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ANALYSIS OF THE SELF-REPORTED PHYSICAL ACTIVITY QUESTIONNAIRES INDICATORS

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Abstract. *"Global action plan on physical activity 2018–2030" emphasizes the need for weekly moderate physical activity for ensuring human health. Physical activity can be measured by a variety of objective and subjective methods, but one of the prerequisites for understanding the connection between active lifestyle and health certainty that the measuring instrument measures the feature for which it has been created and that it can be used in many countries. The goal of the research is to determine the correlations between measurement properties of fitness club clients' self-reported physical activity indicators in the Global Physical Activity Questionnaire (GPAQ), International Physical Activity Questionnaire (IPAQ), European Health Interview Survey-Physical Activity Questionnaire (EHIS-PAQ), and to evaluate their concurrent validity. Methods: participants (volunteers) were 70 fitness club visitors (age 18-79). This research is preparative part for the further research of the project "European Physical Activity and Sports Monitoring System (EUPASMOS)". The type, involvement and amount of physical activity was determined by the GPAQ, IPAQ and EHIS-PAQ adapted into Latvian. The research results showed that questionnaires allowed to determine the respondents' physical activity indicators in and out of fitness club activities. Statistically significant correlations were determined between indicators obtained in all physical activity questionnaires applied in the research ($p<0.05$). This confirms that all three physical activity determination questionnaires can be used for physical activity research in Latvian environment.*

Keywords: *GPAQ, IPAQ, EHIS-PAQ concurrent validity, measurement properties, physical activity.*

Introduction

Today's dynamic rhythm of life, the ever-increasing mental and physical loads, combined with hypodynamics and harmful habits, have become human health problems and predisposing factors to the reduction of life expectancy in the world's leading countries (Kohl, 2012). The significance of physical activity in promoting human physical and mental health has been scientifically proven;

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however, despite the efforts to promote populations' movement activity, scientists note that many inhabitants prefer to watch physical activities but do not engage in the process themselves (Cardinal, 2016). Based on recommendations by the World Health Organization (WHO), it is advised to those who have come of age to have at least 150 minutes of weekly moderate intensity physical activity. In contrast, statistics for 2016 show that 20% of men and 27% of women have indicated low levels of physical activity, even reaching up to 55% for seniors (WHO, 2017).

The modern urbanization process contributes to the reduction of people's physical activity, as the amount of green spaces is reduced in cities due to the increase of building density, which also affects the physical activity frequency of inhabitants. The question of which measuring instruments are optimally suited for physical activity determination and research, their reliability and validity in a particular cultural environment has become more topical in a global context (Baumeister et al., 2016; Wanner et al., 2017; Helmerhorst et al., 2012; Van Poppel et al., 2010; Craig et al., 2003), as well as comparative studies of various physical activity determination instruments are actively being carried out in the world (Raask et al., 2017; Rivière et al., 2016; Bull et al., 2009). The goal of the research is to determine the correlations between measurement properties of fitness club clients' self-reported physical activity indicators in the GPAQ, IPAQ and EHIS-PAQ questionnaires and to evaluate their concurrent validity. Methods: research participants were 70 fitness club visitors (volunteers) aged from 18 to 79. The concurrent validity of the physical activity determination questionnaires GPAQ, IPAQ and EHIS-PAQ adapted into Latvian was determined.

Research Methodology

This research is preparative part for the further research of the project "European Physical Activity and Sports Monitoring System (EUPASMOS)". The research used GPAQ, IPAQ, EHIS-PAQ questionnaires to collect information on the respondents' physical activity types and aspects promoting participation in physical activity. Respondents were asked to fill out a self-completion questionnaire. The questionnaires were filled up at the same time.

