



PHYSICAL ACTIVITY ASSESSMENT QUESTIONNAIRES: A LIFESPAN REVIEW

UPITNICI ZA PROCJENU TJELESNE AKTIVNOSTI U RAZLIČITOJ ŽIVOTNOJ DOBI: PREGLED

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SUMMARY

With a wide range of health benefits across the lifespan, throughout the decades physical activity has remained an interesting topic of many research. To gain quality and valid results on population's physical activity levels, a high-quality measurement tool is needed. Physical activity assessment questionnaires are one of the most frequently used self-reported activity assessment tools. Choosing the right tool can be a challenging task, so we aim to provide a general overview of frequently used questionnaires throughout the lifespan with special emphasis on those available in Croatia. We conducted a literature review on physical activity assessment questionnaires, from toddlers and pre-school to older adults. Our specific focus was on physical activity assessment questionnaires translated, validated, and available in Croatia. Regardless of limitations, questionnaires are still a widely used cost-effective tool that provides good physical activity assessment and can be used in large population studies, but there is still a great need for a consistent and reliable questionnaire. Five physical activity assessment questionnaires for different age groups available in Croatia were identified.

Questionnaires estimate general levels of physical activity in all stages of life. With vast number of existing questionnaires and continuous development of new ones, the emphasis should be on bettering existing questionnaires because the need for a reliable and validated tool for all age groups is immense.

Keywords: physical activity assessment, questionnaires, children, adolescents, adults, elderly

SAŽETAK

Tjelesna aktivnost ima mnoge pozitivne, zdravstvene učinke na pojedinca tijekom cijelog života. Već desetljećima procjena tjelesne aktivnosti česta je tema znanstvenih istraživanja. Prilikom procjene tjelesne aktivnosti, za dobivanje kvalitetnih i valjanih rezultata o razinama tjelesne aktivnosti stanovništva, potreban je provjeren i validiran alat. Upitnici za procjenu tjelesne aktivnosti jedan su od najčešće korištenih alata. Odabir odgovarajućeg upitnika nije uvijek jednostavan zadatak, stoga je cilj ovog rada pružiti pregled dostupne literature i često korištenih upitnika u različitim dobnim skupinama s posebnim naglaskom na upitnike koji su dostupni u Hrvatskoj. Provedena je pretraga dostupne literature o upitnicima za procjenu tjelesne aktivnosti, od djece predškolske dobi do osoba starije životne dobi, s fokusom na upitnicima koji su prevedeni, validirani i dostupni u Hrvatskoj. Identificirano je pet upitnika za procjenu tjelesne aktivnosti za različite dobne skupine.

Upitnici procjenjuju opću razinu tjelesne aktivnosti u svim fazama života. Bez obzira na ograničenja, upitnici se zbog jednostavnosti primjene te dobre procjene tjelesne aktivnosti često koriste u istraživanjima s većim brojem ispitanika. Uz veliki broj postojećih upitnika i kontinuirani razvoj novih, naglasak treba staviti na unaprijeđenje postojećih jer je potreba za pouzdanim i validiranim upitnikom, za sve dobne skupine, velika.

Ključne riječi: procjena tjelesne aktivnosti, upitnici, djeca, adolescenti, odrasli, osobe starije životne dobi

INTRODUCTION

Physical activity is defined by World Health Organization (WHO) as any bodily movement produced by skeletal muscles that require energy expenditure (75). With a wide range of health benefits across the lifespan, throughout the decades physical activity has remained an interesting topic of many research (41,74). Engaging in regular physical activity has been associated with better mental and cognitive health, in both children and adults (39,17,37,41), risk reduction for all non-communicable diseases and related states as well as all-cause mortality (74).

