

RELIABILITY OF CROATIAN VERSION OF THE QUESTIONNAIRE FOR ASSESSMENT OF OVERALL LEVEL OF PHYSICAL ACTIVITY OF ADOLESCENTS

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Abstract

The aim of this research is to determine how to establish the reliability of Croatian version of the questionnaire PAQ-A for assessing the level of physical activity of adolescents and to determine the level of activity in the adolescent age. The study involved 127 students, 50 boys and 77 girls, average age of 16.57 years (SD = 1.56) from a high school in Croatia. Physical Activity Questionnaire for Adolescents (PAQ-A) was used to assess the level of physical activity. The basic descriptive parameters are calculated (arithmetic mean, standard deviation and modal value, minimum and maximum score) in every variable in the first and the second measurement. The PAQ-A test-retest was conducted within a 1-week interval. Reliability was analysed by the intraclass correlation coefficient (ICC) and internal consistency with Cronbach's α .

Test-retest reliability showed ICC=0.87 as the total score of PAQ-A. Internal consistency Cronbach's α was excellent ($\alpha=0.87$). The results confirm the application of the questionnaire in future research. The results of this study also show a low level (>3) of adolescent physical activity (2.60- 2.57). The highest level of activity was achieved in the Activity part during the Physical Education in favour of boys. The Croatian version of the PAQ-A is a valuable tool to estimate general levels of PA among adolescents age 14 to 19 years old.

Key words: *physical activity, Questionnaire for assessment of physical activity, reliability, adolescence*

Introduction

From a public health standpoint, physical activity is an important factor in promoting health. So far, various studies have been conducted with the aim of promoting physical activity and improving health. Similarly physical activity acts to reduce the risk of the occurrence of various diseases, as confirmed by many studies conducted around the world (Lee et al. 2012.; Paffenbarger, 1993.; Pate, 1995.; Blair, 2009.). Various questionnaires were also created to help assess physical activity, all with the aim of improving it, and adopting the habit of regular physical exercise because of the numerous positive health effects, both in adolescence and adulthood. Hypokinesia provokes faster physiological aging of the body, reduces working ability and energy, contribute to unwanted body appearance, what particularly affects adolescents (Heimer & Rakovac, 2005.). Adolescence is a period of maturation during which, not only physical, but also cognitive and psychological changes occur. During this period, adolescents are sensitive because they are accustomed to ongoing change. Because of the faster growth of the body, there is an increase in food intake what, by the influence of various factors at that age, can lead to eating disorders and wrong images of themselves. It is a matter of concern that physical activity is lowest among adolescents and young adults aged 15 to 24 years (Jurakić, Pedišić,

Andrijašević, 2009.). Low levels of physical activity and improper nutrition are the key causes for weight gain and the occurrence of obesity. According to the World Health Organization, young people should spend at least 60 minutes in an activity of moderate to higher intensity in the day. Despite numerous warnings, raising awareness of the importance of physical activity for health and shape, and also the prevention of excessive weight gain and obesity, the number of physically active people is declining at an early age. Therefore, it is very important to get insight into the level of physical activity of this population during the period of adolescence. There are different methods for estimating the level of physical activity, and numerous questionnaires for different ages have been constructed. Their main objective is to estimate energy consumption resulting from different physical activities. Methods of measuring physical activity could be conditionally divided into three basic groups: laboratory methods, methods based on the use of electronic devices and instruments, and survey methods based on self-assessment of the physical activity of the subject (Jurakić, Andrijašević, 2008.). The last four decades more than 30 questionnaires were designed to assess physical activity. Due to the large number of methods of measuring physical activity, the need to standardize measurements has occurred. For the past several years, the frequently used

questionnaire around the world was the "International Physical Activity Questionnaire" (IPAQ). IPAQ belongs to a group of survey methods for self-assessment of physical activity, and measures frequency, duration, and intensity of physical activity in four domains of human life. Vidaković Samaržija and Mišigoj-Duraković (2013.) checked the reliability of the frequently used questionnaire, the Physical Activity Questionnaire for Children (PAQ-C translated into Croatian), to estimate the total physical activity level of young school children, and research has shown the high reliability of this method of testing the physical activity level on a measured sample.

