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Physical activity, screen-based activities and their potential determinants

Kopčáková, Jaroslava

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Document Version

Publisher's PDF, also known as Version of record

Publication date:
2018

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Kopčáková, J. (2018). *Physical activity, screen-based activities and their potential determinants: Active living during adolescence*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.

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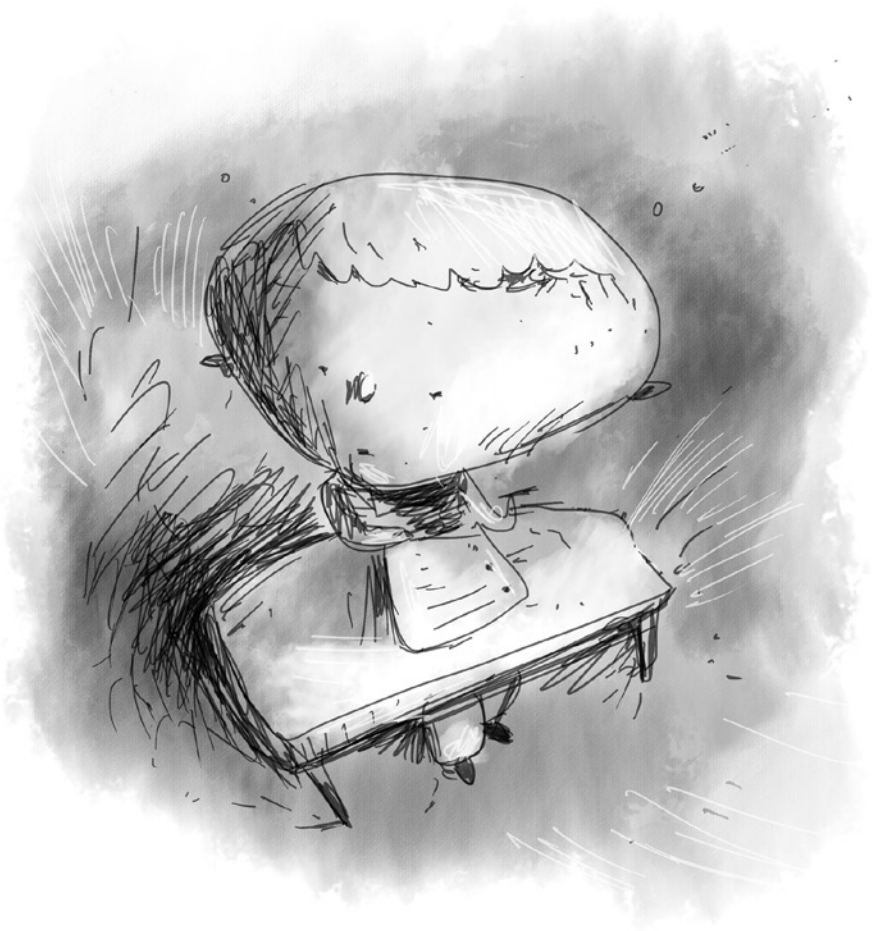
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Test-retest reliability of a questionnaire on motives for physical activity among adolescents



Test-retest reliability of a questionnaire on motives for physical activity among adolescents

Jaroslava Kopcakova, Zuzana Dankulincova Veselska, Michal Kalman, Daniela Bobakova, Dagmar Sigmundova, Andrea Madarasova Geckova, Daniel Klein, Jitse P. van Dijk, Sijmen A. Reijneveld

Submitted

Abstract

Background: The aim of this study was to investigate the test-retest reliability of the motives for PA items from the HBSC questionnaire among Czech and Slovak adolescents, and differences by gender, age group and country. *Methods:* We obtained data from 580 students aged 11 and 15 years old (51.2% boys) who participated in a test and retest study with a four-weeks interval in 2013 via the Health Behaviour in School-aged Children pilot study in the Czech Republic and Slovakia. We estimated the test-retest reliability of all 13 dichotomised motives by using Intraclass Correlation Coefficients (ICC) and Cohen's Kappa statistics, for continuous and dichotomised motives, respectively. *Results:* Test-retest reliability showed moderate agreement for nine motives (ICC from 0.41 to 0.60) and fair agreement for four motives (ICC from 0.33 to 0.40). Kappa statistics were similarly moderate to large (0.33 to 0.61), except for three motives with small or trivial correlations. The motives "To improve my health" and "To enjoy the feeling of using my body" had consistently low kappas and correlations. *Conclusion:* Overall, the results of this study suggest that most questions on motives for PA on the HBSC questionnaire have acceptable test-retest characteristics for use among adolescents.

