



THE VALIDITY AND RELIABILITY OF THE PHYSICAL ACTIVITY QUESTIONNAIRES (PAQ-A) AMONG INDONESIAN ADOLESCENTS DURING ONLINE AND BLENDED LEARNING SCHOOLING

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Abstract

Research objectives. This study aimed to validate the use of the Physical Activity Questionnaire Adolescent (PAQ-A), a physical activity instrument widely used in a school setting, among Indonesian adolescents, particularly during blended learning or online schooling due to COVID-19 restrictions.

Materials and methods. This study was a cross-sectional survey of 370 Indonesian adolescents (62.2% female, mean 15±2 years) participating in online and blended learning. Participants completed the Indonesian version of the PAQ-A online. Sixty-three (17%) participants completed the same questionnaire one week later (second survey) for the test-retest reliability, from which the intraclass correlation coefficients (ICC) were calculated. Internal consistency reliability was calculated in both surveys, while confirmatory factor analysis (CFA) was analyzed from the data in the first survey.

Results. The Cronbach alpha of the PAQ-A for the first and second surveys was 0.78 and 0.82, thus indicating the acceptability of internal consistency reliability. The ICC for all PAQ-A items ranged from 0.40 to 0.81, indicating fair to excellent test and retest reliability. The root means square error of approximation was 0.033 suggesting acceptable construct validity of the instrument.

Conclusions. In conclusion, sufficient evidence shows the validity and reliability of the PAQ-A to justify the use of the questionnaires for measuring physical activity levels in the Indonesian adolescents in the blended learning or online schooling setting.

Keywords: validity, reliability, physical activity questionnaire, adolescents, Indonesia.

Introduction

One of the objectives of physical education in school is to promote physical activity, as an important aspect of growth and development among children and adolescents (Trudeau & Shephard, 2008). Moreover, regular physical activity has been found to provide various benefits for physical, mental, and psychosocial health, all of which are essential for optimizing learning, thus, it fosters improved academic performance among children and adolescents (Erwin et al., 2012). Regular physical activity also plays a critical role in health maintenance (WHO, 2018; Chooi et al., 2019), and in preventing non-communicable diseases (NCD) (Badr et al., 2017; Choukem et al., 2020; Geidl et al., 2020), such as

diabetes mellitus, hypertension, heart disease, cancer, and stroke (Kinlen et al., 2018; Longo et al., 2019). For optimum health benefits, the World Health Organization (WHO) recommends at least 60 minutes per day of moderate or high-intensity physical activity for adolescents (WHO, 2018). Despite this recommendation, however, physical activity level is declining among adolescents globally and in Indonesia (WHO, 2020; Ministry of Health Republic of Indonesia, 2018), while physical inactivity increased from 70% in 2018 to 81% in 2020 in Asian countries (WHO, 2018; WHO, 2020). Therefore, physical activity promotion should be a public health priority among Indonesian adolescents.

Interventions to promote physical activity are essential in this age group because adolescents experience rapid physical, psychosocial, and cognitive development (Regwelski et al., 2019), affecting their physical activity. Moreover, behavioral interventions in this stage are critical since physical activity

is likely to continue into adulthood (Psaltopoulou et al., 2019; Chaudhry et al., 2020; Flodgren et al., 2020). These interventions require valid and reliable instruments for measuring physical activity. However, although several instruments have been widely used to measure physical activity, such as the International Physical Activity Questionnaire (IPAQ) and Global Physical Activity Questionnaire (GPAQ) (Keating et al., 2019), only a few instruments were available for assessing physical activity among adolescents.

One of the instruments is the Physical Activity Questionnaire-Adolescent (PAQ-A), which is considered a brief and comprehensive instrument which is widely used in the school setting. The validity of the PAQ-A during the instrument development was reported by Kowalski et al. (1997) among eighty-five students in grades 8 to 12. They demonstrated a significant correlation of the PAQ-A with physical activity rating ($r = 0.73$), the leisure time training ($r = 0.57$), a caltrac motion sensor ($r = 0.33$), and the seven days of physical activity recall interview ($r = 0.59$) (Kowalski et al., 1997).