Research respondents – clients (volunteers) of fitness clubs in Riga (n=70), of which 30 were men (42.9%) and 40 were women (57.1%) aged from 18 to 79. The average age of respondents was 25.8 years. By using questionnaires, an informative basis was obtained on the correlations between physical activities of fitness club visitors. A survey of population's health factors was conducted with the EHIS-PAQ (European Health Interview Survey-Physical Activity Questionnaire). The questionnaire consists of several sections: individual and household characteristics; health-impacting module; questions about physical

activity; movements; rest and leisure physical activities. In total, the questionnaire consists of 19 questions. IPAQ (International Physical Activity Questionnaire) has two variants: the short one (IPAQ short) and the long one (IPAQ long), the research analysed both variants. The IPAQ short questionnaire consists of 7 questions: questions about voluminous, moderate physical activity; movements and sitting. The IPAQ long variant consists of 27 questions, which are divided into 5 parts: physical activity during work duties; movements; house work; household maintenance; caring for the family; rest, sport and physical activity in leisure; the time spent sitting. GPAQ (Global Physical Activity Questionnaire) is a 16-question questionnaire divided into 4 sections: activity at work; movement to and from different locations; leisure activities; sedentary behaviour. Concurrent validity is characterized by the Pearson correlation coefficient. The most important criterion is the statistical significance of the correlation coefficient. The research also identified weak statistically significant correlations, and this article analyses statistically significant ($p<0.05$) close or moderately close correlations. The results were processed using the Statistical Package for the Social Sciences (SPSS) version 23.0.

Research Results

By analysing statistically significant correlations between the content indicators of the EHIS-PAQ and IPAQ (short) questionnaires, moderately close correlations were determined. The question "How many days in a usual (typical) week do you walk at least 10 minutes without a rest?" shows a moderately close positive correlation with the question "In how many days (during the last 7 days) have you walked for at least 10 minutes without a rest?" ($r=.533$; $p<0.01$). Both questionnaires analyze the question of respondents' movement on foot. There is a negative correlation between the question "How many days in total in the last 12 months have you not attended work for health reasons?" and the question "In how many days (during the last 7 days) have you walked for at least 10 minutes without a rest?" ($r=-.454$; $p<0.05$), which leads to the conclusion that the more days the respondents do not go to work due to health problems, the less they moved on foot.

The correlation analysis between the indicators of the EHIS-PAQ and IPAQ (long) questionnaires showed a positive close correlation between the question "What is your employment status in your main job?" and the question "Are you currently employed?" ($r=.749$; $p<0.01$), where the employment status is closely related to whether or not the respondent is employed. There is a negative moderately close correlation between the question "How many days in total in the last 12 months have you not attended work for health reasons?" and the question "How much time (in the last 7 days) "did you walk from one place to another?"

(r=-.637; p<0.01). The more days the respondents skip work due to health problems, the less they moved on foot. Respondents' walking for more than 10 minutes is related to moving around the workplace. From this it can be concluded that for some respondents, physical activities related to walking are promoted by work conditions, which motivate them to move more, not by their leisure time (r=.523; p<0.01). There is a positive close correlation between the question "How many days in a usual (typical) week do you ride a bicycle for at least 10 minutes without a rest?" and the question "In how many days (in the last 7 days) did you ride a bicycle for at least 10 minutes without a rest, moving from one place to another?" (r=.719; p<0.01), both questionnaires analyse answers to the question on respondents' movements with a bicycle.

Correlations between indicators of the EHIS-PAQ and GPAQ (short) questionnaires. There is a negative moderately close correlation between the gender of the respondents and the question "How many days a week do you usually perform moderate intensity activities as part of your work?" (r=-.581; p<0.01), which shows that the respondents – men do moderate intensity activities less often as part of the work to be done.

There is a positive moderately close correlation between the question "What is your legal family status?" and the question "Do you perform high intensity sport, physical activity (fitness) or leisure (entertainment) activities that lead to a sharp increase in breathing or heart rate (for example, running or football) continuously for at least 10 minutes?" (r=.568; p<0.01).

