

OBESITY AND LOW LEVELS OF PHYSICAL ACTIVITY ARE ASSOCIATED WITH A DECREASED HEALTH-RELATED QUALITY OF LIFE IN POSTMENOPAUSAL WOMEN: A WROCLAW PILOT STUDY

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Menopause is associated with numerous somatic dysfunctions, an increased risk of chronic diseases, and complications in the mental and social components of health that lower the quality of life (QoL). Obesity and related comorbidities affect over 60% of postmenopausal women in Poland. A significant role for systematic physical activity (PA) in the prevention of dysfunctions and chronic diseases, including obesity and mental disorders, has been observed previously. A low level of PA is observed across the Polish population, especially in postmenopausal women.

Aim of the study: To examine QoL in postmenopausal women participating in a community health promotion program as it relates to obesity and levels of PA.

Material and methods: The study sample consisted of 76 postmenopausal women (aged 65.75±5.14 years) participating in the *Active Wrocław 55+* program. Before starting the program, anthropometric measurements were taken, and QoL and PA were assessed using the 36-Item Short Form Health Survey (SF-36) and the International Physical Activity Questionnaire-Short Form (IPAQ-SF), respectively.

Results: Most women had a PA level above 600 MET-min/week (78.95%), and were overweight or obese (86.84%). A waist circumference over 80 cm, indicating an increased risk for metabolic syndrome, was observed in 85.89% of the participants. BMI and waist circumference negatively correlated with the level of PA ($p=0.001$ and $p=0.017$, respectively). Women exhibiting low levels of PA and higher BMIs showed a significantly lower QoL compared to those with higher PA and lower BMIs, particularly with regard to the physical domains of QoL.

Conclusions: Obesity and a low level of PA are associated with a significant decline in the health-related QoL (especially in the PF and PCS domains) of postmenopausal women in an urban setting.

KEYWORDS: menopause, quality of life, obesity, physical activity

BACKGROUND

Demographic change in the general population is an important public health and economic issue, as it can be associated with increased healthcare costs [1]. Postmenopausal women currently outweigh the number of older men in the post-working age population [2], and it is estimated that there will be 1.2 billion postmenopausal women by 2030 [3]. At present, approximately 30% of life expectancy occurs after menopause [4]. Quality of life (QoL) has a multifactorial basis, including health, demographic, economic, and cultural issues [5-6]. The process of aging is associated with numerous disorders and an increased risk of poor health, leading to a lower QoL [7-8]. Menopause entails many vasomotor and emotional changes, such as hot flashes, dizziness, excessive sweating, and sleep disorders, as well as emotional lability, irritability, low mood and self-esteem, difficulty concentrating, and an increased risk of depression [9-12]. Adverse lifestyle changes are also often observed in postmenopausal women, especially in terms of diet and regular physical activity (PA). Poor diet and exercise are modifiable risk factors for chronic diseases [13], including obesity and its associated complications [14-16]. Being overweight, obesity, and an increased risk of metabolic diseases affect up to 78% of postmenopausal women in Poland [17]. Insufficient levels of PA and poor diet contribute to the increased prevalence of excessive body weight in the general Polish population, including in postmenopausal women [18]. Numerous studies have confirmed the positive effects of PA for the prevention of diseases in postmenopausal women [9,16,19-22]. At the same time, many studies have also demonstrated a low level of PA in older women [23-24], including those in Poland [25-26].

AIM OF THE STUDY

The current study aimed to assess the QoL in relation to obesity and low levels of PA in postmenopausal female residents of Wrocław participating in the community health promotion program *Active Wrocław 55+* (*Aktywny Wrocław 55+*).

MATERIAL AND METHODS

Study design, setting, and selection criteria

Approval for the study was issued by the Wrocław Health Center, an independent public healthcare institution, in 2014 (WCZ/PZ/11/04.2014 of 10/04/2014).

The voluntary study involved surveying postmenopausal women selected from a group participating in the community health promotion program *Active Wrocław 55+* (*Aktywny Wrocław 55+*), which was implemented from April 1 to November 30, 2015. The *Active Wrocław 55+* program was financed by the Wrocław Health Center and was part of a project entitled "Health promotion of people over 55 years of age." The women who qualified for this study participated in classes at the Aquapark on Borowska Street in Wrocław.