Keywords: physical activity; motives for physical activity; test-retest reliability; adolescents; gender

Introduction

Low levels of physical activity (PA) during adolescence contribute to obesity and poor health outcomes in adolescence, and these associations endure into adulthood (Iannotti et al., 2009; Currie et al., 2012; Telama, 2009; Hallal et al., 2006; Bauman et al., 2012). As suggested by several studies, one of the potential pathways leading to an increase in levels of PA is through their associations with particular motives for PA (e.g. Nigg, 2003; Kopcakova et al., 2015; Iannotti et al., 2013; Wold et al., 2015). A better understanding of motives for being physically active or inactive could significantly contribute to evidence-based development of national strategies for public health and active living (Kopcakova et al., 2015; Kalman et al., 2015b; Jodkowska et al., 2015) and may increase the effects of interventions.

Motives for PA tend to differ by gender and age. Boys used to report higher rates of achievement motivation than girls, but lower rates of social and health motives than girls (Kopcakova et al., 2015); social and health motives used to be more prevalent in older adolescents than in younger, while achievement motives used to be more prevalent in older adolescent boys and in younger adolescent girls (Kalman et al., 2015b).

Some instruments exist for measuring motives to undertake PA and are widely used, but we know little about their stability over time, which is necessary for the valid assessment of behavioural patterns. To the best of our knowledge only Ojala et al. (2005) has investigated the test-retest reliability and validity of motives for PA items, having done so among Scandinavian students. In this study an instrument similar that of the HBSC study was used, and the test-retest stability was found to be acceptable for most of the motives for PA. However, it might not be possible to generalise findings from Northern or Western Europe to Eastern Europe without caution and verification (Iannotti et al., 2013). Moreover, gender and age differences exist in the prevalence of particular motives for undertaking PA (Kopcakova et al., 2015; Iannottii et al., 2013; Wold et al., 2015; Kalman et al., 2015b).

Therefore, the aim of this study is to investigate the test-retest reliability of the motives for undertaking PA among Slovak and Czech adolescents and to determine whether this reliability differs by gender and age group (11- and 15-year-olds). Based on our knowledge, no previous study has been devoted to the test-retest reliability of adolescent motives for PA since questions on this subject were first used in the 1985/86 Health Behaviour in School-aged Children (HBSC) survey.

Methods

Sample and procedure

This test-retest study is based on the international HBSC cross-sectional study and is consistent with its methodology. HBSC is carried out in collaboration with the World Health Organization every four years and focuses on the health and health-related behaviour of 11-, 13- and 15-year-old school children in their social context. More detailed information about the HBSC methodology can be found in Roberts et al. (2009). Randomly chosen primary schools in the Olomouc and Pardubice region, Czech Republic (7 schools), and the Kosice region, Slovakia (5 schools), were approached in November and December 2013. Questionnaires were administered in the 5th and 9th grades by trained research assistants in the absence of a teacher during regular class time. In the first part of the data collection (Test) we obtained data from 419 adolescents in the Czech Republic (response rate: 83.20%) and 259 adolescents in Slovakia (response rate: 74.14%). Non-response was primarily due to illness and parental disapproval of the participation of their children.

The second part of the data collection (Retest) was conducted 4 weeks after the first part. We obtained data from 353 adolescents in Czech Republic (66 dropped out, 15.7%) and 227 adolescents in Slovakia (32 dropped out, 12.3%) who also participated in the first part of the data collection (Test). The final sample consisted of 353 Czech (51.9% boys) and 227 Slovak (52.9% boys) primary school pupils, grades five and nine.

The study was approved by the Ethics Committee of the Faculty of Physical Culture, Palacky University in Olomouc (decision from May 15th 2013) and by the Ethics Committee of the Medical Faculty at P J Safarik University in Kosice (decision from June 18th 2012). The schools selected in the Czech Republic have a general permission granted at the beginning of the school year by all parents. Parents in Slovakia were informed about the study via the school administration and could opt out if they disagreed with it. Participation in the study was fully voluntary and anonymous, with no explicit incentives provided for participation in either country.