Physical activity levels are of utmost value to several interested parties, from nutrition and kinesiology researchers, health workers, epidemiologists to the public itself (62). To gain quality and valid results on population's physical activity levels, intervention efficacies, health benefits, or to ultimately provide quality recommendations, a high-quality measurement tool is needed (41). The end goal of physical activity assessment is to identify the frequency, duration, intensity, and type of physical activity performed during a specific period of time (2). Tools used to measure physical activity and sedentary behaviors differentiate in their level of precision, simplicity, and information they provide. There are two categories, indirect or self-report measures, and direct measures. Self-report measures usually include a variety of questionnaires, short or long-term recalls, physical activity logs, and diaries. Direct measures include a vast range of motion and multiple-sensors devices, such as accelerometers, pedometers, or heart-rate monitors (73,2). With many tools available decision-making process of choosing the right tool can be a challenging task. The chosen tool should reflect the purpose and context identified for the research, especially with self-report assessment tools since measuring error can be high (41). The growing interest in literature for improving the decision-making process shows the necessity of selecting the right tools in order to decrease the chance of measurement error and increase the precision of selected tool. A good physical activity assessment tool should be versatile, easy to evaluate, and as accurate it can be in the estimation of intensity, duration, and frequency of assessed physical activity. One of the most important factors when it comes to choosing an assessment tool are population characteristics, such as age, gender, socio-economic factors, health, race, ethnicity, education, cultural norms, and language. Cost-effectiveness, trained personnel, time, or the number of participants are additional factors to consider when choosing a measurement tool (2,41). Apart from that, validity and reliability of chosen tool in a selected population are required to ensure quality results (18). Useful models, like consideration of four primary domains (study, population, instrument, and activity characteristics) (48), American Heart Association's (4) decision matrix, or 10 questions presented by Sternfeld et al. (63) have been proposed to enable an easier selection process for the

most appropriate physical activity assessment tool. In September 2020 a consensus by Nigg et al. (41) has been published providing the latest insights, best practices, and steps by step framework for assessing physical activity through questionnaires and challenging other researchers to continuously improve these physical activity assessment tools (41).

Physical activity assessment questionnaires

Physical activity assessment questionnaires are the most frequently used self-reported activity assessment tool. Depending on the type of questionnaire they can capture a variety of information on the duration, frequency, and intensity of physical activity in a set period of time (41). Scoring and results of the questionnaire also depend on the type of the questionnaire. Most of them apart from categorizing respondents on intensity (sedentary behaviors, moderate- and vigorous-intensity) or domain (occupational, transportation, household, sports..) of physical activity have the ability to assess activity as metabolic equivalents (METs) (2).

Throughout the years questionnaires have been modified for different age groups, time periods, language, specific populations and with specific results in mind. From one-question items (25) and a simple classification (active – inactive; low – moderate–vigorous physical activity), short and long versions of different questionnaires to questionnaires that examine activity during the past one to seven days, month, or a year (23,2). In other way, participants through a set of questions subjectively report their physical activity during a specific period of time (58).

Participants ability to recall and self-report physical activity, especially light or moderate activity, is one of the challenges when it comes to questionnaires, but the advantages as their cost- and time-effectiveness, easy administration and scoring process, accuracy in measuring intense activity, providing details of the activity and ability to categorize respondents by activity level prevail (53). Previously mentioned validity, as the degree to which the scores of a measurement instrument are an adequate reflection of a 'gold standard', and reliability as the degree to which the measurement is free from measurement error, are the most frequently assessed properties for questionnaires (50). Despite questionnaires may show limited reliability and validity they have practical value in monitoring changes and indicating where an increase in physical activity levels would be beneficial (58). Questionnaires are more effective in assessing the type and context, or screening and monitoring physical activity in large populations and study samples than accelerometers and pedometers (41,53). They are often used in large descriptive epidemiological studies, cross-sectional studies, or physical activity behavior studies since it has been shown they are more reliable at a group than individual-level assessment (64). One should keep in mind that a combination of measuring tools is more than

warranted. Studies with both self-reported and device-based tools are likely the most promising way to assess physical activity (60,41). In past decades, many questionnaires have been developed for different populations, from children and youth to the elderly, with deference in length, type of activities, and recall periods (11). This paper aims to give a general overview of frequently used questionnaires throughout the lifespan with a special focus on those translated, validated, and available in Croatia. It can also serve as a starting point for researchers who aim to assess physical activity through questionnaires as it contains an overview of novel literature available on the subject.

RESULTS

The most frequently used physical activity assessment questionnaires throughout all life stages were taken into account, as well as novel systemic reviews and meta-analyses regarding this topic. A narrative review is given below. Through literature search five physical activity assessment questionnaires translated and validated in Croatia were identified (Table 1).

