactory internal consistency and retest reliability of the questionnaire, but it was conducted only on a sample of 10-year-old children (Vidaković Samaržija & Mišigoj-Duraković, 2013). To the authors' knowledge, no studies have been conducted examining internal consistency and retest reliability of the Croatian version of PAQ-C to assess general levels of physical activity of 6- to 10-year-old children.

Since elementary school population in Croatia encompasses 6- to 10-year-old children whose physical activity is steadily declining, there is a need for reliable and accessible questionnaire for assessing levels of physical activity during this period. For that reason, the aim of this study was to determine internal consistency and retest reliability of the Croatian version of PAQ-C on a sample of 6- to 10-year-old children and to report physical activity levels of elementary school pupils.

Methods

Experimental Design

In order to evaluate the reproducibility of the PAQ-C for regular use with 6- to 10-year-old children, the present study plan comprised two sections: the assessment of (i) retest reliability and (ii) internal consistency. Therefore, the same set of questions was administered to the pupils on two different occasions, three weeks apart. Retest reliability was evaluated comparing the questionnaire results of the same group of subjects recorded at two time points. The internal consistency was evaluated using all results recorded at initial and final testing, separately. Both testing rounds for 8- to 10-year-old pupils were conducted at school in the presence of an experienced researcher. In contrast, the group of 6- to 8-year-old pupils took the questionnaires home and completed them with parental help. In order to minimize the sources of variation, the same parent was asked to respond on both occasions. The data were analyzed for each group separately, as described further in the text.

Subjects

As a representative of the population of elementary school pupils, a convenience sample (n=126) was selected among the pupils of Ivo Andrić Elementary School in Zagreb. All 6- to 10-year-old pupils (first-fourth grade) were invited to participate in the study. A total of 81 pupils (participation rate 65%) filled out the questionnaire at both time points and reported they had no unusual activity during the previous week (PAQ-C item 10).

Physical Activity Questionnaire for Children (PAQ-C)

PAQ-C questionnaire (Crocker et al., 1997) was used to assess pupils' physical activity levels. The PAQ-C is a self-administered, 1-week recall feedback form. The questionnaire was designed to assess the levels of physical activity in elementary school children aged between 8 and 14 years. It consisted of nine items scored on a 5-point Likert scale. Low values indicate a lower level of physical activity, whereas higher value presumes a higher level of physical activity. The result of the questionnaire is hypothesized to provide an objective summary of physical activity score. The Croatian version of the PAQ-C (Vidaković Samaržija & Mišigoj-Duraković, 2013) has been used in this study.

Statistical Methods

The data from PAQ-C were generally skewed, hence nonparametric statistical methods were chosen. Distributions of all items' scores were similar for all groups (both 6-8 and 8-10-year-olds), as assessed by visual inspection of a boxplot. Wilcoxon signed-rank test was used to determine if there were differences between the test and the retest estimates. Spearman correlation coefficient was used to estimate the rank order agreement between the test and the retest. The level of internal consistency

was determined by Cronbach's alpha. A Kruskal-Wallis H test was run to determine whether there were differences in PAQ-C items' scores between four groups of pupils from the first (n=20), second (n=26), third (n=26) and fourth (n=30) grade. Subsequently, pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. Adjusted p-values are presented.

Results

Results of Internal Consistency and Retest Reliability of the Croatian Version of PAQ-C

Descriptive statistics of two groups (6-8 and 8-10-year-olds) are presented in Table 1. The average age of 6-8 years old pupils was 7.31±0.63 years. On average, they were 131.74±7.05 cm tall with body mass of 29.44±6.44 kg. Male pupils were 133.93±7.22 cm tall and had a body mass of 30.41±5.71 kg, while female pupils were slightly shorter (130.1±6.63 cm) and lighter (28.71±6.99 kg). These values correspond to the reference values for Croatian pupils of that age and gender (Jureša et al., 2012). Average BMI values of male (16.85±2.16 kg/m^2) and female (16.76±2.43 kg/m^2) students indicate a normal weight for 6-8 years old children (Cole et al., 2000).

Pupils in the 8- to 10-year group were on average 9.41±0.54 years old, 142.3±6.58 cm tall with body mass of 36.54±7.53 kg. Male and female pupils' values correspond to the reference values for Croatian pupils of that age and gender (Jureša et al., 2012). Male pupils' height (142.17±5.65 cm) and weight (36.29±5.96 kg) were similar to those of female pupils (height 142.43±7.52 cm, weight 36.79±8.97 kg). The average BMI value of males (17.92±2.54 kg/m^2) and females (17.95±3.04 kg/m^2) indicates a normal weight for the third and fourth grade pupils (Cole et al., 2000).

Table 1

Descriptive statistic of anthropometric measures

		AGE (yrs)	HEIGHT (cm)	WEIGHT (kg)	Body mass index (kg/m^2)
6- to 8-year-olds (first and second grade)	M (n=15)	7.27±0.7	133.93±7.22	30.41±5.71	16.85±2.16
	F (n=20)	7.35±0.59	130.1±6.63	28.71±6.99	16.76±2.43
	TOT (n=35)	7.31±0.63	131.74±7.05	29.44±6.44	16.79±2.28
8- to 10-year-olds (third and fourth grade)	M (n=23)	9.35±0.49	142.17±5.65	36.29±5.96	17.92±2.54
	F (n=23)	9.48±0.59	142.43±7.52	36.79±8.97	17.95±3.04
	TOT (n=46)	9.41±0.54	142.3±6.58	36.54±7.53	17.93±2.77

The results of internal consistency and retest reliability of the Croatian version of PAQ-C are presented in Table 2. Total PA levels were moderate for both 6- to 8-year-old (the first measure 2.81; the second measure 2.89) and 8- to 10-year-old pupils (the first measure 2.66; the second measure 2.72). The lowest levels of PA were reported for PA in spare time for both 6- to 8-year-old (the first measure 1.16; the second measure 1.12) and 8- to 10-year-old pupils (the first measure 1.28; the second measure 1.24).

