

## Quality of life and physical activity among younger working-age Wrocław residents

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**A** – Study Design, **B** – Data Collection, **C** – Statistical Analysis, **D** – Data Interpretation, **E** – Manuscript Preparation, **F** – Literature Search, **G** – Funds Collection

**Summary Background.** Literature concerning quality of life and physical activity relationships in younger working-age people is scarce but suggest that some quality of life factors depend on physical activity.

**Objectives.** The aim of the study was to identify these relationships.

**Material and methods.** The material included 2,691 participants (1,321 men and 1,370 women) aged 18–44 years living in Wrocław. The International Physical Activity Questionnaire, Short Form (IPAQ-SF) served to assess habitual physical activity. Quality of life was determined with the World Health Organization Quality of Life (WHOQoL-BREF) questionnaire.

**Results.** The 68.5% level of physical activity among Wrocław residents proved to be sufficient in the context of the WHO recommendations. More than half (56.3%) of the respondents undertook at least 75 minutes of high-intensity physical activity, and 12.2% carried out moderate activity for at least 150 minutes per week. Among men, the chance that they would assess their quality of life as high was 82% more in people performing at least 75 minutes of high-intensity physical activity per week than in those undertaking less physical activity.

**Conclusions.** Most participants met the WHO health-promoting physical activity standards. In the group of men, statistically significant positive relationships were observed between quality of life and high-intensity physical activity.

**Key words:** exercise, quality of life, World Health Organization.

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### Background

Civilizational progress has brought about a significant increase in work automation, the development of means of transportation and information and communication technologies, as well as other everyday life amenities, thus considerably reducing the need for humans to undertake physical effort [1]. The meta-analyses performed by Hallal et al. [2] show that as many as 31.1% of adults in the world are almost completely physically inactive. Among Europeans, this percentage is even higher and equals 34.8%. The research by Gerovasili et al. [3] proved that 44% of Poles aged 18–64 years are physically inactive, which makes the country last but not first in the whole of the European Union. Drygas et al. [4] came to a similar conclusion in their studies. They observed that 36% of Poles did not undertake almost any physical activity in their free time, 38% as part of their work, 67% when traveling from place to place.

Lack of physical activity is one of the leading causes of premature deaths, owing to the high incidence of chronic non-contagious diseases. It is estimated that about 5.3 million people die worldwide every year from disorders caused by low levels of physical activity. Undertaking physical activity by people of working age is a significant problem. Their engagement in physical exercises of appropriate frequency, duration and intensity can not only contribute to the prevention of diseases and maintaining good psychophysical fitness, but it can also ensure full recovery after diseases, injuries or fatigue [5–8]. As a result, engagement in physical activity allows working-age individuals to successfully fulfill their social, professional, family or sexual

functions, and thus it greatly affects their perceived quality of life [9–11].

Resulting from this, state public health policies focus increasingly on the promotion of preventive measures related to lifestyle improvements. This is reflected in various public health strategies aimed at the development of physical activity, primarily active leisure. Some authors indicate that it is mainly active leisure which brings the greatest health benefits [12, 13]. In fact, the first operational aim of the Polish National Health Program for the years 2016–2020 [14] is the enhancement of diet and physical activity quality. Implementation of the program is aimed at enhancement of longevity, reduction of health-related social inequalities and improvement of general quality of life.