Similar survey questionnaires are also being applied to evaluate the physical activity of younger school children and adolescents such as Fels Physical Activity Questionnaire for Children (FELS PAQ), The Behavioural Risk Factor Surveillance System (BRFSS), Youth Risk Behavior Survey (YRBS) and many others.

However, rare questionnaires, adapted for adolescents, have been translated into Croatian, and especially rare are the determination of their metric characteristics. A commonly used questionnaire to estimate the total level of adolescent physical activity Physical Activity Questionnaire for Adolescents - PAQ-A (Kowalski et al., 2004.) constructed in Canada for adolescents 14 to 19 years of age, demonstrated good validity and reliability in studies measured on different groups of subjects worldwide (Martinez Gomez et al., 2009.; Bervoets et al., 2014.). Cultural adaptation and validation of this questionnaire has not yet been assessed in Croatia. The main aim of this research is to determine how to establish the reliability of the Croatian version of the questionnaire PAQ-A for assessing the level of physical activity of adolescents and to determine the level of activity in the adolescent age.

Methods

Participants

The study was conducted on a total of 127 students with an average age of 16.57 years old (SD=1.56). Of the total number of them, 50 were male with an average age of 17.08 years old (SD = 1.19), and 77 were female with an average age of 16.74 years old (SD = 1.11). The purpose and objective of the survey was explained to the participants. The survey was anonymous and conducted twice in a week.

The study was approved by the Ethical Committee of Faculty of Education in Osijek, Croatia.

Measure

The Physical Activity Questionnaire for Adolescents (PAQ-A) was used to estimate adolescent physical activity levels. The questionnaire is intended for students from 1. to 4. grade of the high school (14 to 19 years old) who regularly attend classes with weekly rest. The questionnaire provides a summary

of the activities in the last seven days, but does not provide an insight into the intensity level of activity.

Test protocol

The questionnaire was conducted in the classroom. In order to prove its reliability, the questionnaire (survey) was conducted on the same group of students two times with a seven days break between measurements.

The questionnaire consisted of 8 questions which examined the level of physical activity. Each question was evaluated on a scale of 1 to 5. Question number 9 was not evaluated and is not used as a part of the summary of physical activities, because the participant answers that question only if, for certain reasons, he or she was prevented from participating in usual physical activity. The validation process was based on an assessment of activity values between 1 and 5 over five simple steps. In the first question, participants estimate the level of their own activities in certain leisure sports. Indicating "NO" determines the value of 1, and indicating "7 or more times" is a value of 5. The total result is formed by taking the average value of all activities from the list. The questions from 2 to 7 assess the participant's level of physical activity during physical and health education classes; during a free time; lunchtime; evening; weekend; for the time he or she spends immediately after school; for each day of the week and finally, the statement which best describes them in the last seven days is assessed. The answers for each question range from at least 1 to the maximum value of 5, and in addition the participant indicates the value that corresponds to the level of his physical activities. Question number 8 is evaluated by taking the average value of all days of the week. Question number 9 was not counting in the total score, it is only used to identify a participant who has not been usually active in class in the past seven days. After obtaining individual and average values for each question, the results are used to calculate the final average value – the average value of these 8 questions results in the total physical activity of the individual (score 1 indicates a low level of physical activity, while the score 5 indicates a high level of physical activity) (Kowalski, Crocker, Donen, 2004.).

Statistical analysis

Descriptive statistics (n, frequencies (mod), mean±SD) were calculated for applicable variables. Test-retest reliability was assessed by one-way random-effects intraclass correlation coefficient - ICC (Bartko, 1966.). Values of ICC less than 0.5 are indicative of poor reliability; between 0.5 and 0.75 indicate moderate reliability; between 0.75 and 0.9 indicate good reliability and greater than 0.90 indicate excellent reliability (Koo, & Li MY, 2016.). The internal consistency of the questionnaire was analysed using Cronbach's α coefficient. Removing every item to confirm or exclude redundancy of the individual items was also performed by Cronbach's α . Values of α greater than 0.7 were deemed

acceptable for general research purposes (Cronbach, 1951.).