The highest levels of PA were reported for PA during physical education (PE) classes for both 6- to 8-year-old (the first measure 5.00; the second measure 5.00) and 8- to 10-year-old pupils (the first measure 5.00; the second measure 5.00).

Table 2

Results of internal consistency and retest reliability of the Croatian version of PAQ-C

		Measure (median)		Difference (median)	Wilcoxon signed-rank test		Spearman correlation	
		1st	2nd	2nd-1st	z	p	r	p
6-8-years-old (first and second grade)	PA in spare time	1.16	1.12	.00	-1.329	.184	**.570**	**.001**
	PA during physical education (PE) classes	5.00	5.00	.00	-.284	.776	.439	.008
	PA during 5-minute breaks between classes	3.00	3.00	.00	1.676	.094	**.349**	**.040**
	PA during a 15-minute lunch break	3.00	3.00	.00	-.476	.634	.156	.372
	PA right after school	3.00	2.00	.00	-.159	.874	**.351**	**.039**
	PA during evenings	3.00	3.00	.00	-.050	.960	**.386**	**.022**
	PA during last weekend	3.00	3.00	.00	-1.360	.174	.316	.065
	Self-evaluated PA	3.00	3.00	.00	-.107	.915	**.541**	**.001**
	PA for each day last week	3.14	3.00	-.29	**-2.276**	.023	**.619**	**.001**
	Total PA level	2.81	2.89	.01	.016	.987	**.352**	**.038**
	Cronbach's alpha	.51	.69					
	Intraclass Correlation Coefficient	.56 (95%CI 0.05 – 0.76)						
8-10-years-old (third and fourth grade)	PA in spare time	1.28	1.24	.00	.273	.785	**.828**	**.001**
	PA during physical education (PE) classes	5.00	5.00	.00	-.483	.629	.550	.001
	PA during 5-minute breaks between classes	2.00	2.50	.00	.473	.636	**.362**	**.014**
	PA during a 15-minute lunch break	3.00	3.00	.00	.700	.484	**.361**	**.014**
	PA right after school	3.00	2.00	.00	-.648	.517	**.377**	**.010**
	PA during evenings	3.00	3.00	.00	.739	.460	**.477**	**.001**
	PA during last weekend	2.00	3.00	.00	.948	.343	**.377**	**.010**
	Self-evaluated PA	2.00	2.50	.00	.562	.574	**.445**	**.002**
	PA for each day last week	2.71	2.50	.00	.312	.755	**.664**	**.001**
	Total PA level	2.66	2.72	-.05	.705	.481	**.527**	**.001**
	Cronbach's alpha	.77	.75					
	Intraclass Correlation Coefficient	.75 (95%CI 0.54 – 0.86)						

There was no statistically significant difference in median scores between the first and second measure in all PAQ-C items, as assessed by Wilcoxon signed-rank test, except for PA for each day last week in the 6- to 8-year-old group (second-first=-.29, z=-2.276, p=.023).

Spearman correlation between the first and second measure ranged from .156 (PA during a 15-minute lunch break) to .619 (PA for each day last week) and from .361 (PA during a 15-minute lunch break) to .828 (PA in spare time) for 6- to 8-year-old and 8- to 10-year-old groups, respectively. All correlations were statistically significant ($p<.05$) except for *PA during a 15-minute lunch break* (r=.156, p=.372) and *PA during last weekend* (r=.316, p=.065) for 6- to 8-year-old group.

Internal consistency for 6- to 8-year-old group, as assessed by Cronbach's alpha, was .51 and .69 for the first and second measure, respectively. For 8- to 10-year-old group, Cronbach's alpha for the first and second measure was .77 and .75, respectively. These values indicate a good internal consistency of the Croatian version of PAQ-C in both age groups, except for the first measure for 6- to 8-year-old group (Milas, 2005).

Average Intraclass Correlation Coefficient (ICC) between Total PA levels of the first and second measure was .56 (95% IC .05 – .76) and .75 (95%CI .54 – .86) for 6- to 8-year-old and 8- to 10-year-old groups, respectively.