Physical activity assessment questionnaires in toddlers and pre-school children

Given the importance of the early years for physical, cognitive, social, and emotional development and the importance of physical activity on those, determining dose of activity needed is important (10). Starting with infants (less than 1 year), toddlers (1 – 3 years), and pre-school children (3 – 5 years), in their *Guidelines on physical activity, sedentary behavior, and sleep* WHO has set the recommendations for children under 5 years of age, presented in Table 2 (76).

To track changes, overall physical activity, or alignment with the recommendations, the right tools are needed. There is a lack of questionnaires with adequate properties to determine physical activity in infants and toddlers, and direct measures, such as accelerometers, are predominantly used in this age group (10;51). Furthermore, physical activity at this age is difficult to assess since it is mostly sporadic and intermittent, with short bursts in irregular intervals throughout the day which is easily missed by parents or caregivers who are usually the ones reporting physical activity through a questionnaire (51).

Table 1. Physical activity questionnaires available in Croatia
 Tablica 1. Upitnici za procjenu tjelesne aktivnosti dostupni u Hrvatskoj

Questionnaire	Age	Measure	Validity and reliability	Reference
<i>Pre-PAQ</i>	3 -5 years	Habitual physical activity and sedentary behaviour	Test-retest reliability	(30) (44)
<i>PAQ-C</i>	8 – 14 years	Moderate to vigorous physical activity levels during school year	Internal consistency and retest reliability	(67) (49)
<i>PAQ-A</i>	14 - 19 years	general measure of physical activity levels	Test-retest reliability	(68)
<i>IPAQ - LF</i>	15 – 64 years	Job-related activities, transportation-related activities, housework-related activities, leisure time activities, and sitting activities	Test-retest reliability	(29) (46)
<i>IPAQ - SF</i>	15 – 64 years	Moderate- and vigorous-intensity physical activity, walking and sitting activities	Test-retest reliability	(3)

Table 2. 24-hour physical activity recommendations for children under 5 years of age (76)
 Tablica 2. Preporuke za 24-satnu tjelesnu aktivnost djece od 5 godina starosti

Age	Activity
< 1 year	<i>Be physically active several times a day in a variety of ways</i> , particularly through interactive floor-based play; more is better. For those not yet mobile, this includes <i>at least 30 minutes in prone position</i> (tummy time) spread throughout the day while awake.
1 – 2 years	<i>Spend at least 180 minutes in a variety of types of physical activities</i> at any intensity, including moderate to vigorous-intensity physical activity, spread throughout the day; more is better.
3 – 5 years	<i>Spend at least 180 minutes in a variety of types of physical activities</i> at any intensity, of which at least 60 minutes in moderate- to vigorous intensity physical activity, spread throughout the day; more is better.

Questionnaires for pre-school and older children have been somewhat more developed and validated (11). A review by Hidding et al. (27) gives a great overview of 89 versions of physical activity questionnaires used in activity assessment in children and adolescents. For pre-school children, age 3 – 5 years, *Preschool-age Children's Physical Activity Questionnaire (Pre-PAQ)* got a good methodological quality assessment based on the COSMIN checklist (40), but the overall conclusion on validity and reliability of used questionnaires is still pending (27). *Pre-PAQ* as a 3 – day (one weekday and two weekend days) recall questionnaire measures habitual physical activity and sedentary behavior. It has been previously used in several studies and has been shown as a reliable and valid measuring tool (19). *Pre-PAQ* has been used in studies of physical activity in Croatian preschool children (44, 30). The questionnaire has been translated to the Croatian language and test-retest reliability was checked on a sample of 25 parents. Correlations between results ranged from 0,73 to 0,81 showing appropriate reliability of the questionnaire (30). To make it easy to administer the test some questionnaires are done in CAPI (computer-assisted personal interview) form, for example, Wood et al. (77) used *NHANES Physical Activity Questionnaire* in their research on physical activity types in young children (77).