Results

The table study shows that in the first measurement, the average level of physical activity of subjects is 2.60 (Table 1.) and in the second 2.57 (Table 2.), indicating a low level of physical activity

of subjects, since the instructions of this standardised questionnaire, levels below 3 are considered insufficient levels of adolescent physical activity. Arithmetic mean (AS) and standard deviation (SD) values and response value range (min.max) indicate almost similar results in the first and second measurements, which is a very important assumption that affects the high reliability of the test.

Table 1.

Basic descriptive parameters of the entire sample in the first measurement.

Variables	N	AS	SD	Mod	F mod	Min	Max
Q1. Spare-time activity: sports	127	1.50	0.39	1	13	1	4
Q2. Activity during physical education classes	127	4.30	1.12	5	74	1	5
Q3. Lunchtime activity	127	1.56	1.00	1	84	1	5
Q4. After-school activity	127	2.70	1.26	3	41	1	5
Q5. Evening activity	127	2.80	1.19	3	46	1	5
Q6. Weekend activity	127	2.74	1.12	3	42	1	5
Q7. Activity frequency during the last 7 days	127	2.63	1.10	2	43	1	5
Q8. Activity frequency during each day last week	127	2.59	0.96	3	12	1	5
PAQ-A total	127	2.60	0.75	Multiple	2	1	5

Legend: N – number of subjects, AS – arithmetic mean, SD – standard deviation, Min – minimal score, Max – maximal score, Mod – mode, F mode – frequency fashion.

Table 2.

Basic descriptive parameters of the entire sample in the second measurement.

Variables	N	AS	SD	Mod	F mod	Min	Max
Q1. Spare-time activity: sports	127	1.39	0.31	1	13	1	3
Q2. Activity during physical education classes	127	4.16	1.17	5	64	1	5
Q3. Lunchtime activity	127	1.71	1.09	1	74	1	5
Q4. After-school activity	127	2.54	1.24	3	43	1	5
Q5. Evening activity	127	2.71	1.27	3	37	1	5
Q6. Weekend activity	127	2.81	1.31	2	34	1	5
Q7. Activity frequency during the last 7 days	127	2.66	1.24	2	47	1	5
Q8. Activity frequency during each day last week	127	2.58	1.00	1	13	1	5
PAQ-A total	127	2.57	0.82	Multiple	2	1	5

Legend: N – number of subjects, AS – arithmetic mean, SD – standard deviation, Min – minimal score, Max – maximal score, Mod – mode, F mode – frequency fashion.

Table 3. presents the results that indicate good test-retest reliability for the PAQ-A (ICC=0.87). Similar relationships were found among girls and boys separately (ICC=0.86 and 0.87, respectively). Regarding individual item analyses, the lowest value (ICC=0.77) was observed for item 4, which informs about after-school activity. The obtained correlations presented in Table 3. show statistical significance at the level of $p < 0.01$. The results thus confirm good reliability of Croatian version of the questionnaire PAQ-A for assessing the level of

physical activity of adolescents and to determine the level of activity in the adolescent age and therefore allow the questionnaire to be used in future research. The internal consistency coefficients of the questionnaire are presented in Table 3. The PAQ-A obtained an internal consistency of $\alpha=0.87$. Cronbach's α indicators for the questionnaire with individual questions removed also had values above 0.84.

Table 3.

Test-retest reliability ICC, Internal consistency Cronbach's coefficient α for PAQ-A