Differences in Physical Activity Levels between Grades

Median scores revealed a low level of *PA in spare time* for all groups and were statistically significantly different between groups, $\chi^2(3)=16.322$, p=.001. Post hoc analysis revealed that fourth-grade pupils have statistically significantly higher median "PA in spare time" scores (1.32) than the first grade (1.16; $p<.05$), second grade (1.16; $p<.05$) and third grade students (1.14; $p<.05$). There were no statistically significant differences between any other group combinations. All grades had a high *PA during physical education (PE) classes* (first grade - 5.00; second grade - 5.00; third grade - 5.00; fourth grade - 5.00) with no significant differences between groups, $\chi^2(3)=.237$, p=.971. *PA during 5-minute breaks between classes* was moderate in the first (3.00) and second grade (3.00), and low in the third (2.00) and fourth grade, but the differences were not significant, $\chi^2(3)=.802$, p =.849. Non-significant differences were also determined for *PA during a 15-minute lunch break*, $\chi^2(3)=4.884$, p=.180, during which all grades were moderately active (first grade - 3.00; second grade - 3.00; third grade - 3.00; fourth grade - 3.00). *PA right after school* was not significantly different between grades ($\chi^{2(3)}=3.212$, p=.360), it was low for the first (2.00), second (2.50) and fourth grade (2.00), but moderate for the third grade (3.00). Moderate PA was reported *during evenings* for all grades (first grade - 3.00; second grade - 3.00; third grade - 3.00; fourth grade - 3.00), with no significant differences between groups ($\chi^{2(3)}=3.227$, p=.358), as well as *for PA during last weekend* ($\chi^2(3)=3.193$, p=.363), when the first (3.00), second (3.00) and third grade pupils (3.00) reported moderate, and the fourth grade students (2.00) low PA. *Self-evaluated PA* did not differ significantly between grades

($\chi^{2(3)}$=4.593, p=.204). The first (2.50), second (2.50) and third grade pupils (3.00) reported moderate PA, while the fourth graders (2.00) reported low PA. Pupils in all grades reported moderate *PA for each day last week* (first grade - 3.29; second grade - 2.93; third grade - 2.79; fourth grade - 2.79), with no significant differences between groups ($\chi^{2(3)}$=2.676, p=.444). *Total PA level* was moderate for all grades (first grade - 2.72; second grade - 2.69; third grade - 2.85; fourth grade - 2.62) and did not differ significantly between groups ($\chi^{2(3)}$=1.740, p=.628). Descriptive statistics of PAQ-C and the results of Kruskal-Wallis H test are presented in Table 3.

Table 3

Differences in PAQ-C items' scores between the first (7 yrs), second (8 yrs), third (9 yrs) and fourth (10 yrs) grade

	First Grade (n=20)	Second Grade (n=26)	Third Grade (n=26)	Fourth Grade (n=30)	$\chi^{2(3)}$	p
PA in spare time	1.16(43.68)	1.16(40.27)	1.14(48.29)	1.32(69.23) [c,d,e]	**16.322**	**.001**
PA during physical education (PE) classes	5.00(52.50)	5.00(50.87)	5.00(49.83)	5.00(52.83)	.237	.971
PA during 5-minute breaks between classes	3.00(53.88)	3.00(53.63)	2.00(51.79)	2.00(47.82)	.802	.849
PA during a 15-minute lunch break	3.00(57.55)	3.00(58.65)	3.00(44.69)	3.00(47.17)	4.884	.180
PA right after school	2.00(49.63)	2.50(48.42)	3.00(60.06)	2.00(48.00)	3.212	.360
PA during evenings	3.00(48.78)	3.00(46.08)	3.00(59.58)	3.00(51.02)	3.227	.358
PA during last weekend	3.00(55.30)	3.00(53.75)	3.00(55.06)	2.00(43.93)	3.193	.363
Self-evaluated PA	2.50(52.90)	2.50(54.00)	3.00(58.15)	2.00(42.63)	4.593	.204
PA for each day last week	3.29(58.00)	2.93(52.23)	2.79(53.56)	2.71(44.75)	2.676	.444
Total PA level	2.72(53.73)	2.69(51.63)	2.85(55.98)	2.62(46.02)	1.740	.628

Note: data presented are median (mean rank) scores

[a]First grade vs Second grade p<0.05; [b]Second grade vs Third grade p<0.05; [c]Third grade vs Fourth grade p<0.05; [d]First grade vs Fourth grade p<0.05; [e]Second grade vs Fourth grade p<0.05.

Discussion

To date, many questionnaires for assessing levels of physical activity in children were constructed. Helmerhorst et al. (2007) conducted a systematic review of the literature and reported validity and reliability of 34 newly constructed and 96 existing physical activity questionnaires. Results indicated that only few questionnaires exhibit good validity and reliability. Additionally, newly constructed questionnaires did not show better validity and reliability than the existing ones. One of the frequently used questionnaires for assessing levels of physical activity in children is The Quantification de l'Activite Physique en Altitude Chez les Enfants (QAPACE). Its good validity and reliability were confirmed by Barbosa et al. (2007) on a sample of 8- to 10-year-old pupils. They reported the intraclass correlation coefficient of .89. Validity and reliability of Fels PAQ for children (7-19 years) was evaluated by Treuth, Hou, Young, and Maynard (2005). A comparison of the questionnaire against an accelerometer indicated a good validity of Fels PAQ. Telford, Salmon, Jolley, and Crawford (2004)

examined metric characteristics of CLASS questionnaire. They had 5- to 6-year-old pupils complete the questionnaire at home with parental help, while 10- to 12-year-old pupils filled out the questionnaire in the classroom. Additionally, questionnaire results were compared with the results of an accelerometer. In both age groups CLASS questionnaire revealed poor validity and reliability.