Physical activity assessment questionnaires in older children and adolescents

Regardless of the classification of childhood and adolescence, when it comes to older children and adolescents, many questionnaires are overlapping in the mean age of respondents. Also, WHO set physical activity recommendations for children and adolescents, aged 5 – 17 years, to at least an average of 60 minutes per day of moderate to vigorous-intensity, mostly aerobic, physical activity, across the week and to incorporate vigorous-intensity aerobic activities at least 3 days a week (75). The most widely used questionnaires in children over 10 years of age are the *Physical Activity Questionnaire for Older Children (PAQ-C)* and *The Physical Activity Questionnaire for Adolescents (PAQ-A)*, developed to assess general levels of physical activity of children ages 8 – 14 and 14 – 20, respectively. Both, *PAQ-C* and *PAQ-A* are self-administered 7 – day recall questionnaires that provide a general measure of physical activity levels during the school year (32;8). *PAQ-C* and *PAQ-A* with acceptable validity and reliability, shown through high application in research (7;70), have also limitations, a whole-year application. They should not be used to assess physical activity in the summer or holiday periods (32). In Croatia, *PAQ-C* has been translated (67) and internal consistency and retest reliability was checked (49). As *PAQ-C* was developed for children from 8 to 14 years research by Podnar et al. (49) expectedly indicates that the use of the Croatian version of *PAQ-C* may be more appropriate to assess physical activity levels in 8 – 10 year

children than those younger than 8 years. The results of the test-retest reliability test of Croatian *PAQ-A* version done by Vidranski et al. (68) showed a satisfactory level of reliability of the questionnaire and a low level of adolescent activity (68).

Other questionnaires used in physical activity assessment in older children and adolescents are *Previous Day Physical Activity Recall (PDPAR)*, *Youth Physical Activity Questionnaire (YPAQ)*, *3-day Physical Activity Record (3PDAR Record)* even the *International Physical Activity Questionnaire – Short Form (IPAQ-SF)* (11,22,27). Many of these questionnaires go through adaptations, translations (79,49,20,78,26) and modifications (1) depending on the research purposes and characteristics of respondents. Other researchers go through the process of developing new questionnaires according to specific demands of the study (54,10).

Physical activity assessment questionnaires in adults

For adults, age 18 – 64 years, WHO (2020) has set basic weekly recommendations regarding physical activity at least 150 – minutes of moderate-intensity aerobic physical activity or at least 75 – 150 minutes of vigorous-intensity aerobic activity or an equivalent combination. In addition, muscle-strengthening activities on 2 or more days a week and limit time spent in sedentary activities (75). Whether it is an assessment of the physical activity level of the population or a specific population group, questionnaires are still widely used cost-effective and valid choices (55,42). Some previously mentioned questionnaires are used in the adult population as well, since some of them were developed and can be administered to respondents 15 years and older, for example, *International Physical Activity Questionnaire (IPAQ)* (14). *IPAQ* developed as a common international measuring tool that can be used to obtain internationally comparable data has been translated to many different languages and is still one of the most frequently used questionnaires (57,71). Both long and short form (*IPAQ-LF*; *IPAQ-SF*) of the questionnaire measure type and time spent physically active in the last 7 days, as well as leisure time. *IPAQ-SF* (7 questions) provides information on the time spent walking, in moderate- and vigorous-intensity physical activity and *IPAQ-LF* (27 questions) collect data in four different domains (job-related, transport-related, domestic and leisure-time physical activity) and intensities (moderate, vigorous, walking) (14,71). Reliability and validity, the influence of age and language, as well as international use of *IPAQ* have been shown repeatedly (14,71,59,36). Both short (3) and long *IPAQ* (29,46) are translated and used in Croatia, with a short version being the more used one (47,15,61). Test-retest reliability test showed that the Croatian both *IPAQ-SF* and *IPAQ-LF* have satisfactory reliability for measuring intensity specific physical activity levels and general physical activity (46;3). A short questionnaire for

the measurement of habitual physical activity, also known as the *Baecke questionnaire* developed in 1982. (6) is still an often-used tool to assess physical activity in different studies. Through three sections work, sport, and leisure-based questions *Baecke questionnaire* gives a combined score categorized as a global index of all these sub-sections (65). Developed by the WHO *Global Physical Activity Questionnaire (GPAQ)* is another international measuring tool (5). Similar to *IPAQ*, *GPAQ* measures minutes spent in moderate and vigorous-intensity physical activity in a typical week in three domains: work- (labor and household) related activities, leisure-time activities, and transportation (16). As before mentioned questionnaire, *GPAQ* provides reproducible data and has shown a moderate-strong positive correlation with *IPAQ*. Overall, the results of *GPAQ* validity are fair and reliability studies indicate that *GPAQ* is a suitable and acceptable instrument for monitoring physical activity (9,12,72,31). And as well as *IPAQ*, the WHO questionnaire has been translated and adjusted to suit other countries (52,45). Other than *IPAQ*, results of a systemic review by Silsbury et al. (59) showed that *The Recent Physical Activity Questionnaire* and *Physical Activity Assessment Tool* also have good/excellent test-retest reliability and *The single-item measure (SIM)* showed significant criterion validity against an accelerometer (59,80). Comparisons with accelerometer data in research also showed that other questionnaires like the *Physical Activity and Sedentary Behaviour Assessment Questionnaire (PASBAQ)* are useful and valid instruments for ranking individuals according to levels of physical activity (56).