Variables	ICC-95% CI Total (n=127)	ICC-95% CI Girls (n=77)	ICC-95% CI Boys (n=50)	Cronbach's coefficient, α
PAQ-A total	0.87 (0.81 - 0.91)	0.86 (0.78 - 0.91)	0.87 (0.77 - 0.93)	0.87
Reliability with items (Q1-Q8) individually removed				
Q1. Spare-time activity: sports	0.89 (0.84 - 0.92)	0.83 (0.73 - 0.89)	0.95 (0.92 - 0.97)	0.87
Q2. Activity during physical education classes	0.81 (0.73- 0.86)	0.81 (0.71- 0.88)	0.72 (0.52 - 0.84)	0.89
Q3. Lunchtime activity	0.90 (0.86 - 0.93)	0.87 (0.80 - 0.92)	0.92 (0.86 - 0.95)	0.88
Q4. After-school activity	0.77 (0.68 - 0.84)	0.81 (0.71 - 0.88)	0.70 (0.47 - 0.83)	0.84
Q5. Evening activity	0.83 (0.77 - 0.88)	0.83 (0.73 - 0.89)	0.85 (0.73 - 0.91)	0.85
Q6. Weekend activity	0.80 (0.71 - 0.85)	0.79 (0.68 - 0.87)	0.79 (0.64 - 0.88)	0.84
Q7. Activity frequency during the last 7 days	0.86 (0.80 - 0.90)	0.86 (0.78 - 0.91)	0.86 (0.75 - 0.92)	0.84
Q8. Activity frequency during each day last week	0.88 (0.84 - 0.92)	0.89 (0.83 - 0.93)	0.87 (0.78 - 0.93)	0.84

Legend: PAQ-A, Physical Activity Questionnaire for Adolescents; Q - question.

Dicussion

This research confirms the validity of the questionnaire developed by Kowalski et al (2004.) when applied to Croatian adolescents. There is no literature in Croatia to date on this topic which evaluates PAQ-A, and this is why this research is the first to provide evidence for the evaluation of the questionnaire. We are introducing the first survey on cultural adjustment and PAQ-A questionnaire evaluation among Croatian adolescents aged 14 to 19 years old. In general, the results of the submitted research show good reliability of the PAQ-A (ICC=0.87). There are numerous questionnaires that assess the level of physical activity, varying in number and detail of the questions and use different techniques to assist the participant in terms of duration, intensity and type of activity which is involved (Mišigoj-Duraković, 1999.). Questionnaires differ in both validity and repeatability, and numerous studies have been conducted to evaluate and determine reliability. One such study was conducted by Bates (2006.), who analysed, among other things, the 8 most commonly used questionnaires to estimate the level of physical activity of children and young people. Among them was the PAQ-A questionnaire which showed high reliability. Biddle et al. (2011.) analysed the 20 most commonly used

questionnaires to estimate the level of physical activity of children and young people. Among the 20 questionnaires analysed, three were highly qualified by experts, PAQ-A was one of them. The high coefficients of PAQ-A reliability have been demonstrated in several studies. Martinez-Gomez et al. (2009.) tested the reliability of the questionnaire on a sample of 82 adolescents aged 12 to 17 years old. Bervoets et al. (2014.) tested the reliability of the Dutch version of the PAQ-A questionnaire. Cronbach's reliability coefficient was $\alpha=0.758$.

Wyszyńska et al. (2019.) was designed to culturally adapt and validate the PAQ-A in the Polish environment. Test-retest showed reliability ICC=0.97 for the total score of PAQ-A. Internal consistency was excellent ($\alpha=0.93$). The PAQ-A was very strongly correlated with steps per day ($r=0.94$) and with moderate-to-vigorous PA ($r=0.81$) measured by the accelerometer. It is a Polish version of the PAQ-A and it is a valuable tool to estimate the general levels of PA among adolescents from 14 to 19 years old.

Aggio et al. (2016.) studied validity and reliability of a modified English version of the PAQ-A among British adolescents with a final result of ICC=0.78 and the Cronbach's α coefficient for the modified

PAQ-A score showed acceptable reliability ($\alpha=0.72$). Total variables correlations ranged from $\alpha=0.24$ to 0.54 with modified questions exceeding $\alpha=0.300$, which was in accordance with original research (Kowalski, 1997.).

Bervoets et al. in the study of reliability and validity of the Dutch PAQ-A, also showed an acceptable reliability of questionnaire for Dutch adolescents. Cronbach's α , as a final result of their numerous PAQ-A questionnaires conducted among adolescents, was 0.76 (Bervoets, 2014.).