However, while the PAQ-A has demonstrated good validity and reliability in the countries such as Canada (Kowalski et al., 2004), England (Aggio et al., 2016), Poland (Wyszyńska et al., 2019), Turkey (Polat et al., 2021), Malaysia (Koh et al., 2020), Ethiopia (Andarge et al., 2021), and Thailand (Pratanaphon et al., 2020), the validation of the instrument during online or blended learning due to school closure or social restriction associated with COVID-19 preventive measures have not been reported in the literature, including in Indonesian setting. This study, therefore, aimed to evaluate the validity and reliability of the Indonesian version of the PAQ-A in the Indonesian adolescent population during blended learning or online schooling due to the COVID-19 restriction. It is expected that the validated instruments could be used as a basis for evaluating physical activity levels among adolescents in this setting.

Materials and methods

Study participants

This research was a cross-sectional study assessing the psychometric properties of the Indonesian version of PAQ-A among adolescents in the school setting (online and blended learning). The research involved 370 Indonesian adolescents between 11-18 years old. Of those, 63 (17%) participated in the second survey for the test and retest analysis the following week. Participants were provided with written consent and parental consent. The research protocol was approved by the Human Ethics Committee of Universitas Gadjah Mada (approval No. KE/FK/1052/EC/2021).

Instrument and Scoring Procedures

PAQ-A assesses physical activity levels for adolescents in grades 9 to 12 or ages 11 to 18 in a school setting. PAQ-A consists of nine questions about daily physical activity during the week, in and outside the school for the last week. The first question contains sixteen questions that specifically discuss the time used for specific types of physical activity/sports usually carried out by adolescents. Question #2 to #7 ask for their physical activity during leisure time, physical education, lunch, after school, evening, weekend. Item #8

ask the frequency of physical activity during each day of the last week, while the ninth question review changes in physical activity compared to the previous week. For the first eight items, the score ranges from 1-5, in which the highest score indicates a higher physically active level. Scores for item #1 and item #8 are the average of the responses. The final score if PAQ-A is the average of items #1 to #8.

Statistical Analysis

Participants completed the Indonesian version of the PAQ-A online (first survey). They were again contacted in the following week to complete the online questionnaire (second survey). In the first survey, they have also completed questionnaires asking their age, weight, height, family history of obesity, study mode (online or blended), type of school (public or private), and duration of time they spend engaging in moderate-vigorous physical activity.

Age data were categorized into two groups (i.e., early adolescents ranging from 11 to 14 years old, and middle adolescents from 15 to 18 years old). Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and was categorized into underweight (<18.5), normal ($18.5-23.5$), and overweight (>23.5). The family history of obesity was organized into two: the presence and absence of obesity in both the father and or mother, grandfather, and grandmother. Time engaging for physical activity was divided into <60 minutes/day and 60 minutes/day. Group comparisons were made between participants who completed only the first survey and completed twice based on those characteristics using the Pearson Chi-Square test.

Internal reliability consistency of PAQ-A was assessed using Cronbach Alpha, with less than 0.70 to indicate acceptable reliability (Sharma, 2016). We also calculated one-week- test and retest reliability on both the PAQ-A by calculating each item's intra-class correlation (ICC) (single oneway model). The ICC 0.4 to 0.59 was considered fair, >0.60 was considered good, and the ICC >0.75 was considered excellent (Schreiber, 2006). To assess the construct's validity, confirmatory factor analysis (CFA) was used to determine the goodness of fit of the observed data using the hypothesized model structure. Several goods of fit criteria indices were used. First, chi-square (χ^2) of less than 3.00 indicated a good fit (Schreiber, 2006). Second, the Root Mean Square Error of Approximation (RMSEA) less than 0.08 indicated a good fit (MacCallum et al., 1996). Next, the Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) of >0.90 , and the standard value of the root mean Square Residual (SRMR) of <0.08 were also indicators of a good fit (Hu & Bentler, 1999). We also calculated the loading factor for each PAQ-A with factor loadings of 0.30 to 0.50 considered low, 0.50 to 0.70 considered moderate, and 0.70 considered good (Shevlin & Miles, 1998). Data were analyzed using SPSS® version 21.0 (IBM Corp., Armonk, NY, USA), except the CFA uses Lisrel version 8.80 (Jöreskog, 2006, by Karl Jöreskog and Dag Sorbom. Scientific Software International, Inc, Copyright©2006) (Jöreskog, & Sorbom, 1993).