Massidda et al. [15] and Maciel et al. [16] showed positive correlations between PA (physical activity) levels and subjective quality of life, in particular in its physical domain. Similarly, Omorou et al. [17], in their studies on working-age adults, observed positive correlations between physical activity and the physical and social domains of subjective quality of life. Correlations with the psychological and social domains were also found by Krzepota et al. [18]. Pucci et al. [19] analyzed the mentioned correlations with PA at three separate intensity levels. Low-intensity PA was found to be significantly correlated with the social and environmental domains of subjective quality of life in men, as well as with the physical and environmental domains in women. Respondents of both genders taking part in moderate-intensity PA assessed their quality of life as best in the physical domain, while those taking part in high-intensity PA, in the psychological and social domains. Olsson et al. [20] compared two groups of respondents: participants in a multi-week training



program and the control group. After completing the training program, a statistically significant increase in subjective quality of life was found among the program participants, but not in the control group. Similar results were attained by Mansikkamaki et al. [21], in whose study participants in PA programs assessed their perceived health condition better in the physical domain than the control group. In the study by Macaluso et al. [22], participants of a 12-week physical training program significantly improved their health condition and subjective quality of life in the physical and psychological domains.

So far, however, there have been few studies regarding healthy people in younger working age. Their analysis allows one to presume that some aspects of the quality of life are assessed better by physically active individuals than by physically inactive people. Nevertheless, this applies only to those with an adequately high level of physical activity [23].

## Objectives

In this context, the purpose of the paper is to identify the relationships between quality of life and physical activity in younger working-age people.

## Material and methods

### Study design

The research process included: determination of the research problem, selection of methods, techniques and research tools, selection of the research sample, conducting research, analysis of test results and presentation of research results.

### Setting

The research was performed in 2014 and 2015 in Wrocław.

### Participants

The sample selection was random using a three-level stratification. First, using a random number table, ten residential areas were selected from all alphabetically ordered Wrocław areas. Next, three streets from each selected residential area were chosen, whose residents were asked to fill in the questionnaires. The number of respondents from particular residential areas was proportionate to the number of residents of these areas.

### Variables and data sources

The International Physical Activity Questionnaire, Short Form (IPAQ-SF) was used to assess habitual physical activity [24]. Physical activity was determined in accordance with the World Health Organization (WHO) recommendations. On the basis of the recommendations, the individuals were divided into the following groups [25]:

- 1) people who met the first WHO criterion (Yes I), i.e. those who undertook at least 75 minutes of high-intensity physical activity per week;
- 2) people who met the second WHO criterion (Yes II), i.e. those who undertook at least 150 minutes of moderate-intensity physical activity per week;
- 3) people not meeting the WHO criteria (No), i.e. those who undertook physical activity for less than 150 minutes (moderate intensity) or 75 minutes (high intensity).

Quality of life was assessed with the World Health Organization Quality of Life (WHOQoL-BREF) questionnaire [26].

### Ethical issue

The research project received a positive opinion from the Commission of Bioethics of the University School of Physical Education in Wrocław.

## Study size

The minimal sample size ( $n$ ) representative of younger working-age Wrocław residents was calculated using the following formula:

$$n = \frac{N}{1 + \frac{e^2(N-1)}{u_\alpha^2 pq}}$$

where:  $N$  – number of Wrocław residents on December 31, 2013,  $p$  – fraction of younger working-age Wrocław residents on December 31, 2013,  $q$  – constant calculated as  $1 - p$ ,  $e$  – expected estimation error of  $p$  ( $e = 1.5\%$ ),  $u_\alpha = 0.05$  – confidence interval  $1 - \alpha$  ( $u_\alpha = 0.05 = 1.96$ ).

## Quantitative variables and statistical analyses

The quality of life indicator was expressed on a nominal scale. The results obtained on a point scale (1–5 points) were converted into a sten scale (1–10 stens); the following formula was applied:

$$S = 5.5 + 2 \times Z,$$

where:  $S$  – input variable values after transformation,  $Z$  – input variable values after standardization into mean and standard deviation for the research sample.

On the basis of the sten scale results, groups of different quality of life self-assessment were distinguished. In the evaluation of quality of life, the following boundary values were assumed: < 6 stens (low), 6 stens (average), > 6 stens (high).

Multinomial logistic regression served to estimate the relationships of quality of life and physical activity. Statistical conclusions were drawn with a significance level of  $\alpha < 0.05$ .