Spanish adolescents, according to survey conducted by Martinez-Gomez et al. (2009.) on reliability and validity of the PAQ-A questionnaire to assess physical activity of Spanish adolescents get total result of ICC=0.71.

PAQ-A reliability studies show that ICC score extends from a lowest result (ICC=0.40) to more respective, depending on the country and race of adolescents involved in survey.

Cronbach's coefficient $\alpha=0.70$, or higher, is usually considered reliable questionnaire (Cronbach, 1951.).

Our research brings as a total result Cronbach's α coefficient higher than the original (Kowalski, 1997.) with final value of $\alpha=0.87$, what is also higher than other results of modified versions of the PAQ-A mentioned above. We note that our coefficients of validity are in principle higher than previously obtained studies with adolescents (Janz et al. 2008.; Martinez-Gomez et al. 2009.; Wang et al. 2016.).

The ICC for individual variables of the PAQ-A ranged from 0.77 to 0.90. The overall correlations of the variables were the lowest in spare-time activity, activity during physical education classes and lunchtime, which is consistent with previous research. Measuring activity in children and adolescents using self-report, survey of Janz et al., gets results of Cronbach's α for the PAQ-A in the range from 0.72 to 0.88. (Janz et al. 2008.).

The result of our test-retest reliability gives us the final result the PAQ-A of ICC=0.87, which is strong evidence to support reliability of our modified PAQ-A for the Croatian adolescents.

Furthermore, the results of this survey also show that in the first measurement, the average level of adolescent physical activity was 2.60 and in the second 2.57, both indicating a low level of physical activity of subjects, because in the instructions of the standardized questionnaire, levels below 3 are considered insufficient and this level of physical activity is not in line with the recommendations of the World Health Organization for physical activity.

Petrić (2011.) observed a worryingly higher percentage of people in both genders who do not fall within the recommended values of physical activity (67.11% of female and 60.33% of male adolescents). It is worrying that physical inactivity increases especially in adolescence, in a part of life that brings numerous changes and in time when different factors influence the formation of self-esteem and a positive image of oneself. The number

of obese people is increasing, and the most common cause is physical inactivity. The highest rates of obesity have been observed in eastern and southern European countries, and there is evidence of increased obesity, particularly in older children and adolescents (Livingstone, 2001.). In adolescence, in addition to the health risks, there are also social and emotional functioning problems linked, which in some cases can lead to anxiety and depression. This is why physical activity is very important, especially for children and adolescents, as it prevents the occurrence of various diseases and the development of excessive body mass, stimulates the natural course of development of the child, improves cognitive function, positively influences the ability to learn and generally makes it easier to function in different areas of life and makes life better. An acquired habit of physical activity at the earliest age affects the quality of life in adulthood. This survey shows that students are most active in physical and health education classes while being least active in certain sports during their free time.

Conclusion

A total of 127 adolescents participated in this survey and the data obtained were used to determine the reliability of the physical activity level assessment questionnaire (PAQ-A) and to estimate the overall level of physical activity. The results showed a satisfactory level of reliability of the questionnaire and a low level of adolescent activity. The level of activity in the first measurement was 2.60, and in the second measurement 2.57, thus confirming earlier studies which showed that in adolescence the trend of decline is increasing. This study confirmed the objective of the work. The results confirm that there is reliability between the results of repeated testing of the estimated physical activity of adolescents, carried out in the Croatian version of the PAQ-A questionnaire, and that the level of physical activity of adolescents aged 14 to 19 years old is not at satisfactory level.

According to our knowledge, the questionnaire for estimating the overall level of physical activity of adolescents PAQ-A has not been translated into Croatian so far. That is why the translation of the original PAQ-A preceded the determination of reliability of the questionnaire itself. The questionnaire is very easy to use. The questions are short and age is appropriate, and it is possible to include a large number of participants. The main disadvantage of the questionnaire is that it does not give insight into the intensity of individual activities. But, because of its simplicity and reliability identified by the research, it can serve in further researches involving an assessment of the total body value of adolescents. It is important to continuously monitor the level of activity of children and young people in order to develop appropriate strategies to promote physical activity, as the habit of adopted daily physical activity at an early age remains in most cases in adulthood.

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