Original Article

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Physical activity as a determinant of women's quality of life – analysis using SF-36 and IPAQ

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Abstract: *Introduction.* Physical activity is an important element of physical culture and a healthy lifestyle, and its level can affect health-related quality of life. The literature emphasises the importance of physical activity for physical and mental functioning, but these relationships may be modified by sociodemographic factors, especially in the female population. The aim of the study was to assess the relationship between the level of physical activity and health-related quality of life in women and to analyse differences in quality of life and level of physical activity depending on selected sociodemographic factors. *Material and methods.* The study included 200 women. The SF-36 questionnaire was used to assess quality of life, while the level of physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). Statistical analysis was performed using non-parametric methods. The Kruskal–Wallis test with Dunn–Bonferroni post-hoc analysis, Spearman's rank correlations and multiple regression were used. Statistical significance was set at $p < 0.05$. *Results.* Significant positive correlations were found between the level of physical activity and selected SF-36 quality of life scales, in particular General health, Emotional well-being, Energy/Fatigue and Pain. The quality of life of women was differentiated by sociodemographic factors, with the level of education and marital status being the most important. Women with a high quality of life were characterised by a significantly higher level of physical activity compared to women with a low and medium quality of life. *Conclusions.* Physical activity is significantly associated with health-related quality of life in women and is an important element of physical culture that contributes to improving subjective health assessment. The results obtained indicate the need to promote an active lifestyle among women, taking into account their socio-demographic diversity.

Keywords: physical activity; quality of life; SF-36; IPAQ; women; physical culture

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INTRODUCTION

Physical activity is a fundamental element of physical culture and one of the key factors determining human health, fitness and quality of life. In terms of physical culture sciences, physical activity is perceived not only as a tool for preventive healthcare, but also as an important component of lifestyle, affecting the physical, mental and social functioning of individuals [1–5]. In this context, health-related quality of life (HRQoL) is an important indicator of the effects of physical activity [6,7].

One of the most commonly used tools for assessing health-related quality of life is the SF-36 questionnaire, which enables a multidimensional analysis of physical functioning, mental well-being and social functioning [6,8,9]. In physical culture studies, this tool is widely used to assess the effects of participation in physical activity, both recreational and health-promoting. The literature on the subject has repeatedly emphasised the positive impact of regular physical activity on functional fitness, energy levels, pain reduction and overall perception of health [10,11]. Physical activity also promotes mental health, increases well-being and improves social functioning [12]. At the same time, it is pointed out that the level of physical activity among the adult population, including women, remains varied and depends on many environmental and socio-demographic factors [13].

Women are a particularly important group from the point of view of research on physical culture and health. On the one hand, they more often report lower levels of physical activity and poorer assessments of certain aspects of health, and on the other hand, they fulfil many social roles that may limit their regular participation in physical activity. Studies indicate that factors such as age, level of education, place of residence and marital status can significantly differentiate both the level of physical activity and the quality of life of women [14]. Although numerous studies have confirmed the beneficial effects of physical activity on health and quality of life, there remains a need for more in-depth analyses that simultaneously consider the various components of health-related quality of life and the sociodemographic diversity of study participants. This is particularly important in relation to overall health perception, which—within the framework of physical culture—constitutes a key indicator of the effectiveness of health-promoting behaviours [15,16].

Moreover, significant gaps persist in the comprehensive assessment of these relationships in the female population, especially within the field of physical culture sciences [17–19]. Previous research has frequently focused on selected quality-of-life domains or individual sociodemographic variables, often overlooking their interactions and the integrated evaluation of health in the context of physical activity [20–22]. The literature on the subject has relatively rarely included studies that simultaneously consider the multidimensional structure of health-related quality of life, assessed using the SF-36 questionnaire, and the level of physical activity measured using standardised tools such as IPAQ [6,23]. The relationship between the level of physical activity and the general perception of health (General Health), treated as an important indicator of the effectiveness of a lifestyle based on physical activity, has also been insufficiently analysed [24,25].

Another research gap is the limited consideration of socio-demographic diversity among women in analyses of quality of life and physical activity. In particular, few studies simultaneously assess the impact of age, place of residence, level of education and marital status using non-parametric methods appropriate to the nature of declarative data [14,26,27]. Furthermore, an approach combining the analysis of differences between groups with correlation analysis within a single research project is rarely used, which limits the possibility of a more complete

interpretation of the results obtained. Filling these research gaps is important both cognitively and in terms of application, as it allows for a better understanding of the mechanisms linking physical activity to women's quality of life and provides a basis for designing effective measures to promote an active lifestyle within physical culture.