PAQ-C is one of the most frequently used questionnaires for assessing the levels of physical activity in children (Crocker et al., 1997). It has been translated into many languages and its metric characteristics have been reported in many studies (Bervoets et al., 2015; Faghihimani et al., 2010; Moore, Hanes, Barbeau, Gutin, Trevino, & Yin, 2007). Bervoets et al. (2015) conducted a reliability and validity study using a Dutch version of PAQ-C on elementary school pupils (mean age 8.9 years). They reported excellent validity (.89), and inter-item reliability was acceptable (.77). Moore et al. (2007) reported good metric characteristics of PAQ-C for assessing physical activity levels of different ethnic groups of American children. Cronbach's alpha indicated good reliability (.75) for European American, but not for African American children (.56). They concluded that PAQ-C requires further development to reliably assess physical activity levels of American children from different ethnic groups. Vidaković Samaržija and Mišigoj-Duraković (2013) studied internal consistency and reliability of the Croatian version of PAQ-C, which showed evidence of satisfactory reliability (.80) in assessing the level of physical activity of 10-year-old pupils.

The present study aimed to determine internal consistency and retest reliability of the Croatian version of PAQ-C on a sample of 6- to 10-year-old pupils and to report physical activity levels of elementary school pupils. Parents were asked to assist in filling out the questionnaire for 6- to 8-year-old pupils. Retest reliability and internal consistency analysis was conducted. Statistically significant Spearman correlations between two measures ranging from .156 to .619 and from .361 to .828 for 6- to 8-year-old and 8- to 10-year-old pupils, respectively, indicate a better reliability of PAQ-C for assessing physical activity of 8- to 10-year-old than for 6- to 8-year old pupils.

Internal consistency for 6 to 8-year-old group, as assessed by Cronbach's alpha of .51 and .69 for the first and second measure, respectively, and for 8- to 10-year-old group for the first and second measure of .77 and .75, respectively, also contribute to the statement that PAQ-C is more reliable for assessing physical activity of 8- to 10-year-old than 6- to 8-year-old pupils. This is also supported by values of Average Intraclass Correlation Coefficient (ICC) of .56 (95% IC .05 – .76) and .75 (95%CI .54 – .86) for 6- to 8-year-old and 8- to 10-year-old group, respectively.

Conclusion

To the authors' knowledge, this is the first study of internal consistency and retest reliability of the Croatian version of PAQ-C on 6- to 10-year-old pupils. In general, PAQ-C is easy to use in school setting. It can be used to acquire information on physical activity levels of large groups of pupils in a relatively inexpensive, efficient

and not time-consuming way. In addition to advantages, every questionnaire has certain limitations. Possible limitations of PAQ-C are that it can be applied only during the school year (not during holidays), it does not differentiate between various physical activities, and does not estimate energy expenditure during physical activity (Faghihimani et al., 2010; Vidaković Samaržija & Mišigoj-Duraković, 2013). Results of the present study support the use of the Croatian version of PAQ-C to assess the physical activity levels of 8- to 10-year-old pupils. In contrast, the current evidence indicates that PAQ-C will not reliably assess parental-reported physical activity levels of children younger than 8 years.

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Interna konzistencija i retest pouzdanost hrvatske inačice PAQ-C upitnika

Sažetak

Cilj ovog istraživanja bio je utvrditi internu konzistenciju i retest pouzdanost hrvatske inačice PAQ-C upitnika na uzorku djece u dobi od 6 do 10 godina te izvijestiti o razini tjelesne aktivnosti učenika razredne nastave. Isti set pitanja primijenjen je na učenicima dva puta s vremenskim razmakom od tri tjedna. Oba mjerenja učenika u dobi od 8 do 10 godina održana su u školi uz prisustvo iskusnog istraživača. Suprotno tome, učenici u dobi od 6 do 8 godina ispunjavali su upitnik kod kuće, uz pomoć roditelja. Ukupno 81 učenik (85%) ispunio je upitnik u obje vremenske točke. Interna konzistencija procijenjena Cronbachovom alfom kod skupine u dobi od 6 do 8 godina iznosila je ,51 za prvo mjerenje, odnosno ,69 za drugo mjerenja. Kod skupine od 8 do 10 godina, za prvo mjerenje Cronbahova alfa iznosila je ,77, a za drugo mjerenje ,75. Prosječan Intraclass Correlation Coefficient (ICC) između rezultata ukupne tjelesne aktivnosti prvog i drugog mjerenja iznosio je 0,56 (95% IC ,05 – ,76) za skupinu u dobi od 6 do 8 godina, odnosno ,75 (95%CI 0,54 – 0,86) za skupinu u dobi od 8 do 10 godina. Rezultati ovog istraživanja podupiru korištenje hrvatske inačice PAQ-C upitnika za procjenu razine tjelesne aktivnosti učenika u dobi od 8 do 10 godina. Nasuprot tome, trenutni dokazi upućuju na to kako PAQ-C upitnik neće pouzdano procijeniti razinu tjelesne aktivnosti učenika mlađih od 8 godina.

Ključne riječi: *ponovljivost; razina tjelesne aktivnosti; učenici razredne nastave.*

Uvod

Tjelesna aktivnost ima važnu ulogu u regulaciji tjelesne mase kod djece te je čak i tijekom djetinjstva povezana s mnogim ponašanjima koje utječu na zdravlje (npr. zlouporaba droge, nezdrava prehrana i sl.; Goran, Reynolds Lindquist, 1999). Iako su dobrobiti redovite tjelesne aktivnosti dobro poznate (Biddle i sur., 2004), dokazi o smanjenju razine tjelesne aktivnosti među djecom prezentirani su u brojnim istraživanjima (Nader, Bradley, Houts, i McRitchie, 2008; Riddoch, 2004). Prema Svjetskoj zdravstvenoj organizaciji (WHO, 2012), djeca bi trebala sudjelovati u najmanje 60 minuta tjelesne aktivnosti umjerenog do visokog intenziteta dnevno.