Results

Participants Social Demographic Characteristics

Three hundred and seventy participants completed the first survey, and 63 of them completed the second survey

Table 1. Comparisons of Participants Sociodemographic in the First and Second Surveys

Characteristics	Total * (n = 370)	Only completed the 1 st survey (n = 307)	Also completed the 2 nd survey (n = 63)**	p-value#
Teenage Age (years)	15 ± 2	15 ± 2	15 ± 2	0.897
11-14 (early)	176 (47.6%)	147 (47.9%)	29 (46.0%)	
15-18 (middle)	194 (52.4%)	160 (52.1%)	34 (54.0%)	
Sex				0.811
Female	230 (62.2%)	190 (61.9%)	40 (63.5%)	
Male	140 (37.8%)	117 (38.1%)	23 (36.5%)	
Body mass index				0.554
Underweight <18.5	150 (40.5%)	122 (39.7%)	28 (44.4%)	
Normal weight (18.5-23.5)	170 (45.9%)	141 (45.9%)	29 (46.0%)	
Overweight >23.5	50 (13.5%)	44 (14.3%)	7 (9.5%)	
Family history of obesity				0.475
Yes	147 (39.7%)	125 (40.7%)	22 (34.9%)	
No	223 (60.3%)	185 (59.3%)	41 (65.1%)	
Type of school				0.060
Public	280 (75.7%)	226 (73.6%)	54 (85.7%)	
Private	90 (24.3%)	81 (26.4%)	9 (14.3%)	
Learning Mode				0.378
Mix	170 (45.9%)	146 (47.6%)	24 (38.1%)	
Full online	200 (54.1%)	161 (52.4%)	39 (61.9%)	
Duration of time for physical activity/sports				0.213
< 60 minutes/day	281 (75.9%)	237 (77.2%)	44 (69.8%)	
≥ 60 minutes/day	89 (24.1%)	70 (22.8%)	19 (30.2%)	

Table 2. Descriptive Statistics and Reliabilities Assessments

No	Characteristics	First Survey (n = 370)			Second Survey (n = 63)			ICC
		Mean ± SD	Corrected item-subscale	α if item deleted	Mean ± SD	Corrected item -subscale	α if item deleted	
PAQ-A								
1.	Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times?	1.47 ± 0.37	0.49	0.76	1.49 ± 0.29	0.55	0.77	0.79
2.	In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)?	3.70 ± 0.88	0.25*	0.77	3.76 ± 0.96	0.37*	0.78	0.73
3.	In the last 7 days, what did you normally do at lunch (besides eating lunch)?	1.70 ± 1.05	0.12*	0.80	1.95 ± 1.29	0.22*	0.82	0.83
4.	In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active?	2.40 ± 0.96	0.52	0.73	2.85 ± 1.12	0.69	0.72	0.65
5.	In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active?	2.26 ± 1.13	0.63	0.71	2.92 ± 0.85	0.59	0.74	0.64
6.	On the last weekend, how many times did you do sports, dance, or play games in which you were very active?	2.15 ± 1.02	0.54	0.73	2.58 ± 0.69	0.45	0.76	0.40
7.	Which one of the following describes you best for the last 7 days?	2.14 ± 1.11	0.69	0.70	2.42 ± 1.03	0.70	0.72	0.79
8.	Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week	2.31 ± 0.87	0.68	0.70	2.52 ± 0.81	0.68	0.73	0.81

*=corrected item-total correlation item deleted <0.4

for the retest reliability assessment (17%). Table 1 summarizes and compares the characteristics of participants who completed only the first survey ($n = 307$) and those who completed both surveys in both the first and second surveys ($n = 63$). Overall, the age of the participants ranged from 11-18 years with a mean of 15 ± 2 years. The majority were women, average weight, had no history of obesity in the family, attended public school, learned online, had less than 60 minutes/day of physical activity, and lived in Java Island in Indonesia. Participants who completed only the first survey and completed both surveys were similar in these characteristics ($p > 0.05$).