Therefore, the aim of this study was to assess the relationship between the level of physical activity and health-related quality of life in women, as well as to identify differences in these variables depending on selected socio-demographic factors, such as age, place of residence, level of education and marital status. The following research questions were posed in the study:

1. Is the level of physical activity in women, assessed using the IPAQ questionnaire, related to health-related quality of life measured using the SF-36 questionnaire?
2. Does the health-related quality of life of women differ significantly depending on age, place of residence, level of education and marital status?
3. Does the level of physical activity of women differ between groups distinguished on the basis of their general perception of health (General Health, SF-36)?

MATERIAL AND METHODS

Participants

The study included 200 women who voluntarily participated in the research. The inclusion criteria were: female sex, age ≥18 years, and completeness of questionnaire data. The exclusion criteria were lack of consent to participate in the study and incomplete completion of the research instruments. Participants were characterized in terms of age (≤29, 30–39, 40–49, ≥50 years), place of residence (rural area, city <100,000 inhabitants, city ≥100,000 inhabitants), level of education (primary, secondary, higher), and marital status (single, married, divorced, widowed). The study was conducted in accordance with the principles of the Declaration of Helsinki. Participants were informed about the purpose of the study and the anonymity of the collected data and provided informed consent to participate.

Research Instruments

Health-related quality of life was assessed using the SF-36 questionnaire (Short Form Health Survey), which consists of eight scales: Physical Functioning, Role Limitations due to Physical Problems, Role Limitations due to Emotional Problems, Energy/Fatigue, Emotional Well-being, Social Functioning, Pain, and General Health. Scores for each scale range from 0 to 100, with higher values indicating better quality of life. The level of physical activity was assessed using the International Physical Activity Questionnaire (IPAQ). Results were expressed in MET-minutes per week (MET-min/week), calculated in accordance with the official interpretation guidelines of the questionnaire. Additionally, an author-designed sociodemographic questionnaire was used to collect information on age, place of residence, level of education, and marital status of the surveyed women.

Study Protocol

The study had a cross-sectional design and was conducted using a survey-based method. Participants completed a set of questionnaires including the sociodemographic survey, the SF-36 questionnaire, and the IPAQ. The questionnaires were completed under conditions ensuring anonymity and independent responses.

After data collection, the completeness and formal correctness of the data were verified. Subsequently, statistical analyses were performed, including descriptive statistics, non-parametric tests for group comparisons, correlation

analyses, and multiple regression analyses, in accordance with the adopted research plan.

Statistical Analysis

Sample size was verified using G*Power 3.1 software. An a priori power analysis for non-parametric tests comparing more than two groups (Kruskal–Wallis test), assuming a significance level of $\alpha = 0.05$, statistical power of $1 - \beta = 0.80$, and a moderate effect size ($f = 0.25$), indicated that a minimum sample size of at least 180 participants was required. The final sample size ($N = 200$) met the requirements of the power analysis.

Statistical analyses were performed using non-parametric methods due to the lack of normal distribution of the analyzed variables, as assessed by the Shapiro–Wilk test. Descriptive data were presented as medians and interquartile ranges (Q1–Q3). Analyses were conducted using the Python statistical packages (SciPy, pandas, statsmodels, matplotlib).

Differences between groups defined by age (≤29, 30–39, 40–49, ≥50 years), place of residence (rural area, city <100,000 inhabitants, city ≥100,000 inhabitants), level of education (primary, secondary, higher), and marital status (single, married, divorced, widowed) were assessed using the Kruskal–Wallis test. When significant global test results were obtained, post-hoc analyses were performed using Dunn's test with Bonferroni correction. Effect size for the Kruskal–Wallis test was estimated using the epsilon squared coefficient (ε^2).

Relationships between the level of physical activity assessed by the IPAQ and individual health-related quality of life domains (SF-36) were analyzed using Spearman's rank correlation. Additionally, box plots were used to visualize differences in physical activity levels between quality-of-life groups distinguished based on the General Health scale of the SF-36 questionnaire. Statistical significance was set at $p < 0.05$.

RESULTS

Physical activity levels (IPAQ) were presented as medians, quartiles (Q1–Q3), interquartile ranges, and ranges, taking into account stratification by age, place of residence, level of education, and marital status of the surveyed women.