Participants

A total of 89 postmenopausal women initially volunteered for the study, based on the inclusion and exclusion criteria. In total, 76 naturally postmenopausal women aged 65.75 ± 5.14 years were included. The prerequisites for joining the *Active Wrocław 55+* program were the consent of a primary care physician and a statement that there were no contraindications to participate in various forms of PA. The exclusion criteria were the use of hormone replacement therapy for the last six months (due to its potential effects on the redistribution of adipose tissue), and the presence of cancer or other chronic conditions, including liver and kidney disease, hyper- or hypothyroidism, and surgical menopause.

Data sources/Measurement

Anthropometric measurements (body weight, height, waist circumference [WC], hip circumference, body mass index [BMI], and waist-to-hip ratio [WHR]) were taken and questionnaires – the International Physical Activity Questionnaire Short Form (IPAQ-SF) and the 36-Item Short Form Health Survey (SF-36) – were completed on the first day before starting the activities included in the *Active Wrocław 55+* program. The sociodemographic characteristics of the study group are shown in Table 1.

The level of PA was assessed using the validated IPAQ-SF [27]. The results were expressed in MET-min/week, where MET stands for Metabolic Equivalent of Task (MET), defined as a multiple of resting metabolic rate. The levels of PA – high (>3000 MET-min/week), moderate (600–3000 MET-min/week), and low (<600 MET-min/week) – were established on the basis of the American Heart Association recommendations on minimum weekly PA for adults (*Physical Activity Guidelines*) [28].

QoL was assessed using the SF-36 (QualityMetric Incorporated, license number QM030530). The SF-36 measures QoL in eight domains: physical functioning (PF), role physical (RP), bodily pain (BP),

Table 1. Sociodemographic characteristics of the study sample (n=76)

Characteristics	Answers	n=76
Education [%]	primary	1
	secondary	57
	incomplete higher	3
	higher	39
Employment status [%]	employed	11
	unemployed	1
	drawing a disability pension	3
	retired	85
Smoking [%]	non-smoking	83
	smoking	17
Cigarettes smoked per day [%]	up to 5 cigarettes	15.5
	up to 10 cigarettes	69
	over 10 cigarettes	15.5
Children [%]	no children	29
	1 child	16
	2 children	41
	3 children	13
	4 children	1
Time since the last menstruation [years]	mean (standard deviation)	13.8 (\pm 6.9)
	minimum	2
	maximum	34
Weight gain after the last menstruation [kg]	mean (standard deviation)	10.6 (\pm 6.6)
	minimum	0
	maximum	32
Family history of at least one of the following diseases* [%]	applies	75
	does not apply	25

* Diseases: obesity, type 2 diabetes, hypertriglyceridemia, coronary artery disease, arterial hypertension before the age of 60, myocardial infarction, stroke, neoplastic diseases.

general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). These domains are grouped into two health components, the physical component summary (PCS: PF, RP, BP, GH) and the mental component summary (MCS: VT, SF, RE, MH). The results for each of the questionnaire domains range from 0 to 100. To facilitate comparison of the results with those obtained from other populations, the scores for the summary domains (PCS, MCS) were standardized according to Norm-Based Scoring (1998) using an algorithm included in the SF-36 manual (T-score transformation with mean, 50 ± 10 [SD]). The higher the score for a given domain, the higher the QoL in that domain, and the norm for standardized values is between 45 and 55 points [29].

Statistical analyses

Statistical analyses were performed using IBM SPSS (v.25 and v.26) software. Values are expressed

as means and standard deviations, or as medians with a confidence interval between the 5th and 95th percentile. The normality of the data distributions was assessed with the Shapiro-Wilk test. The non-parametric Mann-Whitney U test was used to compare the differences between independent groups formed on the basis of BMI and the level of PA according to the IPAQ-SF. The relationships between the studied parameters were determined using the Spearman's rank correlation test. The level of statistical significance was $p \leq 0.05$.

RESULTS

Descriptive data

The anthropometric data (BMI, WC, WHR) and the levels of PA are shown in Table 2. 13.16% of the women had a normal body weight, 43.42% were overweight, and 43.43% were obese. The means \pm SD for the BMI categories were 23.10 ± 1.78 kg/m²,

27.77±1.47 kg/m² and 34.16±3.45 kg/m², respectively. A WHR above 0.8 (82.89%) prevailed in the study sample, as did a WC ≥80 cm (85.5%). The women showed a tendency towards android fat distribution and an increased risk of metabolic disorders.