Descriptive Statistics, and Reliability of PAQ-A

Table 2 summarizes the descriptive statistics of each PAQ-A item as well as the internal consistency and test and retest reliabilities. As seen in Table 2, the Cronbach alpha for the PAQ-A was 0.77 and 0.78 in the first and second surveys. As seen in Table 2, the corrected item subscale of one item of the PAQ-A was below 0.4. However, the ICC for each PAQ-A from 0.40 to 0.81, thus indicating fair to excellent test and retest reliability.

Confirmatory Factor Analysis

The findings from the confirmatory factor analysis are presented in Table 3 and Figure 1.

Table 3 demonstrates that all fitness indexes of the Indonesian translated versions of PAQ-A indicated a good fit

Table 3. Goodness-of-fit statistics of the original and PAQ-A structure ($n=370$)

Characteristics	PAQ-A
χ^2/df	1.35
RMSEA (90%CI)	0.033 (0.000-0.059)
CFI	0.991
TLI	0.987
SMSR	0.062

Note: df, degree of freedom; RMSEA, root mean square approximation; CFI, comparative fit index; TLI, Tucker Lewis index; SMSR, standardized root mean square residual.

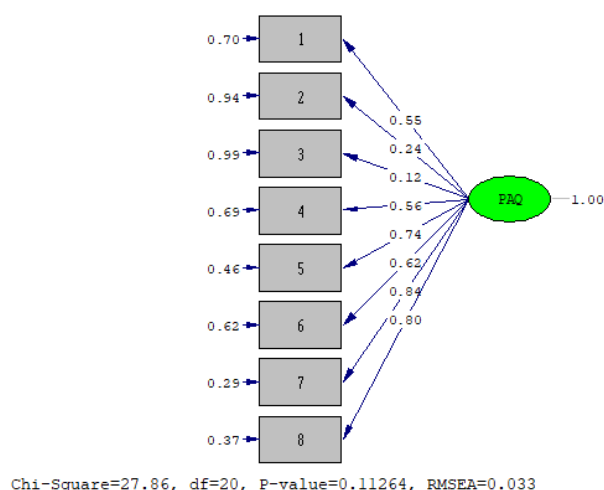


Figure 1. Factor loading PAQ-A

with the original factor structure. Figure 1 further indicates that all items except for items #2 and #3 on the PAQ-A have acceptable factor loadings.

Discussion

This study was the first to validate the PAQ-A in Indonesia and the first to report the validity and reliability of the instrument in the online or blended learning school setting. The overall finding of this study indicates an acceptable internal consistency and test and retest reliability well as a good construct validity of the instrument. The finding from this study suggests that the Indonesian translated version of the PAQ-A questionnaire shows a good and acceptable internal reliability consistency (α -Cronbach of 0.77 and 0.78 in the first and second surveys) and an excellent total intraclass correlation coefficient ($ICC = 0.40-0.83$).

The findings from this study are in line with findings by Aggio et al. (2016) in 169 adolescents with the mean age 14.8 ± 1.7 years in England, which reported α -Cronbach of 0.72 and ICC value of 0.78. It is also in line with findings reported by Wyszynska et al. (2019) in adolescents in 78 Poland age ranged 14-19 years, reporting α -Cronbach of 0.93; $ICC = 0.97$; $r = 0.94$ and $ICC = 0.97$. Our findings are also in corroboration with Polat et al. (2021), who studied PAQ-A among 150 adolescents aged 14-18 years in Turkey, which reported α -Cronbach of 0.86 $ICC = 0.71-0.99$ (Polat et al., 2021). Our findings also support the findings from Koh et al. (2020), who validated PAQ-A in 60 adolescents in Malaysia, age ranged from 15-17 years, which reported with $ICC = 0.72$. It also supports the findings by Pratanaphon et al. (2020) in 96 adolescents in Thailand reporting α -Cronbach of 0.84 and ICC of 0.78, and a study by Andarge et al. (2021) among 110 adolescents aged between 14-19 years old in Southern Ethiopia, which reported α -Cronbach α of 0.74 in their first study and 0.76 in their follow up study. However, the intraclass correlation from the Andarge et al. (2021) study was 0.34 was lower than the finding of our research. The discrepancy might be due to the different intervals of the test and retest study. Their study test and retest interval were 5 weeks, compared to only 1 week in our study thus may be attributed to the discrepancy of these findings.

