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Effects of Aerobic Interval Training on Quality of Life and Stress in Overweight Young Adult Women: A Quasi-Experimental Study

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Abstract

Background: Overweight among young adult women is associated with reduced quality of life and increased perceived stress. Aerobic Interval Training (AIT) may provide psychosocial benefits, but evidence remains limited and inconsistent.

Objective: This study examined the effects of a 16-week AIT program on quality of life and perceived stress among overweight young adult women.

Methods: This quasi experimental, non-randomized pretest posttest control group study included 30 overweight young adult women (mean age approximately 20 years) assigned by matching to an AIT group (n = 15) or control group receiving health education (n = 15). The AIT group completed supervised sessions three times weekly for 16 weeks. Outcomes were assessed at baseline, week 8, and week 16 using the WHOQOL BREF and Perceived Stress Scale 10 (PSS 10). Within group changes were analyzed using repeated measures ANOVA or Friedman tests, and between group differences using independent t tests or Mann Whitney tests. Effect sizes were also estimated.

Results: Both groups showed small, non-significant changes in quality of life and perceived stress across time (all $p > 0.05$). No significant between group differences were observed, with small effect sizes and 95% confidence intervals crossing the null value.

Conclusion: A 16-week AIT program did not significantly improve quality of life or perceived stress among overweight young adult women. Longer interventions with larger samples and integrated lifestyle approaches may be needed to achieve measurable psychosocial benefits.

Keywords
High-Intensity Interval Training; Quality of Life; Psychological Stress; Overweight; Women

Introduction

Overweight and obesity remain major public health concerns worldwide, with a rapidly increasing prevalence among young adults, particularly women. According to the World Health Organization, overweight and obesity are associated not only with cardiometabolic risks but also with adverse psychological outcomes, including impaired quality of life and elevated stress levels.[1,2] In many low- and middle-income countries, including Indonesia, the prevalence of overweight among young adults continues to rise, reflecting changes in lifestyle patterns, physical inactivity, and psychosocial stressors.[3,4]

Beyond physical health consequences, excess body weight has been consistently associated with reduced health-related quality of life and poorer psychological well-being. Studies have demonstrated that individuals with overweight or obesity tend to report lower scores across physical, psychological, and social domains of quality of life compared with individuals of normal weight.[5,6,7] These impairments are often more pronounced in women, who may experience greater psychosocial burden related to body image dissatisfaction and perceived social stigma.[8,9]

Psychological stress plays a central role in the complex relationship between overweight and quality of life. Chronic stress may contribute to weight gain through behavioral pathways such as emotional eating and physical inactivity, as well as through neuroendocrine dysregulation involving the hypothalamic–pituitary–adrenal axis.[10,11] Conversely, excess body weight and negative body image may further exacerbate perceived stress, creating a bidirectional and self-reinforcing cycle that adversely affects overall well-being.[8,9,10,11]

Young adult women represent a particularly vulnerable population in this context. This life stage is often characterized by academic pressure, transitional social roles, and heightened sensitivity to appearance-related norms. Evidence suggests that young women with overweight are more likely to report elevated stress levels, reduced self-esteem, and lower psychological quality of life compared with their normal-weight peers.[9,10] Consequently, interventions that address both physical and psychosocial dimensions of health are especially relevant for this population.

Physical activity is widely recommended as a cornerstone strategy for improving both physical and mental health. However, global surveillance data indicate that a substantial proportion of young adults do not meet recommended physical activity levels.[3] Aerobic exercise has been shown to improve quality of life and reduce stress through multiple mechanisms, including improved cardiorespiratory fitness, modulation of stress hormones, and enhancement of mood-related neurotransmitters.[10,11] Despite these benefits, adherence to traditional continuous aerobic exercise programs remains a significant challenge, particularly among young adults with time constraints and low exercise motivation.

Aerobic Interval Training (AIT), often operationalized as high-intensity interval training, has emerged as a time-efficient alternative to continuous aerobic exercise. Previous studies and systematic reviews have demonstrated that interval-based aerobic training can induce comparable or superior physiological adaptations relative to moderate-intensity continuous training, even with shorter training durations.[12,13] From a behavioral perspective, AIT may be perceived as more engaging and less monotonous, potentially enhancing adherence and exercise enjoyment.