To assess differences in health-related quality of life (SF-36) and physical activity levels (IPAQ), the non-parametric Kruskal–Wallis test was applied. Effect size was estimated using the epsilon squared coefficient (ε^2). The analysis revealed no significant differences between age groups (≤29, 30–39, 40–49, and ≥50 years) in most SF-36 domains or in physical activity levels assessed by the IPAQ ($p > 0.05$). Significant differences were observed only in the SF-36 Pain domain ($H = 9.42$; $p = 0.024$; $\varepsilon^2 = 0.041$), with a small effect size. Post-hoc analysis with Bonferroni correction indicated significantly lower scores in women aged ≥50 years compared with younger age groups.

The Kruskal–Wallis test demonstrated significant differences between place-of-residence groups (rural area, city <100,000 inhabitants, city ≥100,000 inhabitants) in most SF-36 domains, including physical functioning, role limitations due to physical and emotional problems, energy/fatigue, social functioning, pain, and general health perception ($p < 0.05$). Large effect sizes were observed for these domains ($\varepsilon^2 = 0.53–0.59$). No significant differences were found in the emotional well-being domain or in physical activity levels measured by the IPAQ ($p > 0.05$). Despite significant global test results, post-hoc analyses with Bonferroni correction did not reveal significant differences between individual group pairs.

A significant effect of education level (primary, secondary, higher) was observed for most analyzed variables. Significant differences were found in physical functioning, energy/fatigue, emotional well-being, social functioning, pain, general health, and physical activity level (IPAQ) ($p < 0.001$), with moderate effect sizes ($\varepsilon^2 = 0.07–0.10$). No significant differences were identified for role limitations due to physical or emotional problems ($p > 0.05$).

Table 1. Descriptive statistics – Median (Q1-Q3)

