ORIGINAL ARTICLE

Association between Self Reported Questionnaire-determined Physical Activity Level with the Cardiorespiratory Fitness in Adolescent

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ABSTRACT

Introduction: Cardiorespiratory fitness (CRF) and physical activity (PA) in childhood can reduce the risk of cardiovascular diseases in adults. Further analysis related to the relationship between PA and CRF to prevent an inactive lifestyle is needed

Methods: An analytic cross-sectional design in adolescents aged 13-15 years old, who had no cardiovascular and metabolic diseases, with light or medium physical activity, no deformity in the lower limbs and posture disorders. Cardiorespiratory fitness was assessed by the indirect method Bruce Protocol in the Faculty of Sport and Health Education's library, The University of Pendidikan Indonesia on September-October 2019. Physical activity was measure by the Physical Activity Questionnaire for Adolescent (PAQ-A).

Results: Subjects consisted of 82 adolescents (41 boys, 41 girls), aged 13-15 years old with the Body mass index (BMI) was 18.5-29 kg/m^2. The mean value of predicted VO_2max (Bruce) for boys and girls were 46.66 ± 8.765 and 40.06 ± 6.210 ml/kg^2, while the value of predicted PAQ-A score for boys and girls were 2.54 ± 0.756 and 2.16 ± 0.416. The correlation between PAQ-A and VO_2max in boys and girls were r=0,190, p=0,234 and r=0.420; p=0.006.

Conclusion: There was a moderate association between PAQ-A with VO_2max in girls.

Keywords: *Cardiorespiratory fitness, Physical activity questionnaire, VO_2max.*

ABSTRAK

Pendahuluan: Kebugaran kardiorespirasi dan tingkat aktivitas fisik pada masa kanak-kanak akan menurunkan risiko penyakit kardiovaskular pada masa dewasa. Analisa lebih lanjut terkait hubungan antara aktivitas fisik dan kebugaran kardiorespirasi untuk mencegah gaya hidup tidak aktif sangat diperlukan.

Metode: Desain potong lintang analitik dilakukan pada remaja usia 13-15 tahun, yang tidak memiliki penyakit kardiovaskular dan metabolik, dengan tingkat aktivitas fisik ringan-sedang, tidak memiliki deformitas di anggota gerak bawah dan gangguan postur. Kebugaran kardiorespirasi dinilai dengan uji latih Bruce di laboratorium olahraga Fakultas Pendidikan Olahraga dan Kesehatan, Universitas Pendidikan Indonesia pada bulan September-Oktober 2019. Tingkat aktivitas fisik dinilai menggunakan *Physical Activity Questionnaire for Adolescent* (PAQ-A) dalam versi Indonesia.

Hasil: Sebanyak 82 remaja (41 laki-laki, 41 perempuan), berusia 13-15 tahun dengan *Body Mass Index* (BMI) 18.5-29 kg/m^2. Nilai rerata prediksi VO$_2$maks (Bruce) pada remaja laki-laki dan perempuan adalah 46.66±8.765 dan 40.06±6.210 ml/kg^2, sedangkan skor PAQ-A remaja laki-laki dan perempuan adalah 2.54±0.756 dan 2.16±0.416. Korelasi antara PAQ-A and nilai prediksi VO$_2$maks pada laki-laki dan perempuan adalah r=0,190, p=0,234 dan r=0.420, p = 0.006.

Kesimpulan: Terdapat hubungan sedang antara PAQ-A dan VO$_2$maks pada remaja perempuan.

Kata kunci: *Kebugaran kardiorespirasi, kuesioner aktivitas fisik, VO$_2$maks.*

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INTRODUCTION

Recent studies have shown that higher CRF in childhood and adolescence is associated with lower BMI, body fatness, and metabolic syndrome incidence in 2 years later.[1–6] Physical activity is important for improving cardiorespiratory fitness. Several studies have demonstrated that more active children have better cardiorespiratory fitness.[7,8] These findings showed a correlation between physical activity and physical fitness, in improving cardiorespiratory fitness.[9] The development of cardiovascular disease started in childhood and developed along adulthood. Controlling the risk factors earlier is needed and should be done by simple screening tools at school.

Basic Health Research by Indonesian Health Ministry (RISKESDAS) 2018 has showed that inactive young Indonesians age of 10

years and above, increasing from 26,1% in 2013 became 33,5% in 2018. These results linear with the percentage of obese population over 18 years old, that was also increase from 19,7% in 2013, to 21.8% in 2018. Those research data also showed prevalence of non communicable diseases, i.e. diabetes mellitus, hypertension, stroke, and heart disease, can be has correlation with poor physical activity and obesity, which also increased from 2013 to 2018.[10] It is necessary to screening physical activity level of Indonesian adolescents by simple screening tools, to prevent inactivity and promote active lifestyle. Considering the archipelago of Indonesia geographical conditions, then the simple screening tool such as self-administered habitual physical activity questionnaire was needed.

It was difficult to determine the best instruments to assess physical activity, because there was still no gold standard examination. Some instruments that have been used include a variety of physiological indicators, laboratory methods, direct observation, motion sensors, and self-report measures.[11] Self-report measures are most frequently done for the assessment of physical activity levels in children and adolescents, because they are low in cost and can be easily administered to large populations. In response to the need for a valid and feasible self-report measure for large-scale research with children and adolescents, the Physical Activity Questionnaire for Adolescents (PAQ-A) were developed.[12] Dapan et al., had validated PAQ-A Questionnaire in Indonesian adolescent and stated that PAQ-A have good and reliable concurrent validity.[13] Although associations of physical activity that measured

by pedometer have been commonly reported, the relationship of self-reported questionnaire physical activity level with CRF in Indonesia children not well established. Therefore, the aim of this study is to investigate whether physical activity levels that measured by self reported questionnaire associated with levels of CRF in adolescent.