Measures

Demographic data (age, gender) were collected using the single questions used and validated in the Health Behaviour in School-aged Children (HBSC) surveys (Currie et al., 2008; Currie et al., 2012).

The *motives for PA* were assessed using 13 items from the HBSC study examining why young people undertake leisure time PA (Wold & Kannas, 1993). The question reads as follows: "Here is a list of reasons that some young people give for taking part in PA in their free time. For each motive please tick how important it is for you, with as answers (1) very important; (2) fairly important; (3) not important". Respondents reply for

13 motives for PA (Figure 1, Table 2). Further, we dichotomised all of the items by combining (1) very important and (2) fairly important vs. (3) not important (see Table 3). The question was first used as part of an optional PA package in the 1985/86 HBSC survey (Wold & Kannas, 1993). From the 2005/06 HBSC onward, a survey on two additional sub-items was also used, specifically the items: “to control my weight” and “it is exciting”.

Statistical analyses

In the first step we computed frequencies of the background characteristics. Next, we assessed the proportion of respondents who answered a question identically or shifted their response by one or two categories in the test and retest. Third, we used Intraclass Correlation Coefficients (ICC) to estimate the test-retest reliability of all selected items for the whole sample and stratified by gender, age group and country. In the final step, we computed Cohen’s Kappa coefficients with dichotomised variables for the whole sample and stratified by gender, age group and country.

According to Landis and Koch’s subjective guidelines (Landis, Koch, 1977), the strength of test-retest agreement for an ICC greater than 0.81 is considered to be almost perfect agreement; 0.61 to 0.80 is considered to be substantial agreement; 0.41 to 0.60 is considered to be moderate agreement; 0.21 to 0.40 is considered to be fair agreement; and an ICC below 0.20 is considered to be poor. Regarding Cohen’s Kappa statistics correlation coefficients greater than 0.5 are considered to be large, 0.3–0.5 moderate, 0.1–0.3 small and less than 0.1 are considered to be trivial (Cohen, 1988). All data were analysed using IBM SPSS 20 for Windows (IBM Corp. Released 2011).

Results

The background characteristics (prevalence rates) of the sample in the test and retest can be seen in Table 1.

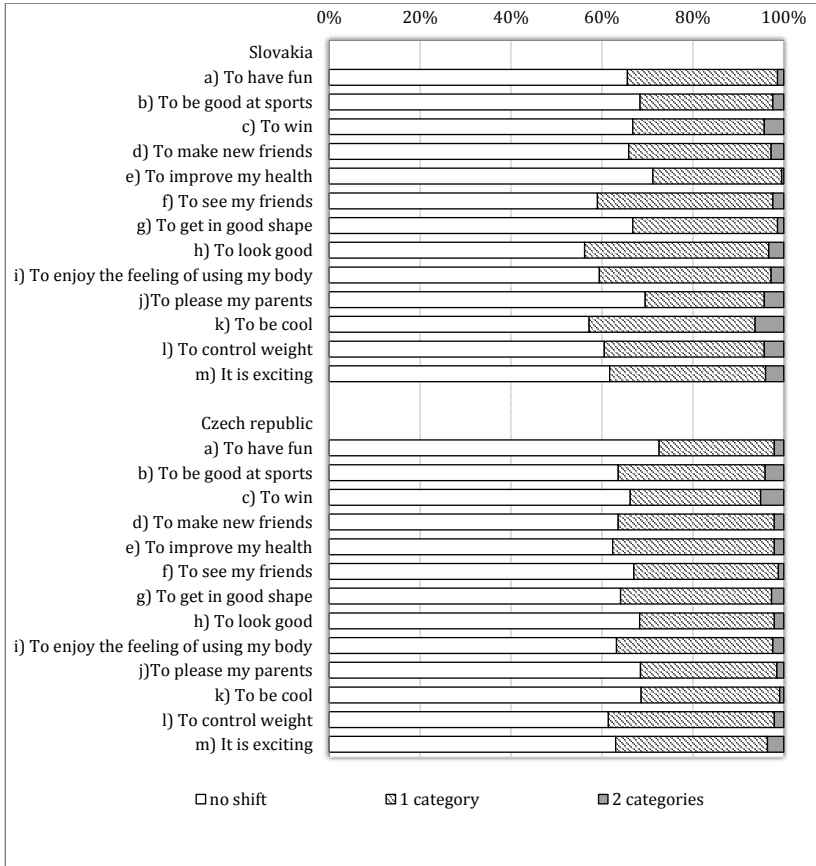
The proportion of respondents who answered a question identically varied from 62% to 73% in the Czech Republic and from 56% to 71% in Slovakia (Figure 1).