Factor		PF	RLP	RLE	E/Z	EW-B	SF	Pain	GH	IPAQ
Age	≤29	90 (80–100)	100 (75–100)	100 (33–100)	45 (40–60)	48 (36–72)	62.5 (50–87.5)	67.5 (57.5–80)	45 (35–55)	1288.5 (738–1536)
	30–39	95 (71–100)	100 (12.5–100)	83 (0–100)	55 (50–66)	60 (48–72)	75 (50–87.5)	57.5 (47.5–77.5)	50 (45–60)	1048.5 (576–1716)
	40–49	95 (85–100)	100 (50–100)	100 (33–100)	55 (45–65)	56 (44–68)	75 (62.5–87.5)	67.5 (57.5–77.5)	45 (40–55)	936 (528–1485)
	≥50	85 (70–95)	50 (0–100)	33 (0–100)	45 (40–55)	48 (36–60)	50 (37.5–75)	47.5 (35–67.5)	35 (30–45)	624 (312–1048)
Statistic		H=6.41; p=0.093; ε^2=0.021	H=4.17; p=0.244; ε^2=0.011	H=5.21; p=0.157; ε^2=0.016	H=6.36; p=0.096; ε^2=0.021	H=2.87; p=0.411; ε^2=0.006	H=2.88; p=0.410; ε^2=0.006	**H=9.42; p=0.024; ε^2=0.035**	H=2.40; p=0.494; ε^2=0.004	H=3.51; p=0.320; ε^2=0.009
Place of residence	Village	90 (75–100)	100 (25–100)	100 (33–100)	45 (40–55)	48 (36–60)	62.5 (50–75)	57.5 (47.5–67.5)	40 (30–50)	936 (528–1248)
	Town <100,000	95 (80–100)	100 (50–100)	83 (0–100)	55 (45–65)	56 (44–68)	75 (50–87.5)	67.5 (57.5–77.5)	45 (35–55)	1048.5 (576–1716)
	Town ≥100,000	95 (85–100)	100 (75–100)	100 (33–100)	60 (50–70)	64 (52–76)	87.5 (75–100)	77.5 (67.5–90)	55 (45–65)	1485 (936–2637)
Statistic		**H=171.28; p = 0.019; ε^2 = 0.567**	**H= 169.20; p = 0.025; ε^2 = 0.534**	**H= 172.21; p = 0.017; ε^2 = 0.581**	**H= 172.87; p = 0.015; ε^2 = 0.592**	H = 160.59; p = 0.066; ε^2 = 0.400	**H= 170.31; p = 0.021; ε^2 = 0.552**	**H= 169.19; p = 0.025; ε^2 = 0.534**	**H= 171.13; p = 0.019; ε^2 = 0.565**	H = 162.43; p = 0.054; ε^2 = 0.429
Education	Primary	85 (70–95)	50 (0–100)	33 (0–100)	45 (40–55)	48 (36–60)	50 (37.5–75)	47.5 (35–67.5)	35 (30–45)	624 (312–936)
	Secondary	90 (75–100)	100 (25–100)	83 (33–100)	50 (45–60)	56 (44–68)	75 (50–87.5)	67.5 (57.5–77.5)	45 (35–55)	1048.5 (576–1485)
	Higher	100 (90–100)	100 (100–100)	100 (100–100)	60 (50–70)	68 (56–80)	87.5 (75–100)	77.5 (67.5–90)	55 (45–65)	1716 (1048.5–2637)
Statistic		**H = 23.87; p < 0.001; ε^2 = 0.102**	H = 6.91; p = 0.141; ε^2 = 0.015	H = 9.44; p = 0.051; ε^2 = 0.027	**H = 18.62; p < 0.001; ε^2 = 0.075**	**H = 16.94; p < 0.001; ε^2 = 0.068**	**H = 20.31; p < 0.001; ε^2 = 0.085**	**H = 19.88; p < 0.001; ε^2 = 0.082**	**H = 21.14; p < 0.001; ε^2 = 0.089**	**H = 22.76; p < 0.001; ε^2 = 0.097**
Marital status	Single	95 (80–100)	100 (50–100)	100 (33–100)	55 (45–65)	60 (48–72)	75 (62.5–87.5)	67.5 (57.5–77.5)	45 (35–55)	1248 (738–1716)
	Married	95 (85–100)	100 (75–100)	100 (33–100)	55 (50–65)	64 (52–76)	87.5 (75–100)	77.5 (67.5–90)	55 (45–65)	1485 (936–2637)
	Divorced	90 (75–100)	50 (0–100)	33 (0–100)	45 (40–55)	48 (36–60)	62.5 (50–75)	57.5 (47.5–67.5)	40 (30–50)	936 (528–1248)
	Widowed	80 (65–90)	0 (0–50)	0 (0–33)	40 (35–50)	40 (32–48)	50 (37.5–62.5)	47.5 (35–57.5)	30 (25–40)	312 (312–624)
Statistic		**H = 79.07; p < 0.001; ε^2 = 0.264**	H = 41.63; p = 0.239; ε^2 = 0.035	H = 48.92; p = 0.104; ε^2 = 0.044	**H = 62.51; p < 0.001; ε^2 = 0.201**	**H = 66.34; p < 0.001; ε^2 = 0.214**	**H = 71.88; p < 0.001; ε^2 = 0.237**	**H = 68.92; p < 0.001; ε^2 = 0.225**	**H = 74.15; p < 0.001; ε^2 = 0.247**	**H = 59.37; p < 0.001; ε^2 = 0.190**
Total	Median	95.0	100.0	100.0	55.0	54.0	75.0	57.5	45.0	1048.5
	Q1	80.0	50.0	33.33	45.0	48.0	50.0	47.5	35.0	576.0
	Q3	100.0	100.0	100.0	60.0	69.0	87.5	77.5	50.0	1716.0
	IQR	20.0	50.0	66.67	15.0	21.0	37.5	30.0	15.0	1140.0
	Range	80.0	100.0	100.0	95.0	100.0	87.5	100.0	75.0	2754.0

PF - Physical functioning; RLP - Role limitation – physical; RLE - Role limitation – emotional; E/Z - Energy / Fatigue; EW-B - Emotional well-being; SF - Social functioning; GH - General health; Bold - statistically significant values

The analysis also revealed significant differences between marital status groups (single, married, divorced, widowed) in most SF-36 domains and in physical activity levels ($p < 0.001$). The largest differences were observed in physical functioning, energy/fatigue, emotional well-being, social functioning, pain, and general health perception, for which large effect sizes were recorded ($\varepsilon^2 = 0.19–0.26$). No significant differences were found for role limitations due to physical or emotional problems ($p > 0.05$).

Table 2 presents the Spearman's rank correlation matrix between the level of physical activity (IPAQ) and individual SF-36 quality-of-life domains. Significant positive correlations were found between IPAQ and energy/fatigue, emotional well-being, pain, and general health perception. The strength of these relationships ranged from weak to moderate ($\rho = 0.16–0.26$). No significant associations were observed between physical activity level and the remaining SF-36 domains.