Despite increasing interest in AIT, evidence regarding its effects on psychological outcomes such as quality of life and perceived stress remains inconsistent. While some studies have reported modest improvements in psychosocial well-being following interval-based exercise interventions, others have found minimal or non-significant effects, particularly in non-clinical and young adult populations.[7,12] Furthermore, many existing studies have focused on clinical populations or employed randomized controlled designs, limiting their applicability to real-world, non-randomized settings.[14]

In addition, cultural and contextual factors may influence psychological responses to exercise interventions. Body mass index classification differs across populations, with Asian-specific cut-off points recommended to more accurately reflect health risks in Asian populations.[15] However, empirical data examining the psychosocial effects of AIT among overweight young adult women using Asian BMI criteria remain limited.[16]

Taken together, there is a clear need for further investigation into the effects of Aerobic Interval Training on quality of life and perceived stress in overweight young adult women, particularly using non-randomized, pragmatic study designs that reflect real-world conditions. Therefore, the aim of this study was to examine the effects of a 16-week Aerobic Interval Training program on quality of life and perceived stress among overweight young adult women using a quasi-experimental, non-randomized design.

Methods

This study employed a quasi-experimental, non-randomized pretest–posttest control group design and was conducted and reported in accordance with the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement. The intervention lasted 16 weeks, with assessments conducted at baseline (T1), week 8 (T2), and week 16 (T3). The study was conducted at the Faculty of Health Sciences, Universitas Muhammadiyah Surakarta, with participants recruited through announcements and informational sessions targeting female undergraduate students. Initial screening assessed eligibility based on age, body mass index (BMI), and health status. Eligible participants were women aged 18–23 years with overweight according to Asian-specific criteria (BMI ≥23.0 kg/m²). Participants were required to be free from diagnosed cardiovascular, metabolic, or musculoskeletal conditions that could contraindicate moderate-to-vigorous exercise. Exclusion criteria included pregnancy, current participation in structured exercise programs, and use of medications affecting cardiovascular or psychological responses.

Of 42 individuals assessed for eligibility, 12 were excluded because they did not meet the BMI criteria, declined participation, or had scheduling constraints. The remaining 30 participants were allocated to the Aerobic Interval Training (AIT) group (n = 15) or control group (n = 15) using matched assignment based on age and baseline BMI to reduce baseline imbalance. Randomization was not feasible because of logistical and scheduling constraints; consequently, allocation concealment and blinding were not implemented. This pragmatic approach was intended to reflect real-world conditions commonly encountered in educational and community-based exercise programs.

The AIT group participated in supervised sessions three times per week for 16 weeks. Each session was supervised by a certified exercise instructor and trained research assistant to ensure participant safety and protocol adherence. The control group received weekly health education sessions addressing general lifestyle and wellness topics and did not participate in structured exercise training. Detailed AIT dosage, intensity progression, and session structure are provided in Supplementary Table S1. Briefly, the program used progressive intensity targets ranging from moderate to vigorous levels, monitored using heart rate parameters and the Talk Test. Session duration increased gradually throughout the intervention to accommodate adaptation and minimize injury risk.

Quality of life was assessed using the World Health Organization Quality of Life-BREF (WHOQOL-BREF), which evaluates physical health, psychological health, social relationships, and environmental domains. The WHOQOL-BREF has demonstrated acceptable validity and reliability across diverse populations, including young adults. Perceived stress was assessed using the Perceived Stress Scale-10 (PSS-10), a widely used self-report instrument measuring the extent to which situations are perceived as stressful. The PSS-10 has demonstrated good internal consistency and has been validated in adult populations. Questionnaires were administered using standardized procedures at all assessment points. Participants completed the instruments in a quiet classroom under researcher supervision to minimize missing data and maintain consistency.

Continuous variables were summarized as mean and standard deviation or median and interquartile range, as appropriate. Data normality was assessed using the Shapiro–Wilk test. Within-group changes across the three assessment points were analyzed using repeated-measures analysis of variance for normally distributed data or the Friedman test for non-normally distributed data. Between-group differences in change scores were assessed using independent t-tests or Mann–Whitney U tests, as appropriate. Statistical significance was set at $p < 0.05$. Effect sizes were calculated to estimate the magnitude of observed changes, using Cohen's d for parametric comparisons and r for non-parametric analyses, with values of 0.2, 0.5, and 0.8 interpreted as small, moderate, and large effects, respectively. Ninety-five percent confidence intervals were reported for between-group comparisons where applicable. All analyses followed a per-protocol approach because no participants were lost to follow-up. Given the exploratory nature of the study and limited sample size, no formal a priori power calculation was performed, and this limitation is acknowledged in the Discussion.