Table 2. Anthropometric and physical activity data (n=76)

Variable	Mean ±SD	Percentage of women with values above the norm
Age [years]	65.75±5.14	—
BMI [kg/m ²]	29.93±4.75	86.84 [25]
WC [cm]	92.28±12.47	85.53 [80]
WHR	0.85±0.06	82.89 [0.8]
PA [MET-min/week]	2868±2293	—
Low PA levels (<600 MET-min/week)		21.05%
MVPA (>600 MET-min/week)		78.95%

SD – standard deviation; BMI – body mass index; WC – waist circumference; WHR – waist-to-hip ratio; PA – physical activity; MET – standard metabolic equivalent unit; MVPA: moderate-to-vigorous physical activity. PA levels are shown for the number of individuals and the percentage of the whole sample.

The PA level of the group ranged from 450 to 10358 MET-min/week. The majority of the women (78.95%) showed a moderate (600–3000 MET-min/

week) or a high (>3000 MET-min/week) level of PA (15.79% vs. 63.16%). In 21.05% of cases, PA was insufficient (<600 MET-min/week).

It was found that the level of PA was significantly related to BMI and WC (p=0.001 and p=0.017, respectively; Table 3).

Table 3. Spearman's rank correlation between categorized BMI, WC, and WHR values and categorized PA (n=76)

Parameter	rho	p
BMI (healthy, overweight, or obese)	-0.582*	0.001*
WC	-0.273*	0.017*
WHR	0.119	0.306

BMI – body mass index; WC – waist circumference; WHR – waist-to-hip ratio; * statistical significance.

The highest SF-36 QoL scores (Table 4) were recorded for the domain of limitations in usual role activities because of emotional problems (RE; 82.68±28.28), PF (77.89±15.06), and for the domain of limitations in usual role activities because of physical health problems (RP; 76.48±28.15), while the lowest QoL levels were seen for the domains of GH (47.20±11.15), BP (64.42±25.29), and VT (62.01±17.01). The norm for standardized values is between 45 and 55 points [29].

Table 4. SF-36 QoL scores on the specific subscales (n=76)

SF-36	PF	RP	BP	GH	VT	SF	RE	MH	PCS	MCS
Mean	77.89	76.48	64.42	47.20	62.01	75.82	82.68	72.24	46.68	49.91
SD	15.06	28.15	25.29	11.15	17.01	21.73	28.28	15.02	8.06	9.25
Minimum	45.00	25.00	0.00	20.00	25.00	25.00	25.00	30.00	27.34	21.71
Maximum	100.00	100.00	100.00	77.00	100.00	100.00	100.00	95.00	62.96	67.03

SD – standard deviation; PF – Physical Functioning; RP – Role Physical; BP – Bodily Pain; GH – General Health; VT – Vitality; SF – Social Functioning; RE – Role Emotional; MH – Mental Health; PCS – Physical Component Summary; MCS – Mental Component Summary.

Table 5. Comparisons of the mean scores for the SF-36 domains across BMI categories (n=76)

SF-36 domains	Normal body weight	Overweight and obesity	Mann-Whitney U	p
PF	87.50	76.46	219.0	0.040*
RP	86.88	74.71	275.5	0.197
BP	76.00	62.49	246.0	0.095
GH	50.10	46.75	294.0	0.340
VT	66.88	61.25	286.0	0.288
SF	82.50	74.42	242.0	0.081
RE	77.50	83.46	335.5	0.696
MH	66.00	73.31	249.0	0.107
PCS	52.56	45.73	166.0	0.005*
MCS	46.87	50.38	296.0	0.364

PF – Physical Functioning; RP – Role Physical; BP – Bodily Pain; GH – General Health; VT – Vitality; SF – Social Functioning; RE – Role Emotional; MH – Mental Health; PCS – Physical Component Summary; MCS – Mental Component Summary; * statistical significance.