Respondents who are not married are mostly engaged in high intensity sport physical activity. There is a negative moderately close correlation between the question "How many days in total in the last 12 months have you not attended work for health reasons?" and the question "How much time per day do you usually spend in moderate intensity sport, fitness or leisure (entertainment) activities?" (r=-.538; p<0.05). Respondents, who spend less time doing moderate intensity sport, fitness or leisure activities, fall sick more often. There is a positive moderately close correlation between the question "How many days in total in the last 12 months have you not attended work for health reasons?" and the question "How much time do you usually spend sitting or sleeping each day?" (r=.540; p<0.01). Respondents, who spend more time sitting or sleeping, fall sick more frequently. Between the question "What is your height without shoes?" and the question "How many days per week do you usually perform moderate intensity activities as part of your work?", a positive moderately close correlation (r=.541; p<0.01) was found. There is a negative moderately close correlation between the question "What is your weight without clothes and shoes?" and the question "How much time a day do you usually spend in moderate intensity sport, fitness or leisure (entertainment) activities?" (r=-.560; p<0.01). Respondents with lower body weight spend longer periods of time engaging in moderate intensity physical

activity. From this it can be assumed that if the respondent devotes more time to moderate intensity physical loads, their body weight decreases.

The correlations between the content indicators of the IPAQ (short), IPAQ (long) questionnaires were determined. There is a positive moderately close correlation between the question "How much time on one of the last 7 days did you spend performing very hard physical work?" and the question "How long did you usually perform very hard physical activities in any of the last 7 days?" ($r=.649$; $p<0.01$). There is a positive moderately close correlation between the question "How much time on one of the last 7 days did you spend performing moderately intensive physical work?" and the question "How long did you usually perform moderately hard physical activities in any of the last 7 days?" ($r=.634$; $p<0.01$). Both questionnaires ask similar questions about moderately intensive physical work. There is a positive moderately close correlation between the question "In how many days (in the last 7 days) did you walk for at least 10 minutes without a rest, moving from one place to another?" and the question "In how many days (in the last 7 days) did you walk for at least 10 minutes without a rest?" ($r=.682$; $p<0.01$). Both questionnaires analyse similar content. There is a positive moderately close correlation between the question "How much time during one of these days did you walk, moving from one place to another?" and the question "For how long did you usually walk on any of these days?" ($r=.610$; $p<0.01$). There is a positive close correlation between the question "How much time on any of the last 7 days did you spend performing very hard physical work in the garden or in the backyard?" and the question "How long did you usually perform very hard physical activity on any of the last 7 days?" ($r=.746$; $p<0.01$). The more time the respondent spends performing very hard physical activity in the household (garden or backyard), the more time the respondent spends performing very hard physical activity and vice versa. There is a positive moderately close correlation between the question "How much time on any of the last 7 days did you spend performing moderately intense physical work in the garden or in the backyard?" and the question "How long did you usually perform very hard physical activity on any of the last 7 days?" ($r=.514$; $p<0.05$). The more or less time the respondent performs moderately intensive physical work in the garden or in the backyard, the accordingly longer or shorter is the total time spent in very hard physical activity. There is a positive close correlation between the question "How much time on one of the last 7 days did you spend performing moderately intensive physical work in the garden or in the backyard?" and the question "How long did you usually walk on any of these days?" ($r=.738$; $p<0.01$). The longer the respondents perform moderately intensive work in the garden or in the backyard, the longer time they spend walking. There is a positive moderately close correlation between the question "How much time did you spend walking during leisure on one of these days?" and the question "How long did

you usually walk on any of these days?" (r=.543; p<0.01). Both questionnaires ask similar questions about the time the respondent spends walking, thus, they correlate with each other. The correlation shows the tendency that the more time the respondent spends walking during leisure, the greater the total time the respondent spends walking. There is a positive moderately close correlation between the question "How much time on one of the working days (in the last 7 days) did you spend sitting?" and the question "How long did you usually perform moderately hard physical activity on any of the last 7 days?" (r=.574; p<0.01). The longer the respondents perform moderately hard physical activity, the longer time they spend sitting after that. There is a positive moderately close correlation between the question "How much time did you spend sitting on one of the holidays (in the last 7 days)?" and the question "How much time did you usually spend sitting on any of the work days (in the last 7 days)?" (r=.543; p<0.01). Both questionnaires ask similar questions about the time the respondents spend sitting, thus, they correlate with each other.