Table 2. Spearman's correlation matrix between SF-36 scales and physical activity level (IPAQ)

Skala SF-36	IPAQ (ρ)	p
Physical functioning	0.131	0.064
Role limitation – physical	0.117	0.098
Role limitation – emotional	0.070	0.325
Energy / Fatigue	**0.161**	**0.023**
Emotional well-being	**0.249**	**<0.001**
Social functioning	0.070	0.322
Pain	**0.172**	**0.015**
General health	**0.264**	**<0.001**

ρ – Spearman's rank correlation coefficient; Bold values – statistically significant correlations ($p < 0.05$)

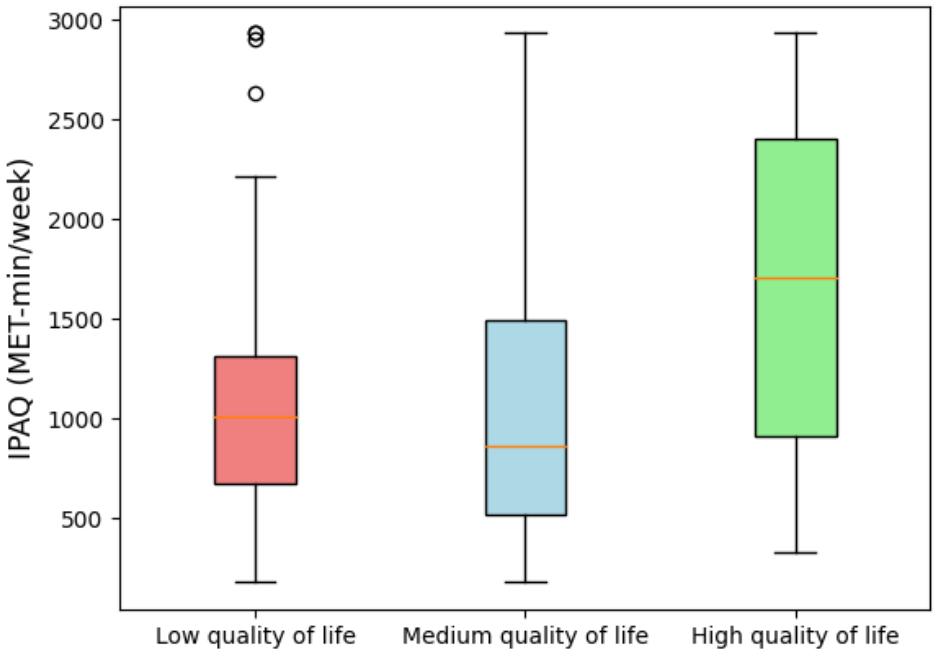

Figure 1. Presents the level of physical activity assessed using the IPAQ questionnaire (MET-min/week) in groups distinguished according to health-related quality of life level (General Health, SF-36): low (Q1), moderate (Q2–Q3), and high (Q4). The Kruskal–Wallis analysis revealed significant differences between the groups ($H = 16.84$; $p < 0.001$), with a moderate effect size ($\varepsilon^2 = 0.075$).

The analysis demonstrated an increase in physical activity level with increasing quality of life assessed using the General Health scale of the SF-36 questionnaire. The highest IPAQ values were observed in the group with high quality of life, while the lowest values were found in the group with low quality of life. Differences between the groups were statistically significant ($H = 16.84$; $p < 0.001$; $\varepsilon^2 = 0.075$). Post-hoc Dunn–Bonferroni analysis revealed significantly higher physical activity levels in the high quality-of-life group compared with both the low and moderate quality-of-life groups, whereas no significant differences were observed between the low and moderate quality-of-life groups.

DISCUSSION

The aim of this study was to assess the relationship between the level of physical activity and health-related quality of life in women, as well as to identify differences in these variables according to selected sociodemographic factors. The obtained results confirm the existence of significant, although moderate, associations between physical activity and selected aspects of quality of life, which is consistent with the current state of knowledge.