Međutim, uslijed prevalencije pretilosti među djecom nove preporuke govore o tome kako bi djeca trebala sudjelovati u jedan do dva sata raznolikih tjelesnih aktivnosti dnevno (Gråstén, Liukkonen, Jaakkola, i Tammelin, 2014). Jedino značajno povećanje razine tjelesne aktivnosti djece može spriječiti epidemiju pretilosti i ostalih bolesti povezanih sa sedentarnim načinom života (Bervoets, 2014).

Tjelesna aktivnost ima jednu od ključnih ulogu u prevenciji i liječenju kroničnih bolesti te je stoga mogućnost procjene razine tjelesne aktivnosti od iznimne važnosti. Zbog njezine kompleksnosti tjelesnu je aktivnost teško objektivno mjeriti. Točna procjena tjelesne aktivnosti među djecom zahtjevan je zadatak zbog kognitivnih promjena tijekom rasta i razvoja, kao i zbog činjenice kako djeca nemaju konstantan uzorak svakodnevne tjelesne aktivnosti. Kada metode za objektivnu procjenu razine tjelesne aktivnosti nisu dostupne (akcelerometri, pedometri, kalorimetrija i sl.), upitnici su najbolji izbor zbog svoje praktičnosti i pristupačnosti. Međutim, njihova primjena mora biti promišljena (Helmerhorst, Brage, Warren, Besson, i Ekelund, 2007), a svaki upitnik za procjenu tjelesne aktivnosti mora ispunjavati osnovne kriterije kao što su praktičnost, primjenjivost, ponovljivost i točnost (Caspersen 1998; preuzeto od Platat Jarrar, 2012).

Jedan od obećavajućih upitnika koji zadovoljava kriterije je Physical Activity Questionnaire for Children (PAQ-C) koji je dizajniran za procjenu razine tjelesne aktivnosti djece u dobi od 8 do 14 godina. Pouzdanost i valjanost upitnika utvrđena je mnogim istraživanjima na ispitanicima starijima od 8 godina (Chinapaw, Mokkink, van Poppel, van Mechelen, i Terwee 2010; Crocker, Bailey, Fulkner, Kowalski, i McGrath, 1997; Currie et al., 2008; Kowalskii sur., 1997; Martinez-Gomez i sur., 2011). Hrvatska inačica PAQ-C upitnika također je pokazala dobru internu konzistenciju i retest pouzdanost, ali istraživanje je provedeno jedino na uzorku djece u dobi od 10 godina (Vidaković Samaržija i Mišigoj-Duraković, 2013). Prema spoznajama autora nijedno istraživanje nije ispitivalo internu konzistenciju i retest pouzdanost hrvatske inačice PAQ-C upitnika za procjenu razine tjelesne aktivnosti djece u dobi od 6 do 10 godina.

Razrednu nastavu u Republici Hrvatskoj pohađaju djeca u dobi od 6 do 10 godina čija je razina tjelesne aktivnosti u stalnom opadanju. Navedeno ukazuje na potrebu za pouzdanim i pristupačnim upitnikom za procjenu razine tjelesne aktivnosti djece tijekom razredne nastave. Stoga je cilj ovog istraživanja utvrditi internu konzistenciju i retest pouzdanost hrvatske inačice PAQ-C upitnika na uzorku djece u dobi od 6 do 10 godina te izvijestiti o razini tjelesne aktivnosti učenika razredne nastave.

Metode

Eksperimentalni nacrt

S ciljem utvrđivanja reproducibilnosti PAQ-C upitnika za redovitu primjenu kod djece u dobi od 6 do 10 godina, ovo se istraživanje sastoji od dva dijela: procjena (i) retest pouzdanosti i (ii) interne konzistencije. Isti set pitanja proveden je na učenicima

dva puta s vremenskim razmakom od tri tjedna. Retest pouzdanost je proveden usporedbom rezultata upitnika iste skupine ispitanika u dvije vremenske točke. Interna konzistencija utvrđena je na rezultatima inicijalnog i završnog mjerenja odvojeno. Oba mjerenja učenika u dobi od 8 do 10 godina održana su u školi uz prisustvo iskusnog istraživača. Suprotno tome, učenici u dobi od 6 do 8 godina ispunjavali su upitnik kod kuće, uz pomoć roditelja. S ciljem smanjenja varijabilnosti, isti je roditelj upućen na to da ispunjava upitnik u obje vremenske točke. Rezultati su analizirani odvojeno za svaku dobnu skupinu (od 6 do 8 i od 8 do 10 godina), kao što je opisano u daljnjem tekstu.

Ispitanici

Kao predstavnik populacije učenika razredne nastave odabran je prigodni uzorak (n=126) među učenicima osnovne škole Ivo Andrić iz Zagreba. Svi učenici u dobi od 6 do 10 godina (prvi do četvrti razred) pozvani su na sudjelovanje u ovom istraživanju. Ukupno 81 učenik (85%) ispunio je upitnik u obje vremenske točke i izjasnio se kako u proteklom tjednu nije bio bolestan ili spriječen u sudjelovanju u svojim normalnim tjelesnim aktivnostima (PAQ-C čestica 10).

