REVIEW ARTICLE

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Physical activity of Poles – Critical analysis of research 2010–2014

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Abstract

The aim of the study was an analysis of research on the physical activity (PA) carried out among Poles from 2010 – 2014 on a national scale. The obtained results concerning PA and recommended levels of PA, in particular those issued by the World Health Organization (WHO), were taken into consideration. The research articles were obtained through searching English-language scientific databases and common search engines. National-level research conducted within the Polish population aged 10 years and above were taken into account. Studies presenting the PA of Poles without division into age categories were excluded. Seven research papers presenting studies on children and adolescents (aged 10–18 years), adults (aged 19–64 years) and older adults (aged 65+ years) were included into the subsequent analysis. When referring to the accepted criteria within the PA research satisfactory levels of PA were observed in: a) 4.2% – 91.4% of female subjects and 17.9% – 93.8% of male subjects aged 10–18 years, b) 9.2% – 77.6% of male subjects and 12.0% – 77.6% of female subjects aged 19–64 years, c) 11.9% – 50.7% of male subjects and 11.1% – 50.7% of female subjects aged 65 years and above. The results obtained in the study demonstrate a very wide variability of PA levels, thus rendering these results implausible. Recommendations issued by the WHO for the PA were assumed in only two cases. The study was conducted by use of the self-reported method, primarily with research tools which did not meet psychometric standards were employed. It is necessary to perform systematic studies on the methodological correctness of research on the PA of Poles. On the basis of the study carried out from 2010 – 2014 it is difficult to answer reliably the question: 'What are the levels of PA of Polish subjects?'

Key words

physical activity, children, adolescents, adult, elderly, Poland

INTRODUCTION

Physical activity (PA) undertaken at recommended levels is associated with multiple health benefits and lowers the risk of various illnesses in people, irrespective of their age [1]. Physical inactivity is the fourth risk factor – after hypertension, smoking and high glucose levels – of premature morbidity worldwide [2]. The World Health Organization (WHO) [3] recommends that children and adolescents aged 5–17 should accumulate at least 60 minutes of moderate to vigorous intensity PA daily. Most of the PA should be aerobic. Activities strengthening muscle and bone should be undertaken at least 3 times per week. Regular PA among children and young people improves the cardiovascular system, quality of bones, helps in maintaining a healthy body weight and reduces symptoms of depression [1, 4, 5, 6].

For adults aged 18–64 years, at least 150 minutes of moderate-intensity aerobic PA or at least 75 minutes of vigorous-intensity aerobic PA weekly is recommended. It is also recommended that aerobic activity should be undertaken in bouts of at least 10-minutes duration and muscle-strengthening activities should be performed at least twice a week (involving the major muscle groups). For older adults (aged 65 years and above), similar PA levels to those of adults are recommended. Moreover, in order to lower the risk of falls, older adults should undertake PA enhancing balance (at least 3 times a week) and muscle-strengthening activities (at least twice a week) [3]. Among major benefits of regular PA among adults and older adults are: reducing the risk of sudden death syndrome, heart diseases, hypertension, diabetes mellitus type 2, metabolic syndrome, some types of cancer, depression, improving cognitive function and beneficial impact on cardiovascular system [1, 7]. Wen et al. [8] in a long-term 8-year study on adults and older adults have shown that 15 minutes daily or 92 minutes weekly of PA of moderate to vigorous intensity may be beneficial for health, as well as in the case of subjects with the risk of cardiorespiratory diseases. People who undertook PA with the recommended frequency reduced the risk of premature morbidity by 14%, and lengthened their life-expectancy by 3 years.

The assessment of PA levels in different age categories, as well as determining changes in PA levels, raises many difficulties. For example, Sun, Norman and While [9], reviewing studies of the PA of adults and older adults from different countries, showed a large variation of the percentage of respondents undertaking PA at the recommended level – from 2.4% – 83.0%. The authors concluded that PA research analysis was a methodological challenge due to, among others, the adoption of different recommendations regarding PA levels. Moreover, the authors identified the need for research on a representative sample of respondents and for the employment of reliable research tools.