The study protocol was approved by the Health Research Ethics Committee of Universitas Muhammadiyah Surakarta (Approval No. 632/KEPK-FIK/XI/2024). Written informed consent was obtained from all participants before participation. All procedures were conducted in accordance with the Declaration of Helsinki, and participants were informed of their right to withdraw from the study at any time without penalty.

Results

A total of 42 participants were assessed for eligibility. Twelve participants were excluded during the screening process due to not meeting the body mass index inclusion criteria (n = 6), declining to participate (n = 4), or scheduling constraints (n = 2). Thirty eligible participants were enrolled and allocated to either the Aerobic Interval Training (AIT) group (n = 15) or the control group receiving health education (n = 15).

All enrolled participants completed baseline assessment (T1), mid-intervention assessment at week 8 (T2), and post-intervention assessment at week 16 (T3). No participants were lost to follow-up, and all allocated participants were included in the final per-protocol analysis. The flow of participants through the study is illustrated in Figure 1.

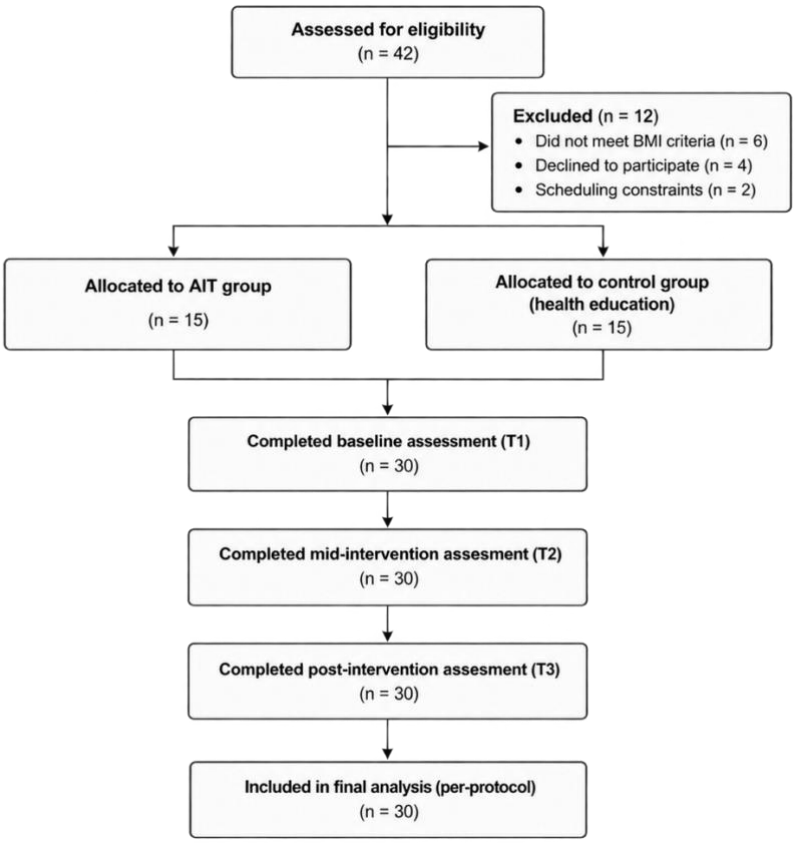

Figure 1. CONSORT Flow Diagram of Participant Recruitment, Randomization, Follow Up, and Final Analysis

Baseline demographic and clinical characteristics of participants are presented in Table 1. No statistically significant differences were observed between the AIT and control groups for age, body mass index, perceived stress, or quality of life domains at baseline ($p > 0.05$), indicating adequate baseline comparability between groups.

Table 1. Baseline Demographic and Clinical Characteristics of Participants

Variable	AIT Group (n = 15)	Control Group (n = 15)	p-value
Age (years)	19.33 ± 0.98	19.93 ± 0.70	0.081
Body mass index (kg/m²)	28.59 ± 2.17	27.93 ± 2.75	0.477
PSS-10 score	20.40 ± 4.81	23.33 ± 5.77	0.522
WHOQOL Physical	51.00 ± 8.44	54.73 ± 13.14	0.071
WHOQOL Psychological	53.53 ± 11.93	57.13 ± 15.57	0.871
WHOQOL Social	62.53 ± 13.84	58.47 ± 15.17	0.827
WHOQOL Environment	66.93 ± 11.34	60.93 ± 16.39	0.099

Within-group changes in perceived stress and quality of life domains across three time points are presented in Table 2. No statistically significant within-group changes were observed in either the AIT or control group for PSS-10 or WHOQOL-BREF domains (all $p > 0.05$). Effect size estimates indicated small magnitudes of change across outcomes.