Comparisons of the scores obtained for the specific SF-36 domains, as well as for overall physical (PCS) and mental (MCS) health, in women with a normal BMI and those who were overweight or obese are shown in Table 5. Statistically significant differences in QoL were observed for the PCS ($p=0.005$) and the PF ($p=0.04$) domains, with higher values observed in women with a normal body weight. In the case of other domains, no statistically significant differences across the BMI groups were observed.

Table 6 shows the comparisons between the two categories of PA with regard to the SF-36 scores. In

this case, significantly higher QoL levels on the PF ($p=0.008$) and PCS ($p=0.045$) domains were also observed in women having at least a moderate level of PA.

Taking into account the multifactorial basis of QoL, two groups of women were compared: those with low levels of PA and at least an overweight BMI, and those with a normal BMI and the recommended level of PA sufficient to maintain health, according to the IPAQ-SF (Table 7). Women with sufficient levels of PA and a normal BMI had significantly higher QoL scores for the PF and the PCS domains ($p=0.01$ and $p=0.034$, respectively).

Table 6. The mean scores for the SF-36 domains depending on the level of physical activity (n=76).

SF-36 domains	Low physical activity	Moderate and high physical activity	Mann-Whitney U	p
PF	68.61	80.77	307.5	0.008*
RP	68.06	79.09	424.0	0.202
BP	61.67	65.28	482.0	0.620
GH	45.50	47.72	434.0	0.274
VT	65.28	60.99	451.0	0.383
SF	78.47	75.00	498.5	0.769
RE	81.02	83.19	492.0	0.660
MH	77.50	70.60	384.0	0.090
PCS	43.12	47.79	358.0	0.045*
MCS	52.91	48.98	405.5	0.155

PF – Physical Functioning; RP – Role Physical; BP – Bodily Pain; GH – General Health; VT – Vitality; SF – Social Functioning; RE – Role Emotional; MH – Mental Health; PCS – Physical Component Summary; MCS – Mental Component Summary; * statistical significance.

Table 7. The mean scores for the SF-36 domains depending on BMI and the level of physical activity (n=76)

SF-36 domains	Low physical activity + above normal BMI	Sufficient physical activity + normal BMI	Mann-Whitney U	p
PF	68.24	80.67	296.0	0.010*
RP	66.91	79.24	403.0	0.190
BP	60.94	65.42	457.0	0.574
GH	45.41	47.71	417.0	0.287
VT	65.44	61.02	431.5	0.380
SF	77.21	75.42	498.5	0.969
RE	80.88	83.19	485.0	0.805
MH	78.24	70.51	350.5	0.058
PCS	42.74	47.81	331.0	0.034*
MCS	53.07	49.00	379.5	0.128

PF – Physical Functioning; RP – Role Physical; BP – Bodily Pain; GH – General Health; VT – Vitality; SF – Social Functioning; RE – Role Emotional; MH – Mental Health; PCS – Physical Component Summary; MCS – Mental Component Summary; * statistical significance.

DISCUSSION

Key results

Postmenopausal women with an above normal BMI and a low level of PA were characterized by a decreased QoL, especially in terms of physical health.

Interpretation

Postmenopausal women are at increased risk for obesity and its associated complications, particularly metabolic disorders [30]. The majority of the women in the current study were characterized by excessive body weight (86.84%), which corresponds

with findings reported by other authors [9,16-17,31-32]. The participants declared an average weight gain of 10 kg in the perimenopausal period, which, according to other authors, may be partly due to hormonal changes [7,9,14-15,33]. Additionally it may be associated with unfavorable lifestyle changes in this period [13,16,19,29]. In the study sample, increased abdominal fat deposition was demonstrated, indicating an android type of obesity. A WC > 80 cm and a WHR > 0.8 were also observed in 85.53% and 82.9% of women, respectively, which confirms an increased risk for metabolic disorders, as reported by other researchers [17,34-35]. The participants of the present study also scored higher on the MCS domain than the PCS domain (49.91±9.25 vs. 46.68±8.06, respectively). However, both values were within the normal range for adults (Norm Based Scoring, 1998).

Many studies have shown a relationship between excessive body weight and reduced QoL [6,31,36-37]. This association was confirmed by Slagter et al. [6], who demonstrated a significant QoL decline in the PF domain related to the performance of everyday activities. This observation is consistent with the current findings showing that women with a higher BMI had a lower QoL in terms of physical health (PCS), especially in the PF domain, than their counterparts with a normal body weight.