According to the concept adopted by the WHO [3], the results of research on PA should contain information concerning the following aspects:

a) the type of PA (e.g. aerobic, muscle-strengthening, balance improving);
b) duration of PA or exercise (given most often in minutes);
c) frequency of undertaking PA (e.g. how many times a week);
d) the intensity of PA, such as moderate (an effort that must be made to undertake particular PA);
e) volume of PA (which is the resultant of, among others, the frequency and duration of PA).

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The use of a research tool which allows the gathering of information about those elements of PA offers an opportunity to perform a comprehensive assessment and calculation of the percentage of people who meet the recommendations concerning PA (in this case, the WHO recommendations).

In the process of assessment of PA, the introduction of objective test methods are recommended, which should include mechanical and electronic meters and the measuring of physiological response [10]. However, in population-based PA research, the self-reported method with the use of questionnaires is the most common method. Questionnaires assessing PA should meet psychometric standards, and those developed for other populations should be adapted accordingly. Few of the questionnaires used in Poland to assess PA can be characterized by verified validity and reliability. In the case of older adults, there is no questionnaire which meets psychometric requirements, and foreign tools have not been completely adapted for the use in the Polish environment [10].

OBJECTIVES

Based on the results of research conducted in Poland in 2010–2014, an attempt was made to answer the following research questions:

1) What are PA levels of Poles of all ages?
2) What is the percentage of people of all ages undertaking PA at the level recommended by WHO?
3) What is the methodology for national evaluation of PA levels of people of all ages?

MATERIALS AND METHOD

Research papers published from January 2010 – April 2014 were sought in the following English-language electronic full-text and bibliographic databases: MEDLINE, SPORTDiscus and PubMed. The list of combination of keywords used to search for items in electronic databases is shown in Table 1.

Table 1. Key words used in the search for articles

Searched aspect	Key words
PA	physical activity/exercise
Sample	children, adolescents/youth/young people/teenagers adults, old people, elderly, old men, old women
Range of studies	Poland/Polish

Additionally, a search was carried out of articles, reports, monographs and other publications regarding the PA of Poles in common online search engines, as well as in Polish-language academic journal and book databases. Article searches were completed on 20 April 2014.

The papers included in the presented analysis had to meet the criteria of the authors' declaration of a nationwide character of the research evaluating PA levels of Polish population aged 10 years and above. Articles in which research results were presented without division into age categories were excluded. If the same institution (research group) conducted cyclical research based on the same methodology, only the latest findings were included. The first stage of the search was based on an analysis of the title. One researcher (AK) decided whether to include work for further analysis. In the second stage, reviews of abstracts of all the papers accepted after the first stage were performed. The final decision on the inclusion of research into the analysis was the result of an agreement between the two authors (WO and AK). Information regarding the respondents (gender, age, number), research methods, adopted recommendations on PA levels and main results obtained were gathered from each of the articles. The following age categories were adopted: children and adolescents (10–18 years), adults (19–64 years), older adults (65 years and above).

RESULTS

Seven articles [11, 12, 13, 14, 15, 16, 17] were included into the final analysis. Three of them [12, 13, 14] presented PA evaluation with the division into age categories. Table 2 presents the analysis of research assessing PA levels of children and adolescents.