Table 2 shows the ICCs for the HBSC items regarding motives for PA by gender, age group and country. Across subgroups and motives, the ICC varied from 0.29 to 0.65, which indicates fair to moderate agreement. Test-retest reliability showed moderate agreement for nine motives (ICC from 0.41 to 0.60) and fair agreement for four motives (ICCs from 0.33 to 0.40 for “to have fun”, “to improve my health”, “to see my friends” and “to enjoy the feeling of using my body”) in the whole sample. Motives for PA tended to have greater agreement in girls than in boys. Likewise, most motives for PA tended to have greater agreement in the 15-year-old adolescents than in the 11-year-old adolescents. Agreement tended to be

better for adolescents in Slovakia than for those in the Czech Republic for most of the items.

We dichotomised all motives according to WHO recommendations and we created binary variables for further analyses. Table 3 shows Cohen's Kappa for the HBSC items regarding motives for PA by gender, age group and country. We observed strong or moderate correlations between test and retest for 10 out of 13 motives in the whole sample. Moreover, we also observed strong or moderate correlations between test and retest for most of the motives per stratum of gender, age group and country. Weak correlations were observed regarding two motives ("to make new friends" and "to enjoy the feeling of using my body") and a trivial correlation in the motive "to improve my health" in the whole sample and also per gender, age group and country. Using binary format resulted in similar findings like using continuous format of motive variable. The only exception was the motive "To improve my health" which showed different results and trivial agreement after dichotomisation. The test-retest reliability of motives for PA tended to be better in boys than in girls. Six of the motives for PA had a somewhat better reliability in 15-year-old adolescents than in 11-year-old adolescents (a, b, c, g, i, l). Likewise reliability tended to be better in Slovakia than in the Czech Republic for most motives for PA.

Figure 1 Percentage of test-retest response shifts in motives for physical activity items counted separately for Slovakia and Czech Republic.



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Table 1 Demographic characteristics of the sample (Slovakia and Czech Republic, 2013).

	Test							
	Boys		Girls		11-year-olds		15-year-olds	
	n	%	n	%	n	%	n	%
Slovakia	134	38.2	125	38.3	132	37.5	127	39.0
Czech Republic	217	61.8	201	61.7	220	62.5	199	61.0
TOTAL	351	100.0	326	100.0	352	100.0	326	100.0

	reTest							
	Boys		Girls		11-year-olds		15-year-olds	
	n	%	n	%	n	%	n	%
Slovakia	120	40.4	107	37.8	114	36.9	113	41.7
Czech Republic	177	59.6	176	62.2	195	63.1	158	58.3
TOTAL	297	100.0	283	100.0	309	100.0	271	100.0

Table 2 ICC for HBSC items regarding motives for physical activity by gender, age group and country (Slovakia and Czech Republic, 2013).