## Results

### Participants

The study was conducted among 2,691 people (1,321 males and 1,370 females) aged 18–44 years.

### Descriptive data

Taking into account the age of the respondents, people aged 25–34 years (44.2%) formed the largest group. Individuals aged 35–44 years accounted for 32.8%, and those aged 18–24 for 23% of all the participants. A total of 41.8% of the respondents had secondary education, 33.1% – primary, junior high and basic vocational education, and 25.1% – higher education. The majority of the participants were white-collar workers (26.3%) or blue-collar workers (25.6%). The remaining groups included pupils and students (23.1%), entrepreneurs (14.7%) and the unemployed and housekeeping (10.3%). Most of the respondents (56.3%) were single, the remaining 43.7% were married. Among the studied Wrocław residents, the majority had an average monthly gross household income of above 2,000 PLN (27.2%) per person or 1,001–1,500 PLN (25.4%) per person. The average monthly gross income per capita in 22.1% of the respondents' households equaled 501–1,000 PLN, in 19.6% – 1,501–2,000 PLN, and in 5.7% – below 500 PLN. More than half (52%) of the participants assessed their quality of life as average, 29.5% as low, and 18.5% as high (Table 1).

### Outcome data

The 68.5% physical activity level among the participants was sufficient in the context of WHO recommendations. More than half (56.3%) of the respondents performed high-intensity activity for at least 75 minutes per week, and 12.2% performed moderate-intensity activity for at least 150 minutes. Almost every

**Table 1. Absolute and relative size of the groups of respondents determined with respect to selected socio-economic characteristics (*n* = 2691)**

| Feature                                 | Category                                  | <i>n</i> | %    |
|-----------------------------------------|-------------------------------------------|----------|------|
| Gender                                  | males                                     | 1,321    | 49.1 |
|                                         | females                                   | 1,370    | 50.9 |
| Age                                     | 18–24                                     | 620      | 23.0 |
|                                         | 25–34                                     | 1,189    | 44.2 |
|                                         | 35–44                                     | 882      | 32.8 |
| Education                               | primary, junior high and basic vocational | 889      | 33.1 |
|                                         | secondary and post-secondary vocational   | 1,126    | 41.8 |
|                                         | higher                                    | 676      | 25.1 |
| Professional status                     | unemployed or housekeeping                | 278      | 10.3 |
|                                         | pupil, student or doctoral student        | 620      | 23.1 |
|                                         | blue-collar worker                        | 689      | 25.6 |
|                                         | white-collar worker                       | 708      | 26.3 |
|                                         | entrepreneur                              | 396      | 14.7 |
| Marital status                          | single                                    | 1,516    | 56.3 |
|                                         | married                                   | 1,175    | 43.7 |
| Average monthly gross income per person | up to 500 PLN                             | 154      | 5.7  |
|                                         | 501–1,000 PLN                             | 593      | 22.1 |
|                                         | 1,001–1,500 PLN                           | 684      | 25.4 |
|                                         | 1,501–2,000 PLN                           | 527      | 19.6 |
|                                         | more than 2,000 PLN                       | 733      | 27.2 |
| Level of the overall quality of life    | low                                       | 796      | 29.5 |
|                                         | average                                   | 1,398    | 52.0 |

**Table 2. Absolute and relative size of the groups determined with respect to WHO physical activity recommendations (*n* = 2691)**

| WHO recommendations | General  |      | Males    |      | Females  |      |
|---------------------|----------|------|----------|------|----------|------|
|                     | <i>n</i> | %    | <i>n</i> | %    | <i>n</i> | %    |
| Yes I               | 1514     | 56.3 | 824      | 62.4 | 690      | 50.3 |
| Yes II              | 329      | 12.2 | 124      | 9.4  | 205      | 15.0 |
| No                  | 848      | 31.5 | 373      | 28.2 | 475      | 34.7 |

Yes I – at least 75 minutes of high-intensity physical activity per week; Yes II – at least 150 minutes of moderate-intensity physical activity per week; No – physical activity below WHO recommendations.