Physical Activity Questionnaire for Children (PAQ-C)

Za procjenu razine tjelesne aktivnosti u ovom istraživanju koristio se PAQ-C upitnik (Crocker, 1997). PAQ-C je upitnik koji se temelji na prisjećanju tjelesne aktivnosti u proteklih tjedan dana. PAQ-C konstruiran je za procjenu ukupne razine tjelesne aktivnosti djece mlađe školske dobi od 8 do 14 godina. Sastoji se od 9 čestica vrednovanih na skali od 5 stupnjeva. Vrijednosti ukazuju na nisku razinu tjelesne aktivnosti, a veće vrijednosti opisuju višu razinu tjelesne aktivnosti. Rezultati upitnika pružaju objektivan uvid u razinu tjelesne aktivnosti kod djece. U ovom je istraživanju hrvatska inačica PAQ-C upitnika koji je opisan u radu Vidaković Samaržija i Mišigoj-Duraković (2013).

Statističke metode

Koeficijent asimetrije distribucije rezultata ukazao je kako dobiveni nisu normalno distribuirani te su se stoga za analizu podataka koristilie neparametrijske metode. Vizualnom inspekcijom grafikona za obje je grupe ispitanika (u dobi od 6 do 8 i 8 do 10 godina) utvrđena je podjenaka distribucija rezultata svih čestica. Wilcoxon signed-rank test primijenjen je za utvrđivanje razlika između rezultata prvog i drugog mjerenja. Spermanov koeficijent korelacije koristio se za utvrđivanje povezanosti između dva mjerenja. Razina interne konzistencije uvrđena je Cronbachovom alfom. Kruskal-Wallis H test primijenjen je za utvrđivanje razlika u rezulatima PAQ-C upitnika između četiri skupine učenika iz prvog (n=20), drugog (n=26), trećeg (n=26) i četvrtog (n=30) razreda. Dodatno, napravljena je usporedba parova koristeći Dunnovu proceduru (1964) uz Bonferroni korekciju za višestruke usporedbe. Prikazane su korigirane p-vrijednosti.

Rezultati

Rezultati interne konzistencije i retest pouzdanosti hrvatske inačice PAQ-C upitnika

Deskriptivni pokazatelji za obje skupine (u dobi od 6 do 8 i od 8 do 10 godina) prikazani su u Tablici 1. Prosječna dob mlađe skupine učenika (u dobi od 6 do 8 godina) bila je 7,31±0,63 godina. Prosječno su bili visoki 131,74±7,05 cm, a imali su tjelesnu masu od 29,44±6,44 kg. Tjelesna visina učenika bila je 133,93±7,22 cm te su imali tjelesnu masu od 30,41±5,71 kg, a učenice su bile nešto niže (130,1±6,63 cm) i lakše (28,71±6,99 kg). Navedene vrijednosti odgovaraju referentnim vrijednostima za hrvatske učenike te dobi i spola (Jureša, 2012). Prosječan indeks tjelesne mase učenika (16,85±2,16 kg/m^2) i učenica (16,76±2,43 kg/m^2) ukazuje na normalnu tjelesnu masu za djecu u dobi od 6 do 8 godina (Cole, 2000).

Učenici u dobi od 8 do 10 godina u prosjeku su imali 9,41±0,54 godina, bili su 142,3±6,58 cm visoki uz tjelesnu masu od 36,54±7,53 kg. Vrijednosti učenika i učenica odgovaraju referentnim vrijednostima za hrvatske učenike te dobi i spola (Jureša, 2012). Učenici su imali sličnu tjelesnu visinu (142,17±5,65 cm) i masu (36,29±5,96 kg) kao i učenice (tjelesna visina 142,43±7,52 cm, tjelesna masa 36,79±8,97 kg). Prosječne vrijednosti indeksa tjelesne mase učenika (17,92±2,54 kg/m^2) i učenica (17,95±3,04 kg/m^2) ukazuju na normalnu tjelesnu masu za djecu dobi od 8 do 10 godina (Cole, 2000).

Tablica 1

Rezultati interne konzistencije i retest pouzdanosti hrvatske inačice PAQ-C upitnika prikazani su u Tablici 2. Rezultati ukazuju na umjerenu razinu ukupne tjelesne aktivnosti kod učenika u dobi od 6 do 8 godina (prvo mjerenje 2,81; drugo mjerenje 2,89), kao i kod učenika u dobi od 8 do 10 godina (prvo mjerenje 2,66; drugo mjerenje 2,72). Najniža razina tjelesne aktivnosti utvrđena je tijekom tjelesne aktivnosti u slobodno vrijeme kod učenika u dobi od 6 do 8 godina (prvo mjerenje 1,16; drugo mjerenje 1,12) kao i kod učenika u dobi od 6 do 8 godina (prvo mjerenje 1,28; drugo mjerenje 1,24). Najviša razina tjelesne aktivnosti kod učenika u dobi od 6 do 8 godina (prvo mjerenje 5,00; drugo mjerenje 5,00), kao i kod učenika u dobi od 8 do 10 godina (prvo mjerenje 5,00; drugo mjerenje 5,00) utvrđena je tijekom nastave tjelesne i zdravstvene kulture.

Wilcoxon signed-rank testom nije utvrđena statistički značajna razlika između medijalnih vrijednosti prvog i drugog mjerenja ni u jednoj čestici PAQ-C upitnika uz iznimku čestice „Ukupna tjedna aktivnost" za skupinu učenika u dobi od 6 do 8 godina (razlika 2,-1, mjerenja =-,29, z=-2,276, p=,023).