In the study by the Central Statistical Office in Poland (Główny Urząd Statystyczny – GUS) [14], 19-year-olds were also included. Two works presented results regardless of gender [12, 13]. All studies were conducted on the national scale, as declared by their authors. The study of Bergier et al. [15] does not present the group selection procedure. In the work by Bergier et al. [13], the age of the respondents is not given, only the type of school (educational level) attended by the respondents. In all the studies, the self-reported method was employed. In the GUS study [14], a research tool without reference to a source containing psychometric parameters was used. In two cases [12, 14] the personal interview method was employed, and in three [11, 13, 15], self-completion questionnaires were used. In the GUS study [14], 32.6% of interviews were carried out with a person replacing the respondent (for instance a close relative). The WHO [3] recommendations concerning PA levels were clearly adopted in only one paper [11]. PA levels of study subjects assessed with the use the International Physical Activity Questionnaire (IPAQ), were very diverse. High levels of PA (according to the criteria adopted in the IPAQ studies) were determined in the case of from 28.7% of adolescents in the Piątkowska study [12] to 76.2% of male subjects and 67.8% of female subjects in the study by Bergier et al. [15]. In the GUS study, regular PA was understood as being undertaken at least once a week. Such a criterion was met by 51.1% of female subjects and male subjects aged 10–14 years and 42.4% of male subjects and 32.0% of female subjects aged 15–19 years [14]. In the study of Mazur and Małkowska-Szkutnik [11], the MVPA index (moderate-to-vigorous PA) was employed. This calculates the number of days throughout the week in which moderate to vigorous PA lasting at least 60 minutes is undertaken daily. The index equal to '7' was adopted, which may be considered as a partial fulfillment of the WHO recommendations, and which was observed in the cases of – depending on the age – 17.9% – 31.4% of male subjects and 4.2% – 23.2% of female subjects.

Table 3 presents the analysis of research assessing PA levels of adults. In the studies carried out by the GUS [14] and Piątkowska [12], PA was assessed in a group aged 19–59 years and in the Biernat and Piątkowska [16] study – in a group aged 18–64 years. The methodologies adopted in Piątkowska [12] and GUS [14] studies have been described previously while evaluating research in a group of children and adolescents. In the Biernat and Piątkowska [16] study, the self-reported method was employed. The study was carried out using

Table 2. Studies on PA of children and adolescents (aged 10–18 years)

Author(s), publication	Sample	Methods	Adopted PA recommendation	Main results
Mazur and Małkowska-Szkutnik [10]	– gender: M and F (with division) – age: 11,13,15 and 17 years – N = 6162 (11 years – 774 M and 776 F, 13 years – 804 M and 846 F, 15 years – 762 M and 789 F, 17 years – 627 M and 784 F)	– self-reported – questionnaire – Physical Activity Screening Measure – questions concerning vigorous PA	– WHO [3]	– index MVPA[1] = 7 was observed in: 31.4% M and 23.2% F aged 11 years; 22.3% M and 13.4% F aged 13 years; 23.0% M and 9.6% F aged 15 years; 17.9% M and 4.2% F aged 17 years
Piątkowska [11]	– gender: M and F (without division) – age – 15 – <19 years – n = 108 (N = 1,028, 15 – 86 years old old)	– self-reported – computer-assisted personal interview – IPAQ (short form)	– lack of adopted recom-mendations	– moderate and vigorous PA[2] observed in 42.6% and 28.7% of respondents, respectively
Bergier et al. [12]	– gender: M and F (without division) – age: middle school and secondary school students – n = 5,086 (N = 12,183, subjects from middle school, secondary schools and students)	– self-reported – questionnaire – IPAQ (short form)	– lack of adopted recom-mendations	– moderate and vigorous PA[2] observed in 30.7% and 41.7% of respondents, respectively
GUS [13]	– gender: M and F (with division) – age: 10–19 years (divided into the following age categories: 10–14 and 15–19 years old) – n: not included for this age category (N=12,183, 5 years old and above)	– self-reported – personal interview – questions concerned the frequency of participation in sport classes or physical recreation activities	– lack of adopted recom-mendations	– regular/frequent participation in PA: 51.1% M and F aged 10–14 years; 42.4% M and 32.0% F aged 15–19 years
Bergier et al. [14]	– sex: M and F (with division) – age: 16 – 18 years – N = 2,974 (1,184 M and 1,790 F)	– self-reported – IPAQ (short form)	– lack of adopted recom-mendations	– moderate and vigorous PA[2] observed in 17.6% M and 23.6% F; 76.2% M and 67.8% F, respectively