Correlation analysis between the indicators of the IPAQ (short), GPAQ questionnaires also provides insight into their interrelations. There is a positive moderately close correlation between the question "Does your work include high intensity activities, which cause a sharp increase in breathing or heartbeat frequency (for instance, carrying or lifting heavy loads, digging or building) for at least 10 minutes without a rest?" and the question "How much time did you usually spend sitting at any work day (in the last 7 days)?" (r=.511; p<0.05). Analysis showed correlation between high intensity work and the time that the respondent later spends sitting. There is a positive weak correlation between the question "Does your work include high intensity activities, which cause a sharp increase in breathing or heartbeat frequency (for instance, carrying or lifting heavy loads, digging or building) for at least 10 minutes without a rest?" and the question "How long did you usually perform very hard physical activity on any of the last 7 days?" (r=.474; p<0.05). If the respondent in the first question has answered that at work they perform high intensity activities, then the second question shows an increase of the time to perform very hard physical work. There is a positive weak correlation between the question "How much time a day at work do you usually spend in moderate intensity activities?" and the question "How long did you usually perform moderately hard physical activity on any of the last 7 days?" (r=.491; p<0.01). There is a positive correlation between the question "How many days a week do you usually walk or ride a bicycle for at least 10 continuous minutes to get to and from different places?" and the question "On how many days (in the last 7 days) did you walk for at least 10 minutes without a rest?" (5=.478; p<0.01). Both questionnaires ask similar questions, thus, they correlate with each other. There is a positive weak correlation between the question "How much time a day do you usually spend walking or riding a bicycle

to move around?" and the question "For how long did you walk on any of the last 7 days?" (r=.479; p<0.01). There is a positive weak correlation between the question "How much time a day do you usually spend in high intensity sport, fitness or leisure (entertainment) activities?" and the question "On how many days (in the last 7 days) did you perform very hard physical activity, such as weightlifting, digging, aerobics or fast cycling?" (r=.427; p<001). There is a negative correlation between the question "Did you perform moderately intensive sport, physical activity (fitness) or recreation (leisure) activities, which cause a slight increase in breathing or heartbeat rate continually for at least 10 minutes (for example, fast walking, cycling, swimming, volleyball)?" and the question "For how long did you usually perform moderately hard physical activity on any of these days?" (r=-.407; p<0.01). There is a positive weak correlation between the question "How much time per day do you usually spend in moderate intensity sport, fitness or leisure (entertainment) activities?" and the question "For how long did you usually walk on any of these days?" (r=.470; p<0.01).

Correlation analysis between indicators of the IPAQ (long), GPAQ questionnaires. There is a positive close correlation between the question "How many days a week do you usually perform high intensity activity as part of your work?" and the question "On how many days (in the last 7 days) did you perform very hard physical work, for example, weightlifting, digging, heavy construction work, climbing stairs?" (r=.860; p<0.01). The physically more difficult work is done by the respondents, the higher the intensity. There is a positive close correlation between the question "How much time a day do you usually spend in high intensity activities at work?" and the question "How much time on one of these days did you spend performing very hard physical work?" (r=7.83; p<0.01). The research found a positive close correlation between the question "How much time a day do you usually spend in high intensity activities at work?" and the question "How much time on one of these days did you spend performing moderately intensive physical work in the garden or in the backyard?" (r=.708; p<0.05). There is a close correlation between the question "How many days a week did you usually perform moderate intensity activities as a part of your work?" (r=.700; p<0.01). There is a positive close correlation between the question "How many days a week do you usually walk or ride a bicycle for at least 10 minutes without a rest to get to and from different places?" and the question "On how many days (in the last 7 days) did you walk for at least 10 minutes without a rest, moving from one place to another?" (r=.724; p<0.01).