Spermanova korelacija između prvog i drugog mjerenja kretala se u rasponu od ,156 (TA tijekom velikog odmora) do ,619 (Ukupna tjedna TA) za skupinu učenika u dobi od 6 do 8 godina, odnosno od ,361 (TA tijekom velikog odmora) do ,828 (TA u slobodno vrijeme) za učenike u dobi od 8 do 10 godina. Sve utvrđene korelacije bile

su statistički značajne (p <,05) osim za čestice „TA tijekom velikog odmora" (r=,156, p=,372) i „Ukupna tjedna TA" (r=,316, p=,065) u skupini u dobi od 6 do 8 godina.

Interna konzistencija Cronbachovom alfom kod skupine u dobi od 6 do 8 godina iznosila je ,51 za prvo mjerenje, odnosno ,69 za drugo mjerenja. Kod skupine od 8 do 10 godina za prvo mjerenje Cronbahova alfa iznosila je ,77, a za drugo mjerenje ,75. Navedene vrijednosti upućuju na dobru internu konzistenciju hrvatske inačice PAQ-C upitnika kod obje skupine učenika, osim za prvo mjerenje u skupini u dobi od 6 do 8 godina (Milas, 2005).

Prosječan Intraclass Correlation Coefficient (ICC) između rezultata ukupne tjelesne aktivnosti (Ukupna TA) prvog i drugog mjerenja iznosio je ,56 (95% IC ,05 – ,76) za skupinu u dobi od 6 do 8 godina, odnosno ,75 (95%CI ,54 – ,86) za skupinu u dobi od 8 do 10 godina.

Tablica 2

Razlika u razini tjelesne aktivnosti između razreda

Vrijednosti ukazuju na nisku razinu *TA u slobodno vrijeme* u svim dobnim skupinama te se statistički značajno razlikuju, $\chi^{2(3)}$=16,322, p=,001. Post hoc analiza je otkrila da učenici četvrtog razreda imaju više medijalne vrijednosti razine tjelesne aktivnosti u slobodno vrijeme (1,32) od učenika prvog (1,16; p<,05), drugog (1,16; p<,05) i trećeg razreda (1,14; p<,05). Između ostalih razreda nisu uočene statistički značajne razlike. Svi razredi imali su visoku razinu *TA tijekom nastave tjelesne i zdravstvene kulture (TZK)* (prvi razred – 5,00; drugi razred – 5,00; treći razred – 5,00; četvrti razred – 5,00) bez statistički značajnih razlika između razreda; $\chi^{2(3)}$=,237, p=,971. Razina *TA tijekom malog odmora* bila je umjerena u prvom (3,00) i drugom (3,00), a niska u trećem (2,00) i četvrtom (2,00) razredu, no bez statistički značajne razlike, $\chi^{2(3)}$=,802, p=,849. Statistička razlika utvrđena je i za *TA tijekom velikog odmora*, $\chi^{2(3)}$=4,884, p=,180, tijekom kojeg su učenici svih razreda imali umjerenu razinu tjelesne aktivnosti (prvi razred – 3,00; drugi razred – 3,00; treći razred – 3,00; četvrti razred – 3,00). *TA nakon škole* nije se statistički značajno razlikovala između razreda, $\chi^{2(3)}$=3,212, p=,360, bila je niska u prvom (2,00), drugom (2,50) i četvrtom (2,00), a umjerena u trećem razredu (3,00). Umjerena razina *TA tijekom večeri* utvrđena je za sve razrede (prvi razred – 3,00; drugi razred – 3,00; treći razred – 3,00; četvrti razred – 3,00) bez statistički značajne razlike između razreda, $\chi^{2(3)}$=3,227, p=,358, kao i za *TA tijekom vikenda* ($\chi^{2(3)}$=3,193, p=,363), koju su učenici prvog (3,00), drugog (3,00) i trećeg razreda (3,00) okarakterizirali kao tjelesnu aktivnost umjerene, a učenici četvrtog razreda (2,00) niske razine. *TA* nije se statistički značajno razlikovala između razreda, $\chi^{2(3)}$=4,593, p=,204. Za prvi (2,50), drugi (2,50) i treći (3,00) razred utvrđena je umjerena razina, a za četvrti razred (2,00) niska razina tjelesne aktivnosti. Za sve razrede utvrđena je umjerena razina *Ukupne tjedne TA* (prvi razred – 3,29; drugi razred – 2,93; treći razred – 2,79; četvrti razred – 2,79) bez statistički značajnih razlika između razreda, $\chi^{2(3)}$=2,676, p=,444. *Ukupna TA* bila je umjerene razine za sve razrede (prvi razred –

2,72; drugi razred – 2,69; treći razred – 2,85; četvrti razred – 2,62) i nije se statistički značajno razlikovala između razreda, $\chi^{2(3)}$=1,740, p=,628. Deskriptivni pokazatelji PAQ-C upitnika i rezultati Kruskal-Wallis H testa prikazani su u Tablici 3.