The PCS reflects overall physical health and includes several domains (PF, RP, BP and GH). The participants in the current study showed different levels of BP (64.42±25.29), and rated GH lower compared to other domains (GH: 47.20±11.15, where the maximum score was 100 points). QoL may have been affected by climacteric disorders and age-related comorbidities, other than obesity, as shown in other studies [8-9]. No significant differences were found in the SF-36 domains related to mental health between women with a normal BMI and those who were overweight. Similarly, other authors have observed a significant and greater effect of obesity on QoL changes in the physical health domains than in those associated with mental health [6,31,37].

Behavioral factors such as low levels of PA and poor eating habits are also important in the context of reduced QoL and obesity in the perimenopausal period [14]. The positive impact of PA on women's physical, mental and social health in the postmenopausal period has been confirmed in many studies, and it is these elements that make up the perception of QoL [11,15,21,37]. Taking up PA has a positive effect on the self-esteem and emotional state of the elderly, and higher physical fitness is associated with a higher QoL [11,22]. Among the women participating in the program, the majority had sufficient PA (78.95% > 600 MET-min/week), which may suggest

that people enrolling in such programs usually prefer a healthy lifestyle.

The level of PA was shown to influence the QoL assessment. Women with a sufficient level of PA (moderate or high level, > 600 MET-min/week) rated their QoL higher, especially in terms of physical health (PCS). Similar findings were reported by Moilanen et al. who examined 45-64-year old women. After an eight-year follow-up, a higher QoL was observed in those women who had higher levels of PA that did not decrease after menopause [38]. In a study by Villalobos et al., a group of women who underwent controlled moderate PA for nine months (2139.1±2059.3 MET-min/week) showed a significant improvement in QoL, as measured by the HRQoL questionnaire, compared to a control group [39].

The present study confirmed a significant relationship between higher levels of PA and lower BMI among women. Other authors have published similar results [13,22,33,39]. A significant weak correlation was found between WC and PA levels, but no such relationship was observed for WHR. In studies conducted by other authors on larger groups, such relationships were confirmed [22,39]. PA in postmenopausal women is important not only to prevent a decline in QoL associated with the occurrence of obesity complications. The literature indicates a positive effect of moderate PA on reducing the risk of metabolic complications [7,15] and cardiovascular disease [32,40]. In sum, a low level of PA in postmenopausal women is associated with a decrease in their QoL, especially in the domains of overall physical health (PCS) and PF. Excessive body weight reduces QoL in the PCS and PF domains, compared to women with a normal body weight. This confirms the important role of PA as a stimulator of high QoL, and an indispensable element for the prevention of disorders typical of peri- and postmenopausal women.

Limitations

The current study has some limitations resulting from the fact that the study group consisted of only 76 women. However, on the other hand, the study group was homogeneous in terms of demographic, social and cultural aspects. At the same time, the proportion of women having insufficient PA, as well as a normal BMI, was small. Moreover, the study was conducted among women who volunteered for a program in which PA was the main component. Thus, it could be expected that participants were those who prefer an active way of spending their free time. In addition, the level of PA was assessed with a questionnaire, but one that is widely used and validated. Therefore, the

study needs to be continued, and the current results should be verified in a larger group.

CONCLUSIONS

Obesity and low PA levels are associated with reduced health-related QoL (especially in the PF and PCS domains) in postmenopausal women living in an urban area. In sum, systematic moderate PA is an

important factor not only for the prevention of metabolic diseases, but for improvements in the mental and social health of postmenopausal women.