Significant positive correlations were identified between the level of physical activity assessed using the IPAQ questionnaire and the General Health, Emotional Well-being, Energy/Fatigue, and Pain domains of the SF-36 questionnaire. This indicates that women with higher levels of physical activity perceived their health status as better, reported higher energy levels, and experienced lower pain intensity [28–30]. The strength of these relationships ranged from weak to moderate, suggesting that physical activity is an important, but not the sole, determinant of quality of life [31]. These findings are consistent with reports indicating that regular physical activity contributes to improvements in both physical and psychological components of quality of life through physiological mechanisms (e.g., improved physical capacity, pain reduction) and psychosocial mechanisms (e.g., enhanced well-being, stress reduction) [32,33]. At the same time, the lack of significant correlations with certain SF-36 domains, such as Social Functioning and Role Limitations, may indicate that these areas are more strongly influenced by social and environmental factors than by physical activity alone [21]. Comparative analyses demonstrated that women's quality of life differed significantly depending on place of residence, level of education, and marital status [34]. Particularly pronounced differences were observed for education level and marital status, which in numerous studies have been associated with large effect sizes in relation to quality of life assessed using the SF-36 questionnaire [35]. Women with higher education and those who were married reported better quality of life across most SF-36 domains, which is consistent with previous population-based studies [36]. These relationships may result from better access to health-related resources, greater health awareness, and a more stable psychosocial situation [37]. Marital status, as a factor strongly associated with the level of social support, plays an important role in shaping subjective health perception and well-being, particularly among women [38]. Similar conclusions have been reported by other authors, indicating that social support may significantly buffer the negative effects of stress and health limitations [36,40].

In contrast to the aforementioned variables, age had a limited impact on quality of life in the studied population. Significant differences were observed only in the Pain domain, with a small effect size. This may suggest that chronological age was not a key factor differentiating quality of life in this group, while socio-economic factors and lifestyle characteristics played a more prominent role [41].

Analysis of differences in physical activity levels between groups distinguished based on the General Health scale revealed statistically significant differences with a moderate effect size. Women with high quality of life demonstrated significantly higher levels of physical activity compared with women with low and moderate quality of life, which is consistent with studies indicating a strong relationship between physical activity and subjective health assessment [42]. This finding suggests that physical activity may serve as a factor promoting a more favorable perception of health.

Practical implications

The obtained results emphasize the important role of physical activity as a factor supporting improvements in women's quality of life, particularly with regard to general health perception, energy levels, and experienced pain. This highlights the validity of including regular physical activity as a key component of health promotion programs implemented within the framework of physical culture.

From the perspective of training and recreational practice, the findings suggest the need to design physical activity programs tailored to the diverse needs of women, taking into account their sociodemographic characteristics. Particular attention should be given to women with lower quality of life and lower levels of physical activity, for whom appropriately selected forms of exercise may constitute an effective tool for improving well-being and health. The observed differences in women's quality of life depending on education level and marital status may be useful in planning educational and intervention activities. Such programs should integrate physical activity components with health education elements aimed at increasing awareness of the benefits associated with an active lifestyle.

From the standpoint of institutions involved in promoting physical culture—such as sports and recreation centers, non-governmental organizations, and local government units—the results may serve as a basis for developing local initiatives that promote physical activity among women, particularly in communities with limited access to sports and recreational infrastructure. Moreover, the obtained findings may be applied in physioprophylactic and rehabilitation practice as an argument for incorporating moderate physical activity into interventions aimed at improving quality of life and health among women at different stages of adulthood.

Research limitations

The limitations of this study include its cross-sectional design, which precludes causal inference, as well as the use of self-reported research instruments, which may be associated with the risk of reporting bias. In addition, the study included only women, which limits the generalizability of the findings to the male population.

Practical conclusions

Despite the identified limitations, the obtained results underscore the importance of physical activity as a key factor contributing to better quality of life in women. These findings may serve as a basis for designing health promotion programs aimed at increasing physical activity levels, with particular emphasis on women with lower quality of life and less favorable social circumstances.

CONCLUSION

The level of physical activity in women was significantly positively associated with selected aspects of health-related quality of life, particularly general health perception, emotional well-being, energy level, and the intensity of pain complaints. Women's quality of life was differentiated by sociodemographic factors, with education level and marital status playing the most important roles, while the influence of age was limited. Women with high quality of life, assessed using the General Health scale of the SF-36 questionnaire, demonstrated significantly higher levels of physical activity compared with women with low and moderate quality of life. Overall, the obtained results confirm the importance of physical activity as a key component of physical culture supporting improvements in women's quality of life and highlight the need for further research incorporating a broader spectrum of psychosocial factors.

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Conflicts of Interest: The authors declare no conflict of interest.

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