	Country															
	All (n = 580)				Gender				Age				Country			
	ICC	95% CI	ICC	95% CI	Boys (n = 297)	Girls (n = 283)	11 years (n = 309)	15 years (n = 271)	Slovakia (n = 227)	Czech (n = 353)	95% CI	ICC	95% CI	ICC	95% CI	
Motives for PA																
a) To have fun	0.38 ^{oo}	0.31-0.45	0.36 ^{oo}	0.26-0.46	0.41 ^{oo}	0.30-0.50	0.32 ^{oo}	0.22-0.42	0.46 ^{oo}	0.35-0.55	0.36 ^{oo}	0.24-0.48	0.40 ^{oo}	0.31-0.49		
b) To be good at sports	0.56 ^{oo}	0.50-0.61	0.55 ^{oo}	0.46-0.62	0.54 ^{oo}	0.45-0.62	0.46 ^{oo}	0.36-0.54	0.65 ^{oo}	0.58-0.72	0.64 ^{oo}	0.55-0.71	0.50 ^{oo}	0.42-0.58		
c) To win	0.59 ^{oo}	0.54-0.65	0.65 ^{oo}	0.57-0.71	0.48 ^{oo}	0.38-0.57	0.58 ^{oo}	0.49-0.65	0.61 ^{oo}	0.53-0.68	0.64 ^{oo}	0.55-0.71	0.56 ^{oo}	0.48-0.63		
d) To make new friends	0.44 ^{oo}	0.37-0.50	0.42 ^{oo}	0.32-0.52	0.45 ^{oo}	0.35-0.54	0.38 ^{oo}	0.27-0.47	0.46 ^{oo}	0.36-0.55	0.49 ^{oo}	0.38-0.58	0.40 ^{oo}	0.30-0.48		
e) To improve my health	0.33 ^{oo}	0.25-0.40	0.29 ^{oo}	0.18-0.39	0.36 ^{oo}	0.25-0.46	0.28 ^{oo}	0.17-0.38	0.38 ^{oo}	0.28-0.48	0.40 ^{oo}	0.28-0.50	0.28 ^{oo}	0.18-0.38		
f) To see my friends	0.40 ^{oo}	0.33-0.47	0.38 ^{oo}	0.27-0.48	0.43 ^{oo}	0.33-0.52	0.44 ^{oo}	0.34-0.53	0.36 ^{oo}	0.25-0.46	0.30 ^{oo}	0.17-0.42	0.47 ^{oo}	0.38-0.55		
g) To get in good shape	0.50 ^{oo}	0.44-0.56	0.45 ^{oo}	0.35-0.54	0.56 ^{oo}	0.47-0.63	0.45 ^{oo}	0.36-0.54	0.56 ^{oo}	0.47-0.64	0.54 ^{oo}	0.43-0.63	0.48 ^{oo}	0.39-0.56		
h) To look good	0.58 ^{oo}	0.52-0.64	0.60 ^{oo}	0.52-0.67	0.57 ^{oo}	0.48-0.64	0.60 ^{oo}	0.52-0.67	0.54 ^{oo}	0.45-0.62	0.51 ^{oo}	0.40-0.61	0.63 ^{oo}	0.56-0.69		
i) To enjoy the feeling of using my body	0.39 ^{oo}	0.32-0.46	0.35 ^{oo}	0.25-0.45	0.41 ^{oo}	0.31-0.51	0.35 ^{oo}	0.24-0.45	0.42 ^{oo}	0.31-0.51	0.30 ^{oo}	0.17-0.42	0.44 ^{oo}	0.35-0.52		
j) To please my parents	0.56 ^{oo}	0.50-0.62	0.50 ^{oo}	0.40-0.58	0.62 ^{oo}	0.54-0.69	0.45 ^{oo}	0.36-0.54	0.51 ^{oo}	0.41-0.59	0.57 ^{oo}	0.47-0.66	0.55 ^{oo}	0.48-0.62		
k) To be cool	0.60 ^{oo}	0.54-0.65	0.59 ^{oo}	0.51-0.66	0.61 ^{oo}	0.52-0.68	0.58 ^{oo}	0.50-0.66	0.61 ^{oo}	0.53-0.68	0.54 ^{oo}	0.44-0.63	0.36 ^{oo}	0.27-0.45		
l) To control weight	0.46 ^{oo}	0.39-0.52	0.43 ^{oo}	0.32-0.52	0.49 ^{oo}	0.39-0.57	0.41 ^{oo}	0.30-0.50	0.50 ^{oo}	0.40-0.59	0.44 ^{oo}	0.32-0.54	0.47 ^{oo}	0.38-0.55		
m) It is exciting	0.54 ^{oo}	0.48-0.60	0.58 ^{oo}	0.49-0.65	0.49 ^{oo}	0.39-0.57	0.54 ^{oo}	0.45-0.62	0.54 ^{oo}	0.45-0.62	0.55 ^{oo}	0.45-0.64	0.52 ^{oo}	0.44-0.60		

^{oo}ICC value > 0.81- perfect agreement; ^{ooo}0.61-0.80 - substantial agreement; ^{oo} 0.41-0.60 - moderate agreement; ^{oo}0.21-0.40 - fair agreement;

^oICC value < 0.20 poor agreement (Landis, Koch, 1977).

Table 3 Cohen's Kappa coefficients with dichotomised variables for HBSC items regarding motives for physical activity by gender, age group and country (Slovakia and Czech Republic, 2013).