**Table 3. Relationships between the quality of life and physical activity in males**

| Quality of life | Parameter    | $\beta$ | <i>s</i> | Wald $\chi^2$ | <i>p</i> | OR   | $\pm$ 95% CI |
|-----------------|--------------|---------|----------|---------------|----------|------|--------------|
| AQoL            | intercept    | 0.48    | 0.12     | 16.81         | < 0.001  | –    | –            |
|                 | yes I vs no  | 0.44    | 0.13     | 10.94         | < 0.001  | 1.56 | 1.20–2.03    |
|                 | yes II vs no | -0.35   | 0.30     | 1.34          | 0.247    | 0.71 | 0.39–1.27    |
| HQoL            | intercept    | -0.65   | 0.16     | 17.33         | < 0.001  | –    | –            |
|                 | yes I vs no  | 0.60    | 0.19     | 10.28         | < 0.001  | 1.82 | 1.26–2.61    |
|                 | yes II vs no | 0.13    | 0.27     | 0.24          | 0.624    | 1.14 | 0.68–1.92    |

The reference category for the dependent variable is LQoL,  $\chi^2 = 24.5$ ,  $p < 0.001$ .

$\beta$  – assessment value of model parameters; *s* – asymptotic standard error  $\beta$ ; Wald  $\chi^2$  – parameter significance; *p* – Wald  $\chi^2$  probability value; OR – odds ratio; CI – confidence interval; AQoL – average quality of life; HQoL – high quality of life; LQoL – low quality of life; yes I – at least 75 minutes of high-intensity physical activity per week; yes II – at least 150 minutes of moderate-intensity physical activity per week; no – physical activity below WHO recommendations.

third individual (31.5%) did not meet the WHO standards. The recommendations were more often fulfilled by males (71.8%) than females (65.3%). The first criterion was met by 62.4% of males and 50.3% of females, and the second one by 9.4% of males and 15.0% of females (Table 2).

## Main results and other analyses

Among males, the chance that they would assess their quality of life as average, and not low, was 56% more in people who

met the first WHO criterion than in those not meeting any standards. The chance that the respondents would rate their quality of life as high, and not low, was 82% more in people performing high-intensity activity for at least 75 minutes per week than in those who undertook an insufficient amount of physical activity. No significant relationships were noted between quality of life and moderate-intensity activity (Table 3).

The relationships of quality of life and physical activity in females were statistically insignificant (Table 4).

| Quality of life | Parameter    | $\beta$ | $s$  | Wald $\chi^2$ | $p$     | OR   | $\pm$ 95% CI |
|-----------------|--------------|---------|------|---------------|---------|------|--------------|
| AQoL            | intercept    | 0.44    | 0.11 | 15.65         | < 0.001 | –    | –            |
|                 | yes I vs no  | -0.02   | 0.18 | 0.01          | 0.919   | 0.98 | 0.69–1.40    |
|                 | yes II vs no | 0.16    | 0.28 | 0.31          | 0.580   | 1.17 | 0.67–2.04    |
| HQoL            | intercept    | -0.53   | 0.13 | 15.65         | < 0.001 | –    | –            |
|                 | yes I vs no  | 0.22    | 0.13 | 2.81          | 0.094   | 1.25 | 0.96–1.61    |
|                 | yes II vs no | 0.10    | 0.22 | 0.20          | 0.655   | 1.10 | 0.72–1.69    |

The reference category for the dependent variable is LQoL,  $\chi^2 = 14.3$ ,  $p < 0.05$ .

$\beta$  – assessment value of model parameters;  $s$  – asymptotic standard error  $\beta$ ; Wald  $\chi^2$  – parameter significance;  $p$  – Wald  $\chi^2$  probability value; OR – odds ratio; CI – confidence interval; AQoL – average quality of life; HQoL – high quality of life; LQoL – low quality of life; yes I – at least 75 minutes of high-intensity physical activity per week; yes II – at least 150 minutes of moderate-intensity physical activity per week; no – physical activity below WHO recommendations.