Table 2. Within-Group Changes in Perceived Stress and Quality of Life

Outcome	Group	Pre	Mid	Post	p-value	Effect size
PSS-10	AIT	20.40 ± 4.81	20.13 ± 4.53	20.26 ± 5.28	0.852	d = 0.03
	Control	23.33 ± 5.77	23.13 ± 4.67	20.07 ± 6.17	0.586	d = 0.29
WHOQOL Physical	AIT	51.00 ± 8.44	57.46 ± 17.83	54.20 ± 16.78	0.470	d = 0.19
	Control	54.73 ± 13.14	56.80 ± 12.95	50.60 ± 16.74	0.560	d = 0.24
WHOQOL Psychological	AIT	53.53 ± 11.93	52.60 ± 11.84	55.47 ± 11.67	0.783	d = 0.16
	Control	57.13 ± 15.57	56.93 ± 10.90	56.87 ± 16.59	0.563	d = 0.02

Between-group comparisons of change scores from baseline to post-intervention are presented in Table 3. No statistically significant differences were identified between the AIT and control groups for any outcome variable (all $p > 0.05$). The estimated effect sizes for between-group differences were small, and 95 percent confidence intervals included the null value.

Table 3. Between-Group Comparisons of Changes from Baseline to Post-Intervention

Outcome	Mean Difference	95% CI	p-value	Effect size
PSS-10	3.40	−2.51 to 9.31	0.248	d = 0.36
WHOQOL Physical	7.33	−8.64 to 23.31	0.355	d = 0.34
WHOQOL Psychological	2.20	−12.69 to 17.09	0.574	d = 0.14
WHOQOL Social	−13.93	−32.21 to 4.34	0.109	d = 0.55
WHOQOL Environment	−2.87	−14.90 to 9.17	0.629	d = 0.18

Discussion

The present study examined the effects of a 16-week Aerobic Interval Training (AIT) program on quality of life and perceived stress among overweight young adult women using a quasi-experimental, non-randomized design. The main findings indicated that AIT did not result in statistically significant improvements in perceived stress or quality of life domains when compared with a health education control group. Within-group analyses revealed small, non-significant changes across outcomes in both groups, while between-group comparisons demonstrated small effect sizes with confidence intervals crossing the null value.

The absence of statistically significant effects may be partly explained by the limited sample size and the resulting low statistical power to detect small-to-moderate psychosocial changes.[17] Psychological outcomes such as quality of life and perceived stress are known to exhibit greater inter-individual variability and smaller effect sizes compared with physiological outcomes, particularly in non-clinical populations.[18] Consequently, modest intervention effects may not reach statistical significance in studies with relatively small samples.[14]

Intervention duration represents another important consideration. Although 16 weeks of AIT is generally sufficient to induce measurable physiological adaptations, psychological and behavioral changes may require longer exposure and sustained engagement to become detectable using standardized self-report instruments.[19] Previous studies have suggested that improvements in stress perception and quality of life often emerge after longer intervention periods or when exercise is combined with additional behavioral or psychosocial components.[7,10,11]

From a neurobiological perspective, the small, non-significant trends observed in the AIT group may reflect early-stage adaptations that precede measurable psychological change. Aerobic exercise has been shown to influence hypothalamic–pituitary–adrenal axis regulation, neurotransmitter activity, and neurotrophic factors associated with stress resilience and mood regulation.[10,11] However, such internal physiological changes may not immediately translate into subjective improvements in perceived stress or quality of life within a relatively short timeframe.[20]

Contextual and lifestyle-related factors may also have influenced the study outcomes. Variables such as dietary habits, sleep quality, academic workload, and social support were not systematically controlled or monitored in the present study. These factors are known to substantially affect psychological well-being and may have attenuated the isolated effects of the exercise intervention. Similar challenges have been reported in previous exercise-based interventions targeting psychosocial outcomes in young adults.[21]

The use of a quasi-experimental, non-randomized design reflects real-world conditions commonly encountered in educational and community settings; however, this pragmatic approach also introduces potential selection bias and residual confounding. Although matched assignment was employed to reduce baseline imbalance, unmeasured factors may still have influenced individual responses to the intervention. In addition, the lack of blinding may have contributed to response bias in self-reported outcomes.

