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Original research papers

DAILY PHYSICAL ACTIVITY, DIET AND BODY COMPOSITION OF WOMEN PARTICIPATING IN DIFFERENT FITNESS MODALITIES: CARDIO, MUSCLE, CARDIO & MUSCLE, AND BODY & MIND

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Abstract

Introduction. Women increasingly participate in organized fitness activities that differ in training characteristics, physiological demands, and potential effects on lifestyle behaviors and body composition. Despite growing interest in fitness participation, comparative studies simultaneously addressing physical activity, sedentary behavior, diet quality, nutrition knowledge, and body composition across different fitness modalities remain limited. This study aimed to assess these factors among young adult women regularly participating in cardio, muscle, cardio & muscle, or body & mind fitness classes and to examine associations between lifestyle behaviors and adiposity. ***Material and Methods.*** The study included 276 women aged 20-35 years who regularly attended one selected fitness modality. Physical activity and sitting time were assessed using the short version of the International Physical Activity Questionnaire (IPAQ). Dietary behaviors and nutrition knowledge were evaluated with selected components of the KomPAN questionnaire, including the Pro-Healthy Diet Index (pHDI-10) and Non-Healthy Diet Index (nHDI-14). Body composition was assessed using anthropometric measurements, skinfold thickness, and bioelectrical impedance analysis (BIA). Nonparametric statistical tests and Spearman's rank correlations were applied. ***Results.*** All groups demonstrated high levels of total physical activity. Women participating in cardio & muscle classes showed the highest mean levels of total and vigorous physical activity, whereas the lowest values were observed in the cardio group; however, these differences were not statistically significant. A significant positive association was found between sitting time and body fat percentage. Diet quality and nutrition knowledge were moderate across all groups, with no significant intergroup differences. The most favorable body composition parameters were observed in women attending muscle classes, while the highest adiposity values occurred in the body & mind group, although most differences were not statistically significant. ***Conclusions.*** Among physically active young women, fitness modality alone was not a key determinant of physical activity level, diet quality, nutrition knowledge, or overall body composition. Total exercise dose and sedentary behavior appeared to be more important factors influencing adiposity. Reducing sitting time alongside regular exercise may enhance health outcomes in women participating in fitness programs.

Keywords: physical activity, fitness modalities, body composition, dietary behaviors, sedentary behavior

Introduction

Over the past two decades, women's physical activity patterns have undergone substantial changes with respect to both intensity and preferred forms of exercise. An increasing proportion of women engage in organized physical activity within fitness clubs, participating in diverse class formats that include endurance-based training (cardio), strength-oriented exercise (muscle), combined formats (cardio & muscle), and mind-body practices (body & mind). Fitness activity has thus become not only a means of improving physical fitness and body shape, but also an important component of health promotion, stress management, and quality of life enhancement, particularly among women of working age exposed to sedentary behavior and occupational stress [1, 2]. Recent population-based evidence further indicates that prolonged sedentary behavior constitutes an independent risk factor for increased total and central adiposity, even among individuals meeting recommended levels of physical activity, underscoring the importance of simultaneously addressing both exercise participation and sitting time in health-oriented interventions [3].

Individual fitness modalities differ in terms of dominant physiological stimulus and metabolic demand. Cardio-based training primarily enhances cardiorespiratory fitness and energy expenditure, resistance-oriented exercise promotes increases in muscle mass and resting metabolic rate, while combined cardio & muscle formats integrate endurance and strength components, potentially offering broader adaptations. Meta-analytical evidence suggests that concurrent training may be more effective in reducing body fat while preserving fat-free mass compared with aerobic or resistance training performed in isolation, particularly when training volume and intensity are appropriately balanced [4, 5]. In contrast, body & mind classes focus on psychophysical balance, postural control, and body awareness, typically involving lower energy expenditure but documented benefits related to mobility, balance, and stress reduction [2].