## Discussion

### Key results

The study results indicate that there are relationships between the quality of life and physical activity in people aged 18–44 years. The probability of the average versus low and of high versus low self-assessment of the overall quality of life among the surveyed Wrocław residents was highest in people who met the WHO health-promoting physical activity standards. However, it should be emphasized that the identified relationships were only noted in the group of males and with respect to high-intensity physical activity.

### Limitations of the study

A limitation of the paper is the reduced spatial scope of the research, referring to one city only. Future research should be extended to cover the whole of Poland and other Central European countries. The use of the short form of IPAQ is also a drawback. For further studies, it is therefore postulated to apply tools allowing to measure physical activity in various areas of life, i.e. in free time, while relocating and when fulfilling professional and household duties. In fact, Kim et al. [27] demonstrated that the direction and strength of the relationships with the quality of life could differ in each of these cases. The joint analysis of the whole group of younger working-age Wrocław residents constitutes another limitation of the article. It is recommended for future research to analyze the impact of physical effort on the quality of life in groups selected with the consideration of such factors as age or health status.

### Interpretation

Positive relationships between the overall quality of life and the volume of performed physical activity were also observed by Anokye et al. [28], Brodáni et al. [29], Rosenkranz et al. [30] and Kolt et al. [31]. In the studies by Ramirez-Campillo et al. [32], individuals with a high level of physical activity were characterized by higher self-assessment of quality of life as compared with the control group with significantly lower physical activity.

The results presented in this paper also remain in line with earlier papers analyzing the relationships between particular areas of the quality of life and physical activity. For example, a higher self-assessment of the quality of life in the somatic domain among more physically active people was noted by Krzepota et al. [18] and Ramirez-Campillo et al. [32]. Chai et al. [23] observed positive relationships between quality of life in the psychological domain and the level of physical activity. In turn, higher levels of physical activity in respondents who better assessed their quality of life in the social domain were reflected by Guimarães and Baptista [33], and with reference to the environmental domain – by Santos et al. [34].

Da Silva et al. [35] and Zaenker et al. [36] proved that only systematic high-intensity physical effort had a beneficial effect on the quality of life. This is probably due to the fact that it was total weekly physical activity that was considered in the research. Presumably, some of the people performing moderate physical activity may have met the WHO recommendations by fulfilling their professional and household duties or by relocating. The Wrocław residents who undertook high-intensity physical effort probably did it as part of organized physical activities. The beneficial effects of physical activity associated with exercise on the quality of life has already been documented in literature [32].

The role of gender in the development of the relationships between quality of life and physical activity in working-age people is still not fully explained. Although Huang-tz et al. [37] also obtained these relationships only in surveyed males, Guimarães and Baptista [33] showed that performing physical activity of moderate intensity for 60 minutes improved the quality of life in females. However, these females were older than those surveyed in Wrocław, as their age ranged between 45 and 59 years. In our previous paper, concerning people aged 55–64 years [38], the self-assessment of the quality of life also improved with the respondents' level of physical activity, regardless of their gender.

### Generalizability

The obtained results also entitle the authors to recommend actions aimed at increasing physical activity among the younger working-age population. Such actions should be taken both by the people themselves and by organizations and socio-economic policy entities. A sufficiently high volume of physical activity and its high intensity may contribute to improving people's quality of life, especially in males.

### Conclusions

- 1) Most participants met the WHO health-promoting physical activity standards.
- 2) Among males, statistically significant positive relationships were observed between quality of life and high-intensity physical activity.
- 3) Physical activity should be an important element of preventive care and should be recommended to patients by doctors and nurses.

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Conflicts of interest: The authors declare no conflicts of interest.



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