Items	Gender				Age		Country	
	All (n = 580)	Boys (n =297)	Girls (n =283)	11 years (n =309)	15 years (n = 227)	Slovakia(n = 271)	Czech (n =353)	
	Cohen's Kappa	Cohen's Kappa	Cohen's Kappa	Cohen's Kappa	Cohen's Kappa	Cohen's Kappa	Cohen's Kappa	
Motives for PA								
a) To have fun	0.36**	0.29**	0.41**	0.21**	0.59**	0.45**	0.27**	
b) To be good at sports	0.50**	0.50**	0.48**	0.41**	0.57**	0.66**	0.39**	
c) To win	0.56**	0.67**	0.44**	0.54**	0.58**	0.61**	0.53**	
d) To make new friends	0.28**	0.30**	0.27**	0.34**	0.24**	0.37**	0.18**	
e) To improve my health	-0.03	-0.02	-0.03	-0.03	-0.02	-0.02	-0.03	
f) To see my friends	0.36**	0.41**	0.32**	0.40**	0.29**	0.28**	0.41**	
g) To get in good shape	0.33**	0.29**	0.37**	0.17**	0.57**	0.32	0.34**	
h) To look good	0.54**	0.59**	0.48**	0.55**	0.46**	0.46**	0.60**	
i) To enjoy the feeling of using my body	0.25**	0.20**	0.29**	0.23**	0.28**	0.14*	0.30**	
j) To please my parents	0.48**	0.41**	0.54**	0.56**	0.43**	0.53**	0.43**	
k) To be cool	0.61**	0.60**	0.61**	0.65**	0.57**	0.47**	0.39**	
l) To control weight	0.42**	0.46**	0.37**	0.38**	0.45**	0.33**	0.48**	
m) It is exciting	0.51**	0.61**	0.42**	0.53**	0.47**	0.58**	0.44**	

* p < 0.05; **p<0.01

Discussion

The aim of the study was to examine the test-retest reliability of the motives for PA items of the HBSC questionnaire in Czech and Slovak adolescents by age and by gender. The motives for PA items showed moderate agreement for most motives in the whole sample and also stratified by gender, age group and country. After dichotomisation we observed a moderate correlation between the test and retest in almost all examined items, exceptions being small correlations for the motives “to make new friends” and “to enjoy the feeling of using my body” and a trivial correlation for the motive “to improve my health”.

The test-retest reliability was moderate for nine motives and fair for four motives in the whole sample, and was somewhat better in girls than in boys, and in 15-year-old adolescents than in 11-year-old adolescents. According to our knowledge, no previous study assessed the test-retest reliability of adolescents’ motives for PA as used in HBSC study. We therefore can only compare our findings with those on adjacent concepts. Ojala et al. (2005) reported in a study on motives for exercise that test-retest reliability was acceptable for adolescents, using a similar instrument as in the HBSC study. Wold et al. (2015) assessed changes in motives for PA among adolescents from 1986 to 2006. They found that adolescents in 2006 tended to report higher importance of motives for PA than adolescent of the same age 20 years earlier in Finland, Norway and Wales. Among similar measured constructs such as e.g. motives for food choice (Markovina et al., 2015), and motives of smoking (Fiala et al., 2010; Boudrez & De Bacquer, 2012), test-retest reliability was found to be acceptable.

With further similar patterns as for the ICC we observed strong or moderate correlations between test and retest for ten out of thirteen dichotomised motives, both in the whole sample, and per stratum of gender, age group and country.

Strengths and limitations

This study has a number of important strengths, including a large sample size, comprising adolescents from two countries, collected according to a standardized protocol. Furthermore, the period between test and retest administration (4 weeks) was sufficiently long to avoid the retention of previously chosen answers and sufficiently short to avoid changes in lifestyle patterns.

Some limitations should be taken into account concerning the present study. First, in this study reliability was only analysed using ICC and Cohen’s Kappa. Assessing the reliability of motives for PA items is arguable and depends on different strictness of criteria suggested by different authors. Another potential limitation is that this study focused

on the reliability of the selected items but did not investigate their validity; this would be an issue for future research.

Conclusion

Motives for PA showed mostly moderate agreement and a similarly mostly strong or moderate correlation after dichotomisation in both genders in 11- and 15-year-old adolescents. We conclude that the HBSC questionnaire on motives for PA is an acceptable instrument to measure motives for PA among adolescents. Continuous-level variables could be used as best responses on this questionnaire; these responses are more stable over time than dichotomised responses. The study offers unique and interesting insights into how adolescents perceive motives for PA in the Czech and Slovak Republics.