F – female; M – male; PA – physical activity.
[1] MVPA (Moderate-to-Vigorous Physical Activity) – index related to the number of days of the week during which moderate-vigorous PA in at least 60-minute bouts was undertaken.
[2] Moderate PA – when any one of the following 3 criteria is met:
1) 3 or more days of vigorous activity for at least 20 minutes per day;
2) 5 or more days of moderate-intensity activity or walking for at least 30 minutes per day;
3) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week.
High PA is when any one of the following 2 criteria is met:
1) vigorous-intensity activity on at least 3 days and accumulating at least 1,500 MET-minutes/week;
2) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes/week.

a telephone interview and the IPAQ, and the results were analyzed according to the WHO recommendations [3]. In the GUS study, it was assumed that regular PA is undertaken at least once a week and such a criterion was met – depending on age – by 9.2%–26.1% of male subjects and 12.0%–19.0% of female subjects [14]. Piątkowska [12] concluded that high a PA level (in accordance with the criteria adopted in the IPAQ research) was observed in – depending on age – 29.8%–40.4% and 36.9%–45.8% of subjects. In the Biernat and Piątkowska study [16], it was observed that the WHO recommendations concerning PA [3] were met by 57.7% of male subjects and 58.5% of female subjects.

Table 3. Studies on PA of adults (aged 19–64 years)

Author(s), publication	Sample	Methods	Adopted PA recom-mendation	Main results
Piątkowska [11]	– gender: M and F (without division) – age: 19–59 years (divided into the following age categories: 20–29 years; 30–39 years; 40–49 years; 50–59 years) – n = 703 (N = 1,028, 15–86 years old)	– self-reported – computer-assisted personal interview – IPAQ (short form)	– lack of adopted recom-men-dations	– moderate and vigorous PA[1] observed, depending on age: 29.8% – 40.4%; 36.9% – 45.8% of subjects, respectively
GUS [13]	– gender: M and F (with division) – age: 20–59 years (divided into the following age categories: 20–29; 30–39; 40–49 and 50–59 years) – n: not included for this age category (N = 12,183, 5 years old and above)	– self-reported – personal interview – questions concerned the frequency of participation in sport classes or physical recreation activities	– lack of adopted recom-men-dations	– regular/frequent participation in PA, depending on age: male subjects – 9.2%-26.1%; female subjects – 12.0%-19.0%
Biernat and Piątkowska [15]	– sex: M and F (without division) – age: 18–64 years (divided into the following age categories: 18–24; 25–29; 30–39; 40–49 years; 50–59; 60–64 years) – N = 1,505 (740 M and 765 F)	– self-reported – computer-assisted telephone interview – IPAQ (long form)	WHO [3]	– vigorous-intensity activities lasting longer than 75 minutes/week were undertaken by 77.2% of male and female subjects – moderate-intensity activities lasting longer than 150 minutes/week were undertaken by 48.3% of male and female subjects – the WHO recommendations were met by 57.7% of male subjects and 58.5% of female subjects

F – female; M – male; PA – physical activity.
[1] Moderate PA – when any one of the following 3 criteria is met:
1) 3 or more days of vigorous activity for at least 20 minutes per day;
2) 5 or more days of moderate-intensity activity or walking for at least 30 minutes per day;
3) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week.
High PA is when any one of the following 2 criteria is met:
1) vigorous-intensity activity on at least 3 days and accumulating at least 1,500 MET-minutes/week;
2) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes/week

Table 4. Studies on PA of older adults (aged 65 years and above)