METHODS

This experimental study was reviewed and approved by the research and ethics review committee of Faculty of Medicine, University of Padjadjaran, Bandung, Indonesia. All of the subjects and parents have given their informed consent and filled out the Physical Activity Readiness Questionnaire (PAQ-R) before participating in the study.

The inclusion criteria of the study were adolescents aged 13-15 years old, participant and their parents agree to participate and sign the informed consent. The exclusion criteria of the study were having congenital heart disease, type 2 Diabetes, asthma bronchial, obese (BMI>30kg/m^2), and having a deformity in lower extremity and scoliosis.

Eighty-two participants (41 boys, 41 girls) who met the inclusion criteria were recruited at Baptist Junior high School in Bandung. Participants were examined by researcher to confirm the eligibility at Baptist Junior High School auditorium on September-October 2019. Participants who did not follow all of the study procedure or did not attend the exercise testing were dropped out. A self-administered habitual physical activity

questionnaire in Indonesian version that has been validated by Dapan et al was used.[13] The PAQ-A addresses a habitual physical activity in the last 7 days. The PAQ-A consists of three sections, including physical activity in school, during transportation and leisure-time. Each section is further divided into different activity categories. School section: physical education and breaks between lessons with options for different intensity levels, and sitting at lessons. Transportation section: walking and bicycling at least 10 min at a stretch, and going by a motor vehicle. Leisure-time section: activities at least 10 min long at two different intensity levels along with walking at least 10 min at a stretch and sitting activities.[12]

Cardiorespiratory fitness assessed by exercise testing to predicting VO_2max using Bruce protocol at sport laboratory of Sport and Health Education Faculty, University of Pendidikan Indonesia, on September-October 2019. Bruce exercise testing was held not more than 3 days after physical activity measurement. Heart rate of participant recorded by Polar monitor heart rate. Subjects were instructed to walk and run on treadmill (En-Mill) that was programmed for increases in grade and speed every 3 minutes as outlined by Bruce et al. Calibrations for grade and belt speed were checked at frequent intervals. Each subject was urged to continue to the point of severe fatigue and subjects were persuaded to perform maximal or at least very close to maximal exercise. The tested ended while the subject cannot continue the test because of any reason.

This observational analytic study use cross-sectional design. Data was analyzed using Pearson correlation test. Statistically significance was determined with p value <0.005. All statistical analysis performed using SPSS version 21.0 for Windows.

RESULTS

Total numbers of participants involved in the study were 120 subjects. Random selection of subjects based on the serial number of attendance list. There were 100 participants who met the inclusion criteria. Finally, there were 82 subjects participated in this study, consisting of 41 boys and 41 girls.

Table 1. The Physical Activity and Cardiorespiratory Fitness

	Boys	Girls
PAQ-A	2.54±0.756	2.16±0.416
VO_2max ml/kg^2	46.66±8.765	40.06±6.210

Table 2. The correlation between Physical Activity and Cardiorespiratory Fitness

PAQ-A and VO_2max	r	p
Boys	0,190	0,234
Girls	0.420	0.006*

*Pearson-test

Pearson's correlation test showed the moderate correlation between PAQ-A and VO_2max in girl (r=0.420; p = 0.006). The PAQ-A and VO_2max in boys were higher than the girls.

DISCUSSION

This study analyzed the relationship between physical activity level using PAQ-A questionnaire and cardiorespiratory fitness (VO_2max) in Adolescent. The results study showed moderate correlation between PAQ-A questionnaire and VO_2max in girls. This evidence demonstrated that a girl who was physically active might have higher cardiorespiratory fitness level than inactive children. The data from this study was similar with result study by Latt et al. , that observed the American youth.[12] Another research by Aires et al in Portugal showed relationship between physical activity with cardiorespiratory fitness. Aires used physical activity index to measure physical activity.[7] Adequate physical activity will affect the distribution of minute ventilation, distribution of muscle fibers type and body composition, which was in turn affects cardiorespiratory fitness.[12]

The data from this study has showed moderate correlation between the score of PAQ-A and the VO_2max, while there was no correlation as in boys. Voss et al showed only weak correlation between PAQ-A score in adolescent boys (r=0,273, P<0,001).[14] Such typical weak-to-moderate associations between CRF and PA may in part be explained by genetics, which accounts for up to 30% of the variance in CRF and responsiveness to training.[15] Peter et al have found the fact that PAQ-A have inability to capture duration and intensity of PA.[16] Duration and intensity of physical activity are related to VO_2max in a dose–response manner.[6] Another limitations of self-administered habitual physical activity questionnaire may be limited by the dependency on written language (i.e., questions) and external factors (i.e., social desirability, complexity of the questionnaire, age, and seasonal variation). [16] Despite of PAQ-A limitations author observed that there is associations of expected strengths and direction of PAQ-A as a tool to estimate general levels of PA.

This study has limitation, i.e. the lack number of subjects, the subjects recruited only from one location, the PAQ-A was subjective examination that can be deviation, particularly when the subjects were not focus. Therefore, the result from this study regarding relationship between physical activity and cardiorespiratory fitness levels in adolescent girls should be interpreted carefully. The results of this study can be generalized to the similar populations. Another limitation was the cardiorespiratory fitness assessed by indirect measurement of VO2max. However, previous studies have demonstrated a high correlation between VO_2max indirect and direct in Bruce exercise testing.[17,18]

CONCLUSION

The self-reported questionnaire (PAQ-A) to determined physical activity level has a moderate association with cardiorespiratory fitness in girls. The self-reported questionnaire to determined physical activity can be used to assessed the physical activity level, and to predict the cardiorespiratory fitness as a health predictor in girls.

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