When it comes to specific stages of adulthood such as pregnancy, specific questionnaires are usually developed or existing ones are modified. Paper by Schuster et al. (55) gives a summary of valid and reliable questionnaires for pregnant women. Four of them met the inclusion criteria *Pregnancy Physical Activity Questionnaire*, *Modified Kaiser Physical Activity Survey*, *Short Pregnancy Leisure Time Physical Activity Questionnaire*, and *Third Pregnancy Infection and Nutrition Study Physical Activity Questionnaire* (55).

Physical activity assessment questionnaires in elderly

There are many beneficial effects of physical activity later in life. In the elderly physical activity increases the quality of life, in both cognitive and physical sense, lowers risk for developing neurodegenerative diseases, such as Alzheimer's or dementia (24), reduces depression and all-cause mortality (53). To achieve all those benefits elderly should, in addition to recommendations for adults, on 3 or more days a week do activities that emphasize functional balance and strength training to enhance functional capacity and prevent falls (75). The tools used to assess physical activity in this population has to ensure that it accounts for the specific characteristics of the age group, as a differing physical and psychological condition and overall

physical and cognitive functions decline. In this age group when using questionnaires biases may come from memory recall, having problems understanding the questions, or issues regarding reading and vision difficulties (13). Several instruments are available for physical assessment in the elderly, from diaries to accelerometers, but questionnaires appear to be one of the popular measuring tools in the elderly (33,21). The most recent systemic review by Sattler et al. (53) focused precisely on the questionnaires used in the elderly. Overall 40 questionnaires were included in the review, but only two of them, the *Physical Activity Scale for the Elderly (PASE)* for measuring total physical activity and *Physical Activity and Sedentary Behaviour Questionnaire (PASB-Q)* for measuring moderate-to-vigorous physical activity in older adults earned their recommendation for usage after evaluation (53). Northey et al. (43) used the *Physical activity recall (PAR)* questionnaire and *Active Australia Survey (AAS)* in their assessment of the elderly's physical activity. Results showed that *PAR* may be used for collecting data on greater levels of physical activity and health outcomes, but overall neither of them showed considerable validity in determining the duration and intensity of physical activity (43). Questionnaires like *IPAQ* (13), short and long version (66), *The Physical Activity Questionnaire for Elderly (PAQE)*, and their modified versions for this specific age group or language, has been often used for assessing physical activity (34,35,38). *PAQE* provides data on habitual physical activity including household chores, sports, leisure time, in the past year. The questionnaire was developed by modification of the *Baecke questionnaire*, so it is also known as the „modified Beacke questionnaire“ (69). *IPAQ* showed moderate/acceptable validity for measuring moderate to vigorous physical activity in both United Kingdom (13) and Belgium (66) elderly. *IPAQ-E* is an *IPAQ*-based questionnaire modified for the elderly, for example, activity examples are changed to more age-appropriate or description of intensity levels are adjusted (28). To our knowledge, there are not any questionnaires developed, translated, or validated for this specific age group in Croatia.

CONCLUSION

Questionnaires estimate general levels of physical activity in all stages of life. Regardless of limitations, questionnaires are still a widely used cost-effective tool that provides good physical activity assessment and can be used in large population studies. A number of research papers on physical activity questionnaires show their frequent usage. The emphasis in the future should be on bettering existing questionnaires because the need for a reliable and validated tool for all age groups is immense. As for the questionnaires translated and modified for respondents of all age groups in Croatia, there is a lack of choices when it comes to translated and validated questionnaires, especially when it comes to older adults.

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