Author(s), publication	Sample	Methods	Adopted PA recommendation	Main results
Piątkowska [11]	– gender: M and F (without division), – age: 60–86, – n = 211 (N = 1,028, 15–86 years old)	– self-reported – computer-assisted personal interview – IPAQ (short form)	– lack of adopted recommendations	– moderate and vigorous PA[1] were observed in 33.8% and 16.9%, respectively
Rowiński and Dąbrowski [16]	– gender: M and F (with division) – age: 65 years and above – N = 4,813 (2,488 M and 2325 F)	– self-reported – questionnaire – questions concerned the frequency of participation in various physical activities	– lack of adopted recommendations	– regular PA weekly was undertaken by 50.1% of male subjects and 33.4% of female subjects
GUS [13]	– gender: M and F (with division) – age: 60 years and above – n: not included for this age category (N = 12183, 5 years old and above)	– self-reported – personal interview – questions concerned the frequency of participation in sport classes or physical recreation activities	– lack of adopted recommendations	– regular/frequent participation in PA: 11.9% of male subjects and 11.1% of female subjects

F – female; M – male; PA – physical activity.
[1] Moderate PA – when any one of the following 3 criteria is met:
1) 3 or more days of vigorous activity forf at least 20 minutes per day;
2) 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day;
3) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week.
High PA is when any one of the following 2 criteria is met:
1) vigorous-intensity activity on at least 3 days and accumulating at least 1,500 MET-minutes/week;
2) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 3,000 MET-minutes/week.

Table 4 presents the analysis of research assessing PA levels of older adults.

In the studies carried out by the GUS [14] and Piątkowska [12], PA was assessed in a group aged 60 years and above, and in the Rowiński and Dąbrowski [17] study, in a group aged 65 years and above. The methodologies adopted in the Piątkowska [12] and GUS [14] studies were described earlier while evaluating research in the group of children and adolescents. In the third work analyzed in this age group [17], the self-reported method was employed, and the questions concerned the frequency of undertaking various forms of PA. In none of the research undertaken were the obtained results analyzed in the light of the WHO recommendations. In the GUS study (similar to the children and adults groups), it was assumed that regular PA is undertaken at least once a week. Such a criterion was met by 11.9% of male subjects and 11.1% of female subjects [14]. Piątkowska [12] concluded that a high PA level (in accordance with the criteria adopted in the IPAQ research) was observed in 16.9% of subjects. The Rowiński and Dąbrowski study [17] showed that regular PA throughout the week was undertaken by 50.1% of male subjects and 33.4% of female subjects. It was assumed that regular PA is that undertaken at least once a week by performing one of determined forms of PA.

DISCUSSION

Reliable information about the level of the PA in the study population provides the opportunity to prepare and implement appropriate concepts and programmes of activation of people of all ages. In Poland, there is no institution or research team which would monitor the PA levels of people of all the age categories, working in accordance with an appropriate research methodology. The review of research from 2010–2014 conducted in the presented study corroborates the statement that very few research teams performed an analysis of the PA of Poles. The studies were mostly conducted within differently-oriented research projects; therefore, the long-term character of these studies cannot be assured. The exceptions are studies carried out in Poland since 1990 within the framework of the project Health Behaviour in School-aged Children and the WHO Collaborative Study, which provided systematic data on the PA of children and adolescents [11].

Difficulties in interpretation of the obtained results concerning the PA of Poles arise from presenting data with no division into male and female groups, or the lack of precise information concerning subjects' ages. The credibility of the results may be questionable in the studies in which valid and reliable research tools were not employed. In practice, in the articles under this review, two tools – IPAQ [18, 19] and the Physical Activity Screening Measure [20] – could be characterized by certain psychometric parameters, and only the IPAQ was fully adapted to Polish conditions. However, in studies conducted with the use of the IPAQ, it is quite common to overestimate the PA undertaken, which was confirmed in earlier studies in different countries [21, 22, 23, 24]. In Poland, the IPAQ is the only verified questionnaire to used to assess the PA of persons aged 15–69 years.