Discussion

The WHO Global Strategy foresees the need for improvements in the health surveillance system for collecting data on population's physical activity in all

countries. Determining the validity of various physical activity detection tools is an important pre-condition for further monitoring of population's physical activity.

The international study (Craig et al., 2003) has demonstrated that reliable and valid physical activity data can be collected by the IPAQ instruments in many countries and this study also identified statistically significant correlations between indicators of all physical activity questionnaires (GPAQ, IPAQ (S), IPAQ (L) and EHIS-PAQ). The highest number of correlations is between the IPAQ (L) variant and GPAQ – 82 correlations, including 5 close correlations ($0.7<r<0.99$) and 13 moderate correlations ($0.5<r<0.69$), while the rest are weak correlations. The lowest number of correlations is between IPAQ (S) and GPAQ – 22 correlations. These include 1 moderate correlation ($0.5<r<0.69$) and the rest are weak correlations ($0.2<r<0.49$). Concurrent validity of GPAQ was assessed using IPAQ, overall, the results showed an acceptable level of association (0.45 to 0.57) (Bull et al., 2009).

The results of the study show that these instruments are ready for use to compare population estimates of physical activity. However, in order to prove that the test measures the trait for which it was created, it is necessary to determine not only the concurrent validity, but also the criterion validity (Helmerhorst et al., 2012) by comparing self-reported levels of physical activity with an objective assessment captured by an accelerometer.

Conclusions

There are statistically significant correlations between the content indicators of all three physical activity questionnaires, but most moderate and strong correlations were determined between IPAQ (short) and IPAQ (long) ($p<0.05$).

Between EHIS-PAQ indicators and IPAQ (short), IPAQ (long) and GPAQ (short) forms, 12 moderate and strong correlations ($p<0.05$) were found:

With the IPAQ (**short)** variant, there are two moderate statistically significant correlations. Both questionnaires analyse the question of respondents' walking ($r=.533$; $p<0.01$); and a correlation between the number of days skipped at work due to health problems and the amount of walking ($r=-.454$; $p<0.05$). With the **IPAQ (long)** variant, there are three strong and 1 moderate correlation ($p<0.05$). The employment status is closely to whether the respondent is employed ($r=.749$; $p<0.01$). The more days the respondents skip work due to health problems, the less they walk and vice versa ($r=.-637$; $p<0.01$). Physical activity related to walking is related to the type of leisure time activity ($r=.523$; $p<0.01$). There is a correlation between the question indicators that analyse cycling ($r=.719$; $p<0.01$). With the **GPAQ (short) variant,** there are six moderate correlations ($p<0.05$). There is a moderate correlation between the average

intensity activities as part of work and gender (r=-.581; p<0.01). Between high intensity sport physical activity and family status (r=.568; p<0.01). Between illness frequency and average intensity physical activity (r=-.538; p<0.05). Between the number of illness cases and the time spent sitting or sleeping (r=.540; p<0.01). Between average intensity daily load and respondents' height indicators without footwear (r=.541; p<0.01) and weight indicators without clothing and footwear (r=-.560; p<0.01).

Between IPAQ (short) and IPAQ (long), there are 10 moderate and strong correlations (p<0.05). There is a correlation between the time spent performing very hard physical work and hard physical activity (r=.649; p<0.01); there is a correlation between moderate intensity physical work and moderately hard physical activity (r=.634; p<0.01), between walking (r=.682; p<0.01), as both questionnaires analyse similar content. Walking on one of the days and how it is in everyday life (r=.610; p<0.01). There is a correlation between performing hard physical work in the garden or in the backyard and the time spent in the same period of time performing hard physical activity (r=.746; p<0.01) and moderate physical activity (r=.514; p<0.05). Between performing moderate physical intensity in the harden or in the backyard and walking (r=.738; p<0.01). Walking in free time is related to the total walking time (r=.543; p<0.01). The time spent sitting during work time is related to the amount of moderately hard physical activity (r=.574; p<0.01), as well as to the amount of time spent sitting (r=.543; p<0.01).