Despite these limitations, the findings of the present study contribute to the growing body of evidence suggesting that Aerobic Interval Training alone may not be sufficient to elicit substantial psychosocial benefits in overweight young adult women. Comparative studies have reported that interval-based and continuous aerobic exercise often produce similar effects on quality of life, indicating that the mode of aerobic exercise may be less influential than overall engagement, adherence, and contextual support.[22]

These results highlight the importance of adopting a more integrated approach to psychosocial health promotion. Exercise interventions may be more effective when combined with behavioral counseling, stress management strategies, or social support components that directly target psychological determinants of well-being.[23] Future studies should employ randomized controlled designs with larger sample sizes, extended intervention durations, and follow-up assessments to better elucidate the long-term psychosocial effects of Aerobic Interval Training.

Conclusion

This quasi-experimental study found that a 16-week Aerobic Interval Training (AIT) program did not result in statistically significant improvements in quality of life or perceived stress among overweight young adult women when compared with a health education control group. Although small, non-significant changes were observed within groups across several outcome measures, between-group comparisons revealed small effect sizes with confidence intervals crossing the null value. These findings indicate that AIT, when implemented as a standalone intervention within a non-randomized framework and a relatively short intervention duration, may be insufficient to elicit measurable psychosocial benefits in this population.

Several limitations should be considered when interpreting these findings. The non-randomized design limits causal inference and increases susceptibility to selection bias and residual confounding, despite the use of matched assignment to improve baseline comparability. The relatively small sample size reduces statistical power to detect small-to-moderate psychosocial effects, while reliance on self-reported questionnaires may introduce recall and response bias. In addition, lifestyle-related factors such as dietary intake, sleep quality, academic workload, and social support were not systematically controlled and may have influenced perceived stress and quality of life outcomes. The absence of post-intervention follow-up further limits conclusions regarding the sustainability of observed trends.

From a clinical and practical perspective, Aerobic Interval Training remains a feasible and safe exercise modality for overweight young adult women; however, clinicians and exercise professionals should exercise caution in expecting meaningful improvements in quality of life or perceived stress from AIT alone over a 16-week period. Interventions targeting psychosocial outcomes may benefit from integrating exercise with behavioral counseling, stress management strategies, or structured social support.[24] Future research should employ randomized controlled designs with larger samples, longer intervention and follow-up periods, and multidimensional outcome assessments to better clarify the role of Aerobic Interval Training within comprehensive health promotion programs.

Author Contribution

Khoiruna Malihah: Conceptualization, Methodology, Investigation, Data curation, Writing original draft.
Farid Rahman: Conceptualization, Methodology, Supervision, Writing review and editing.
Muhammad Raihan Ishad: Investigation, Data curation, Formal analysis, Writing review and editing.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest related to the conduct, analysis, or publication of this study.

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Ethics Statement

This study was approved by the Health Research Ethics Committee of Universitas Muhammadiyah Surakarta under ethical approval number 632/KEPK-FIK/XI/2024. The approval was valid from November 4, 2024, to November 4, 2025. All participants received information regarding the study objectives, procedures, potential risks, and benefits, and written informed consent was obtained from all participants before participation. The study was conducted in accordance with applicable ethical standards.