Declarations/Acknowledgements

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REFERENCES

- Nazarpour S, Simbar M, Ramezani Tehrani F, Majd HA. Factors associated with quality of life of postmenopausal women living in Iran. *BMC Womens Health* 2020; 20(1): 104.
- Chen C, Maung K, Rowe JW, et al. Gender differences in countries' adaptation to societal ageing: an international cross-sectional comparison. *Lancet Healthy Longev* 2021; 2(8): e460-e469.
- Gujski M, Raczkiwicz D, Humeniuk E, Sarecka-Hujar B, Wdowiak A, Bojar I. Depressive symptoms and healthy behavior frequency in Polish postmenopausal women from urban and rural areas. *Int J Environ Res Public Health* 2021; 18(6): 2967.
- Wang X, Ran S, Yu Q. Optimizing quality of life in perimenopause: lessons from the East. *Climacteric* 2019; 22(1): 34-37.
- Dennerstein L, Lehert P, Guthrie J. The effects of menopausal transition and biopsychosocial factors on well-being. *Arch Womens Ment Health* 2002; 5(1): 15-22.
- Slagter SN, van Vliet-Ostapchouk JV, van Beek AP, Keers JC, Lutgers HL, van der Klaauw MM, et al. Health-related quality of life in relation to obesity grade, type 2 diabetes, metabolic syndrome and inflammation. *PLoS One* 2015; 10(10): e0140599.
- Daan NM, Fauser BC. Menopause prediction and potential implications. *Maturitas* 2015; 82(3): 257-265.
- Dotlic J, Radovanovic S, Rancic B, Milosevic B, Nicevic S, Kurtagic I, et al. Mental health aspect of quality of life in the menopausal transition. *J Psychosom Obstet Gynaecol* 2021; 42(1): 40-49.
- Skrzypulec V, Dąbrowska J, Drosdzol A. The influence of physical activity level on climacteric symptoms in menopausal women. *Climacteric* 2010; 13(4): 355-361.
- Krajewska-Ferishah K, Krajewska-Kułak E, Terlikowski S, Wiktor H, Van Damme-Ostapowicz K, Chadzopulu A, et al. Analysis of quality of life of women in menopause period in Poland, Greece, Belarus and Belgium using MRS scale. A multicenter study. *Adv Med Sci* 2010; 55(2): 191-195.
- Moratalla-Cecilia N, Soriano-Maldonado A, Ruiz-Cabello P, Fernández MM, Gregorio-Arenas E, Aranda P, et al. Association of physical fitness with health-related quality of life in early postmenopause. *Qual Life Res* 2016; 25(10): 2675-2681.
- Tuomikoski P, Savolainen-Peltonen H. Vasomotor symptoms and metabolic syndrome. *Maturitas* 2017; 97: 61-65.
- Foster-Schubert KE, Alfano CM, Duggan CR, Xiao L, Campbell KL, Kong A, et al. Effect of diet and exercise, alone or combined, on weight and body composition in overweight-to-obese postmenopausal women. *Obesity (Silver Spring)* 2012; 20(8): 1628-1638.
- Jung SY, Vitolins MZ, Fenton J, Frazier-Wood AC, Hursting SD, Chang S. Risk profiles for weight gain among postmenopausal women: a classification and regression tree analysis approach. *PLoS One* 2015; 10(3): e0121430.
- Lwow F, Jedrzejuk D, Dunajska K, Milewicz A, Szmigiero L. Cardiovascular disease risk factors associated with low level of physical activity in postmenopausal Polish women. *Gynecol Endocrinol* 2013; 29(7): 683-686.
- Lwow F, Bohdanowicz-Pawlak A. Vitamin D and selected cytokine concentrations in postmenopausal women in relation to metabolic disorders and physical activity. *Exp Gerontol* 2020; 141: 111107.
- Lwow F, Jedrzejuk D, Milewicz A, Szmigiero L. Lipid accumulation product (LAP) as a criterion for the identification of the healthy obesity phenotype in postmenopausal women. *Exp Gerontol* 2016; 82: 81-87.
- Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 international online survey. *Nutrients* 2020; 12(6): 1583.
- Lwow F, Dunajska K, Milewicz A, Laczmannski L, Jedrzejuk D, Szmigiero L. ADRB3 and PPAR 2 gene polymorphisms and their association with cardiovascular disease risk in postmenopausal women. *Climacteric* 2013; 16: 473-478.
- LaMonte MJ, Wactawski-Wende J, Larson JC, Mai X, Robbins JA, LeBoff MS, et al. Association of physical activity and fracture risk among postmenopausal women. *JAMA Netw Open* 2019; 2(10): e1914084.
- Mendoza N, De Teresa C, Cano A, Godoy D, Hita-Contreras F, Lapotka M, et al. Benefits of physical exercise in postmenopausal women. *Maturitas* 2016; 93: 83-88.
- Sternfeld B, Bhat AK, Wang H, Sharp T, Quesenberry CP. Menopause, physical activity, and body composition/fat distribution in midlife women. *Med Sci Sports Exerc* 2005; 37(7): 1195-1202.
- Zaworski K, Kubińska Z, Dziewulska A, Walasek O. Physical activity of Poles in the care for their health potential before and during the COVID-19 pandemic. *Disaster Med Public Health Prep* 2020; [published online ahead of print, 2020 Oct 22]: 1-4.