Between IPAQ (long) and GPAQ, there are five close correlations (p<0.05). There are correlations between answers to the question about how many days a week high intensity activities are performed, as part of work and the performed hard physical work (r=.860; p<0.01), as well as if on one of these days very hard physical work is performed (r=7.83; p<0.01), with moderately intensive physical work in the garden or in the backyard (r=.708; p<0.05), with average intensity activities as part of work (r=.700; p<0.01). There is a correlation between the weekly time spent riding a bicycle and walking (r=.724; p<0.01).

Between IPAQ (short) and GPAQ five correlations have been found (p<0.05). High intensity activities as part of work correlates with performing hard physical work (r=.860; p<0.01). High intensity physical activities at work and very hard physical work on one of the days (r=.783; p<0.01), as well as with moderately intensive work in the garden or in the backyard (r=.708; p<0.05). There is correlation between question indicators related to average intensity activities as part of work (r=.700; p<0.01). There is also correlation between the respondents' answers to cycling and walking (r=.724; p<0.01).

References

Baumeister, S., Ricci, C., Kohler, S., 1, Fischer, B., Töpfer, C., Finger, J., & Leitzmann, M. (2016). Physical activity surveillance in the European Union: reliability and validity of the European Health Interview Survey- Physical Activity Questionnaire (EHIS-PAQ) *International Journal of Behavioral Nutrition and Physical Activity,* 1-11, DOI 10.1186/s12966-016-0386-6

Bull, F.C., Maslin, T.S., & Armstrong, T. (2009). Global Physical Activity Questionnaire (GPAQ): nine country reliability and validity study. *Journal of physical activity & health, 6,* 790–804. PMID: 20101923

Cardinal, B.J. (2016). Physical Activity Education's Contributions to Public Health and Interdisciplinary Studies: Documenting More than Individual Health Benefits, *Journal of Physical Education, Recreation & Dance, 87,* 4, 3-5. DOI: https://doi.org/10.1080/07303084.2016.1142182

Craig, C.L., Marshall, A.L., Sjostrom, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*., *35*, 1381–95. DOI: 10.1249/01.MSS.0000078924.61453.FB.

Helmerhorst, H., Brage, S., Warren, J., Besson, H., & Ekelund, U. (2012). A systematic review of reliability and objective criterion-related validity of physical activity questionnaires. International Journal of *Behavioral Nutrition and Physical Activity, 9,* 103, DOI: 10.1186/1479-5868-9-103

Kohl, H. 3rd, Craig, C., Lambert, E., Inoue, S., Alkandari, J.R., Leetongin, G., & Kahlmeier, S. (2012). *The pandemic of physical inactivity: global action for public health.* Lancet Physical Activity Series Working Group. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/22818941

Raask, T., Latt, E., Jurimae, J., Jurimae, T., Vainik, U., & Konstabel, K. (2017). Comparison of IPAQ-SF and Two Other Physical Activity Questionnaires with Accelerometer in Adolescent Boys. *PLoS ONE, 12*(1), e0169527. DOI:10.1371/journal.pone.0169527

Rivière, F., Widad, F.Z., Speyer, E., Erpelding, M.L., Escalon, H., & Vuillemin, A. (2016). Reliability and validity of the French version of the global physical activity questionnaire. *Journal of sport and health science, 7*(3), 339-345. DOI: 10.1016/j.jshs.2016.08.004

Van Poppel, M.N., Chinapaw, M.J., Mokkink, L.B. et al. (2010). Physical activity questionnaires for adults: a systematic review of measurement properties. *Sports Medicine, 40*(7), 565-600. DOI: 10.2165/11531930-000000000-00000

Wanner, M., Hartman, C., Pestoni, G., Martin, B., Siegrist, M., & Martin-Diener, E. (2017). Validation of the global physical activity questionnaire for self-administration in a European context. *BMJ Open Sport Exercise Medicine, 3*(1), e000206.

WHO (2017). *World Health organization*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/physical-activity