Tablica 3

Rasprava

Do danas je konstruiran velik broj upitnika za procjenu razine tjelesne aktivnosti djece. Helmerhorst i sur. (2007) napravili su sustavan pregled literature i izvijestili o valjanosti i pouzdanosti 34 i 96 postojećih upitnika za procjenu tjelesne aktivnosti te su pokazali kako samo nekoliko upitnika pokazuje dobru valjanost i pouzdanost. Nadalje, novi upitnici nisu imali bolju valjanost i pouzdanost od postojećih. Jedan od češće primjenjivanih upitnika za procjenu razine tjelesne aktivnosti djece je Quantification de l'Activite Physique en Altitude Chez les Enfants (QAPACE). Njegovu dobru valjanost i pouzdanost potvrdili su Barbosa i sur. (2007) na uzorku učenika u dobi od 8 do 10 godina. Izvijestili su o Intraclass Correlation Coefficient-u (ICC) od ,89. Istraživali su valjanost i pouzdanost Fels PAQ upitnika za djecu (7 – 19 godina) (2005). Usporedba upitnika s akcelerometrom pokazala je dobru valjanost Fels PAQ upitnika. Metrijske karakteristike provjerili su metrijske karakteristike CLASS upitnika (2004). Učenici u dobi od 5 do 6 godina ispunili su upitnik kod kuće uz pomoć roditelja, učenici u dobi od 10 do 12 godina samostalno su ispunili upitnik u učionici. Dodatno, rezulati upitnika uspoređeni su s rezultatima akcelerometra. Kod obje skupine učenika CLASS upitnik nije pokazao zadovoljavajuću valjanost i pouzdanost.

PAQ-C upitnik je jedan od najčešće primjenjivanih upitnika za procjenu razine tjelesne aktivnosti djece (Crocker i sur., 1997). Preveden je na mnoge jezike, a njegove metrijske karakteristike istražene su velikim brojem istraživanja (Bervoets i sur., 2015; Faghihimani i sur., 2010; 2007). Bervoets i sur. (2015) istražili su pouzdanost i valjanost nizozemske inačice PAQ-C upitnika za procjenu razine tjelesne aktivnosti djece razredne nastave (prosječne dobi 8,9 godina). Izvijestili su o odličnoj pouzdanosti (,89) i zadovoljavajućoj pouzdanosti između čestica upitnika (,77). Moore i sur. (2007) objavili su metrijske karakteristike PAQ-C upitnika za procjenu razine tjelesne aktivnosti kod američkih učenika različitih etničkih skupina. Cronbachova alfa ukazala je na dobru pouzdanost (,75) kod euro-američke, ali nezadovoljavajuću kod afro-američke djece (,56). Zaključili su kako je potreban daljnji razvoj upitnika za pouzdano utvrđivanje razine tjelesne aktivnosti kod različitih etničkih skupina američke djece. Vidaković Samaržija i Mišigoj-Duraković (2013) istražili su internu konzistenciju i pouzdanost hrvatske inačice PAQ-C upitnika. Hrvatska inačica PAQ-C upitnika pokazala je zadovoljavajuću pouzdanost (,80) u procjeni razine tjelesne aktivnosti učenika u dobi od 10 godina.

Cilj ovog istraživanja bio je utvrditi internu konzistenciju i retest pouzdanosti hrvatske inačice PAQ-C upitnika na uzorku učenika razredne nastave u dobi od 6 do 10 godina te izvijestili o njihovoj razini tjelesne aktivnosti. Roditelji su zamoljeni

da ispune upitnik za djecu u dobi od 6 do 8 godina. Napravljena je analiza retest pouzdanosti i interne konzistencije. Statistički značajne vrijednosti Spermanove korelacije između dva mjerenje koje su se kretale od ,156 do ,619 za učenike u dobi od 6 do 8 godina i od ,361 do ,828 za učenike u dobi od 8 do 10 godina ukazuju na bolju pouzdanost upitnika za procjenu tjelesne aktivnosti kod učenika u dobi od 8 do 10 nego kod učenika u dobi od 6 do 8 godina.

Interna konzistencija upitnika kod učenika u dobi od 6 do 8 godina, procijenjena Cronbachovom alfom od ,51 za prvo, odnosno ,69 za drugo mjerenje i kod učenika u dobi od 8 do 10 godina od ,77 za prvo, odnosno ,75 za drugo mjerenje potvrđuje navod kako je upitnik pouzdaniji za procjenu razine tjelesne aktivnosti kod učenika u dobi od 8 do 10 nego kod učenika u dobi od 6 do 8 godina. Navedeno potvrđuju i prosječne vrijednosti Intraclass Correlation Coefficient-a (ICC) od ,56 (95% IC ,05 – ,76) za skupinu u dobi od 6 do 8 godina, odnosno ,75 (95%CI ,54 – ,86) za skupinu u dobi od 8 do 10 godina.

Zaključak

Prema spoznajama autora ovo je prvo istraživanje interne konzistencije i retest pouzdanosti hrvatske inačice PAQ-C upitnika na uzorku učenika u dobi od 6 do 10 godina. PAQ-C upitnik jednostavan je za primjenu u školskom okruženju. Može prikupiti informacije o razini tjelesne aktivnosti velikog broja učenika na relativno jeftin i učinkovit način u kratkom vremenu. Uz navede prednosti svaki upitnik ima i određena ograničenja. Moguća ograničenja PAQ-C upitnika su njegova mogućnost primjene jedino tijekom školske godine, nemogućnost razlikovanja između vrsta tjelesnih aktivnosti i nemogućnost procjene potrošnje energije tijekom tjelesne aktivnosti (Vidaković Samaržija i Mišigoj-Duraković, 2013; Faghihimani i sur., 2010). Rezultati ovog istraživanja podupiru korištenje hrvatske inačice PAQ-C upitnika za procjenu razine tjelesne aktivnosti učenika u dobi od 8 do 10 godina. Nasuprot tome, trenutni dokazi upućuju kako PAQ-C neće pouzdano procijeniti razinu tjelesne aktivnosti učenika mlađih od 8 godina.