In the analyzed studies, self-reported questionnaires, personal and telephone interviews were employed. These techniques are not very objective, but they can be quite accurate research techniques when assuring appropriate research methodology. One should be critical about the GUS study [14], in which almost one-third of the interviews were conducted with a person replacing a research subject. However, the results of this study were often presented in the media and attracted public attention. In two of the analyzed studies [14, 17] inappropriate criteria defining the level of regularity of undertaking PA were adopted, which (without a proper analysis of the results) may be misleading for the reader, for it is difficult to claim regularity of PA in the case of undertaking one of the PA types once a week [14], or undertaking any PA once a week [17].

Due to very large discrepancies in the obtained results, especially in view of dissimilar reliability of the measurements, it is difficult to determine actual PA levels of Poles of all ages. For example, in studies performed with the use of the IPAQ in a group of adolescents [12, 13, 15], moderate to high levels of PA was observed in about 30% to as much as about 90% of cases. First, the differences are significant, and secondly, it is difficult to assume that the great majority of adolescents may be characterized by such a favorable frequency of undertaking PA. Similar surprisingly large disparities may be observed

in studies concerning adults and older adults. Using the PA criteria presented in the analyzed works (with the awareness of erroneous assumptions concerning, among other, criteria required to consider PA on a regular basis), it can be stated that PA at a satisfactory level was observed in:

a) from 4.2% [11] – 91.4% [15] of female subjects and from 17.9% [11] – 93.8% [15] of male subjects in the age category 10–18 years;

b) from 9.2% of male subjects and from 12.0% [14] of female subjects to 77.6% [12] of male and female subjects in the age category 19–64 years;

c) from 11.9% of male subjects and 11.1% of female subjects [14] to 50.7% [12] of male and female subjects in the age category 65 years and more.

In the above list of research which employed IPAQ, moderate or vigorous-intensity PA was considered satisfactory.

It is difficult to estimate the proportion of people who meet the WHO recommendations [3] on PA levels. Among various aspects of PA, the duration, frequency and intensity of AF were most commonly assessed, and less frequently assessed was the kind of PA undertaken. No research takes into consideration all aspects of PA required to completely meet the WHO recommendations. The attempt to present the level of PA made by Biernat and Piątkowska [16] in the light of the WHO recommendations, applies only to the PA in leisure time, and does not take into account all the recommended guidelines concerning the PA of adults.

To the best of the knowledge of the authors of the presented study, this is the first review and comparison of nationwide studies on the PA of Poles. However, due to the search performed, both in bibliographic databases and in the so-called 'grey literature',* it was difficult to determine the exact search criteria. Included in the comparison were the studies in which the authors declared the nationwide character of their research. Unfortunately, not all the researches were conducted on a representative sample of Poles for a given age category. Moreover, information concerning methodology included in the papers were often insufficiently detailed, and therefore did not allow for a complete replication of the study. Similar difficulties in the analysis of results of various research on PA were mentioned by Sun, Norman and White [9].

CONCLUSIONS

This review of studies from 2010–2104 indicated that it is not possible to reliably answer questions about the levels of PA of Poles and the percentage of those who meet the WHO recommendations on PA. It is vital to improve research methodology and conduct studies on a representative sample of Poles, taking into account the ages and gender of the subjects. In addition, efforts should be made in order to develop or to adapt different research tools assessing PA levels as a part of surveys, or to use objective methods of measurements (pedometers, heart rate monitors, accelerometers or GPS), as it is not feasible to rely on the results of studies employing unproven research tools, often prepared *ad hoc*. This situation could be improved by appointing a State institution or a research team to be involved in the measurement and evaluation of long-term changes in the PA of Poles.

*Grey literature: '*That which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers.*' (Definition by the Fourth International Conference on Grey Literature, Washington, DC, October 1999 [GL 99]).

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