These previous studies were paper-based surveys conducted during offline schooling, while ours was an online survey conducted during online schooling and blended learning. The findings of this present study, therefore, extend the applicability of the PAQ-A within an online environment. In addition, the overall goodness and fitness test indicate a good fit of the data, thus supporting the use of this instrument in this population. Two items in the PAQ A, however, indicate low factor loadings. These items asked about physical activity during physical education lessons and lunchtime. Participants with full online schooling might have difficulties in answering these questions. Therefore, further studies are required to confirm this finding. Attempt to compare this finding with confirmatory factor analysis on other studies in PAQ-A is limited as studies to validate PAQ-C in the literature are lacking (Cuberek et al., 2021). The finding from this study thus extends the evidence of the PAQ-C construct validity among adolescents in developing countries such as Indonesia during online schooling.

The main strength of our study was that we assessed the validity of the Indonesian version of PAQ-A using standard-

ized guidelines (Kowalski et al., 2004; Johnson et al., 2002). Another strength was that the sample size in our study exceeds the sample size for factor analysis, thereby increasing the accuracy of the estimates (Jackson, 2003). We, however, acknowledge several limitations. First, the study sample was recruited using internet access and social media, so there are limitations in generalizing our findings to adolescents who do not have access to social media. Second, with a cross-sectional design in the study, due to resource limitation, we did not conduct convergent validity of the PAQ-a with the gold standard such as accelerometers, further research to confirm the validity of the PAQ-A compared to the accelerometers, therefore, are recommended.

Conclusions

Preliminary evidence indicates the validity and reliability of the Indonesian version of PAQ-A in Indonesian adolescents to justify the use of the Indonesian translated version of these questionnaires among Indonesian adolescents in blended learning or online school settings. Further research, however, is recommended to confirm the finding of this study.

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Conflict of interest

All authors declare no conflict of interest.

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ВАЛІДНІСТЬ І НАДІЙНІСТЬ АНКЕТ ІЗ ФІЗИЧНОЇ АКТИВНОСТІ (РАQ-A) СЕРЕД ІНДОНЕЗІЙСЬКИХ ПІДЛІТКІВ ПІД ЧАС ДИСТАНЦІЙНОГО ТА ЗМІШАНОГО НАВЧАННЯ В ШКОЛІ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 3 табл., 1 рис., 33 джерела.

Мета дослідження. Це дослідження мало на меті обґрунтування використання анкети з фізичної активності для підлітків (РАQ-A), тобто засобу вимірювання рівнів фізичної активності, який широко використовують у шкільному середовищі, серед індонезійських підлітків, особливо під час змішаного або дистанційного навчання в школі через обмеження внаслідок пандемії COVID-19.

Матеріали та методи. Це дослідження становило собою перехресне опитування 370 індонезійських підлітків (62,2% жіночої статі, середній вік 15 ± 2 роки), які брали участь у процесі дистанційного та змішаного навчання. Учасники заповнювали анкету РАQ-A індонезійською мовою онлайн. Шістьдесят три (17%) учасники заповнили ту саму анкету через тиждень (повторне опитування)

для оцінки надійності результатів повторного тестування, із якого були розраховані коефіцієнти внутрішньогрупової кореляції (ICC). Надійність внутрішньої узгодженості було розраховано в обох опитуваннях, тоді як підтверджувальний факторний аналіз (CFA) було проведено на основі даних, одержаних у першому опитуванні.

Результати. Коефіцієнт альфа Кронбаха анкет PAQ-A для першого та повторного опитувань становив 0,78 та 0,82, таким чином указуючи на прийнятність показників надійності внутрішньої узгодженості. Коефіцієнти внутрішньогрупової кореляції (ICC) для всіх пунктів анкети PAQ-A коливалися в межах від 0,40 до 0,81, показуючи на-

дійність результатів повторного тестування від задовільної до відмінної. Середньоквадратична похибка апроксимації становила 0,033, що дає підстави вважати конструктивну валідність зазначеного вище засобу прийнятною.

Висновки. Як висновок, достатні докази показують валідність і надійність анкет PAQ-A для обґрунтування використання цих анкет для вимірювання рівнів фізичної активності в індонезійських підлітків у шкільному середовищі в умовах змішаної або дистанційної форми навчання.

Ключові слова: валідність, надійність, анкета з фізичної активності, підлітки, Індонезія.

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