24. Hall G, Laddu DR, Phillips SA, Lavie CJ, Arena R. A tale of two pandemics: how will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Prog Cardiovasc Dis* 2021; 64: 108-110.
25. EuroStat. Performing health-enhancing physical activity by sex, age and educational attainment level. [online database] Last update 24 February 2020 [cit. 05.06.2020]. Available from URL: [https://ec.europa.eu/eurostat/databrowser/view/hlth_egis_pe9e\\$DV_469/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/hlth_egis_pe9e$DV_469/default/table?lang=en).
26. Biernat E, Piątkowska M. Leisure-time physical activity participation trends 2014–2018: a cross-sectional study in Poland. *Int J Environ Res Public Health* 2020; 17(1): 208.
27. Biernat E, Stupnicki R, Gajewski AK. Międzynarodowy Kwestionariusz Aktywności Fizycznej (IPAQ) – wersja polska. *Wychowanie Fizyczne i Sport* 2007; 51(1): 47-54. (In Polish).
28. Kaminsky L, Montoye AHK. Physical activity and health: what is the best dose? *J Am Heart Assoc* 2014; 3(5): e001430.
29. Ware JE Jr, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36) Conceptual framework and item selection. *Med Care* 1992; 30(6): 473–483.
30. Brochu M, Mathieu M, Karelis AD, Doucet É, Lavoie M, Garrel D, et al. Contribution of the lean body mass to insulin resistance in postmenopausal women with visceral obesity: a Monet study. *Obesity* 2008; 16(5): 1085-1093.
31. Busutil R, Espallardo O, Torres A, Martinez-Galdeano L, Zpazaya N, Hidalgo-Vega A. The impact of obesity on health-related quality of life in Spain. *Health Qual Life Outcomes* 2017; 15(1): 197.
32. Rebollo-Cobos RC, Becerra JE, Sanchez LP, Mendinueta-Martinez M, Polo-Gallardo R, Sarmiento-Rubiano MC, et al. Correlation between physical activity and cardiovascular risk factors in postmenopausal women from Colombia Caribbean. *Porto Biomed J* 2021; 6(1): e118.
33. Sims ST, Larson JC, Lamonte MJ, Michael YL, Martin LW, Johnson KC, et al. Physical activity and body mass: changes in younger versus older postmenopausal women. *Med Sci Sports Exerc* 2012; 44(1): 89-97.
34. Karelis AD, Brochu M, Rabasa-Lhoret R. Can we identify metabolically health but obese individuals (MHO)? *Diabetes Metab* 2004; 30(6): 569-572.
35. Zimmet P, Alberti G, Shaw J. A new IDF worldwide definition of the metabolic syndrome: the rationale and result. *Diabetes Voice* 2005; 50(3): 31-33.
36. Kolotkin RL, Andersen JR. A systematic review of reviews: exploring the relationship between obesity, weight loss and health-related quality of life. *Clin Obes* 2017; 7(5): 273-289.
37. Doll HA, Petersen SE, Stewart-Brown SL. Obesity and physical and emotional well-being: associations between body mass index, chronic illness, and the physical and mental components of the SF-36 questionnaire. *Obex Res* 2000; 8(2): 160-170.
38. Moilanen JM, Aalto AM, Raitanen J, Hemminki E, Aro AR, Luoto R. Physical activity and change in quality of life during menopause : an 8-year follow-up study. *Health Qual Life Outcomes* 2012; 10(1): 8.
39. Villalobos F, Vinuesa A, Pedret R, Basora T, Basora J, Arija V. Physical activity and health-related quality of life in adults: the “Pas a Pas” community intervention programme. *Ment Health Phys Act* 2019; 17: 100301.
40. Hargan J, Combet E, Dougal P, McGowan M, Lumsden MA, Malkova D. Efficacy of a culture-specific dancing programme to meet current physical activity recommendations in postmenopausal women. *Int J Environ Res Public Health* 2020; 17(16): 5709.

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