Reference

1. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults. Lancet. 2024;403(10431):1027-1050.
2. Chooi YC, Ding C, Magkos F. The epidemiology of obesity. Metabolism. 2019;92:6-10.
3. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1.9 million participants. Lancet Glob Health. 2018;6(10):e1077-e1086.
4. Kementerian Kesehatan Republik Indonesia. Survei Kesehatan Indonesia 2023. Jakarta: Kementerian Kesehatan Republik Indonesia; 2023.
5. Skevington SM, Epton T. How will the sustainable development goals deliver changes in well-being? A systematic review and meta-analysis to investigate whether WHOQOL-BREF scores respond to change. BMJ Glob Health. 2018;3(Suppl 1):e000609.
6. Fløjo TN, Liu HH, Andersen JR, Kolotkin RL. Exploring the relationship between obesity, weight loss and health-related quality of life: an updated systematic review of reviews. Clin Obes. 2026;16(1):e70049.
7. Abiri B, Hosseinpanah F, Banihashem S, Madinehzad SA, Valizadeh M. Mental health and quality of life in different obesity phenotypes: a systematic review. Health Qual Life Outcomes. 2022;20(1):63.
8. Lee KM, Hunger JM, Tomiyama AJ. Weight stigma and health behaviors: evidence from the Eating in America Study. Int J Obes (Lond). 2021;45(7):1499-1509.
9. Matheson EL, Schneider J, Gentili C, Tinoco A, Silva-Breen H, White P, et al. A systematic review and meta-analysis of interventions that target the intersection of body image and movement among girls and women. Int Rev Sport Exerc Psychol. 2025;18(1):467-502.
10. Tomiyama AJ. Stress and obesity. Annu Rev Psychol. 2019;70:703-718.
11. van der Valk ES, Savas M, van Rossum EFC. Stress and obesity: are there more susceptible individuals? Curr Obes Rep. 2018;7(2):193-203.
12. Palma S, Hasenoehrl T, Jordakieva G, Ramazanova D, Crevenna R. High-intensity interval training in the prehabilitation of cancer patients: a systematic review and meta-analysis. Support Care Cancer. 2021;29(4):1781-1794.
13. Serrablo-Torrejon I, Lopez-Valenciano A, Ayuso M, Horton E, Mayo X, Medina-Gomez G, et al. High intensity interval training exercise-induced physiological changes and their potential influence on metabolic syndrome clinical biomarkers: a meta-analysis. BMC Endocr Disord. 2020;20(1):167.
14. Nurdiana I, Safitri R. Pengaruh hidroterapi terhadap penurunan tekanan darah pada ibu hamil dengan hipertensi di PMB Sumariyah S.Tr.Keb Kota Malang. Health Inf J Penelit. 2023;15(1):1-9.
15. Li Z, Daniel S, Fujioka K, Umashanker D. Obesity among Asian American people in the United States: a review. Obesity (Silver Spring). 2023;31(2):316-328.
16. Conradson HE, Hayden KA, Russell-Mayhew S, Raffin Bouchal S, King-Shier K. Positive psychological well-being in women with obesity: a scoping review of qualitative and quantitative primary research. Obes Sci Pract. 2022;8(6):691-714.
17. de Vries YA, Schoevers RA, Higgins JPT, Munafò MR, Bastiaansen JA. Statistical power in clinical trials of interventions for mood, anxiety, and psychotic disorders. Psychol Med. 2023;53(10):4499-4506.
18. Gu H, Lei Y, Yao Y, Chen C, Liu C. Physiological and psychological responses to acute stress: a meta-analysis of the 171 studies of Trier Social Stress Test including 8452 healthy adults. Psychoneuroendocrinology. 2025;180:107566.
19. Liu C, Liang J, Nie Y, Ma W, Tan W, Zhong J, et al. The effect of exercise interventions on enhancing psychological resilience: a systematic review and meta-analysis. BMC Psychol. 2026;14:1167.
20. Hilger K, Talić I, Renner KH. Individual differences in the correspondence between psychological and physiological stress indicators. bioRxiv. 2024 Aug 23.
21. Shimizu R, Rodwin AH, Munson MR. A systematic review of psychosocial nutrition interventions for young adults. J Nutr Educ Behav. 2021;53(4):316-335.
22. Ribeiro VB, Lopes IP, Dos Reis RM, Silva RC, Mendes MC, Melo AS, et al. Continuous versus intermittent aerobic exercise in the improvement of quality of life for women with polycystic ovary syndrome: a randomized controlled trial. J Health Psychol. 2021;26(9):1307-1317.
23. Nero DSM, Lira CRN, Silva Lima Paz CL, Farias Costa PR, Magalhães Cunha C, Amador Bueno A, et al. Effect of physical activity on depression, anxiety, and stress in women surviving breast cancer: a systematic review and meta-analysis of randomized clinical trials. J Health Psychol. 2025;30(11):2825-2843.
24. Churchill R, Teo K, Kervin L, Riadi I, Cosco TD. Exercise interventions for stress reduction in older adult populations: a systematic review of randomized controlled trials. Health Psychol Behav Med. 2022;10(1):913-934.