Comparative studies examining the effects of different fitness modalities on women's body composition provide inconsistent findings. While some research suggests more favorable adiposity-related indicators among women participating in resistance-based or combined training, other studies report only modest or non-significant differences between modalities, particularly when body composition is assessed using bioelectrical impedance analysis. These discrepancies are frequently attributed to methodological heterogeneity, variation in training dose, and participant characteristics, indicating that modality-specific effects may be less pronounced than commonly assumed [1, 6]. Recent systematic reviews further emphasize that resistance training plays a key role in preserving lean body mass during weight reduction, even when overall changes in body mass are modest, highlighting the qualitative rather than purely quantitative nature of body composition adaptations [7, 8].

Growing evidence indicates that favorable changes in body composition depend primarily on total exercise dose, encompassing training volume, intensity, and regularity, rather than on the specific type of activity performed. Dose-response analyses demonstrate a largely linear relationship between the volume of aerobic exercise and reductions in body mass and fat mass, although the magnitude of these effects is typically moderate and often insufficient without complementary lifestyle or dietary modifications [9]. It has been suggested that a minimum threshold of approximately 150-180 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week is required to elicit measurable somatic adaptations. Moreover, lifestyle-related factors such as sleep duration, stress, recovery quality, and sedentary behavior may substantially modulate training effects, particularly among physically active women, potentially attenuating or enhancing changes in body fat levels [3, 10, 11, 12].

Women participating in fitness classes generally demonstrate greater health awareness and interest in nutrition compared with the general population; however, dietary behaviors vary across fitness modalities. Participants of muscle-oriented training more frequently report increased protein intake and reduced consumption of simple carbohydrates, whereas women practicing body & mind modalities tend to emphasize avoidance of processed foods, reduced meat consumption, and a preference for plant-based products [13, 14].

Despite these differences, studies employing the KomPAN questionnaire indicate that although physically active women often present higher levels of nutritional knowledge than inactive individuals, the association between knowledge and actual dietary practice remains moderate. Notably, higher nutritional knowledge observed among participants of body & mind classes does not consistently translate into more favorable dietary behaviors or body composition parameters, highlighting a persistent gap between awareness and practical implementation [15, 16, 17].

Despite the growing number of publications addressing women's physical activity, comprehensive studies simultaneously comparing different fitness modalities with respect to physical activity patterns, sedentary behavior, dietary practices, nutrition knowledge, and body composition remain limited. Most existing analyses focus on single training forms or isolated outcome measures, without accounting for interactions between lifestyle-related factors. Therefore, the aim of this study was to assess physical activity levels, sitting time, dietary behaviors, nutrition knowledge, and body composition in young adult women regularly participating in different fitness modalities (cardio, muscle, cardio & muscle, and body & mind), and to examine associations between selected lifestyle factors – particularly physical activity and sedentary behavior – and body fat content.

Material and Methods

Study material

The study included 276 women aged 20-35 years who regularly participated in group classes organized by fitness clubs. Women were eligible if they attended one specific fitness modality, i.e., cardio, muscle, cardio & muscle, or body & mind. Women who reported participating in multiple types of fitness classes were excluded, as were individuals whose total physical activity was below 1500 MET-min/week [18]. Group sizes in the cardio, muscle, cardio & muscle, and body & mind categories were comparable. With regard to training duration, the largest proportion of participants reported attending fitness classes for more than two years (36.6%). Approximately one quarter of the women had been participating for one to two years, while a smaller proportion reported a shorter training experience of less than one year. Regarding training frequency, the majority of participants reported attending fitness classes three to four times per week (62.3%). Approximately one fifth of the women declared a lower frequency of one to two sessions per week, while a smaller proportion reported either less frequent or more frequent participation.

Among physically active women, four groups were distinguished according to the selected fitness modality: cardio, muscle, cardio & muscle, and body & mind. The cardio group included women attending classes such as Zumba, Dance, Body Combat, Body Attack, and Indoor Cycling. The muscle group most frequently attended Body Pump, Fitball, and ABT classes. The cardio & muscle group included Step, circuit training, TBC, and interval training, whereas the body & mind group included Yoga, Stretching, Pilates, Body Balance, and "Healthy Spine" classes.

The research adhered to the principles of the Declaration of Helsinki and was approved by the Senate Ethics Committee at the University of Physical Education in Warsaw (SKE 01-27/2017, 18.05.2017).

Anthropometric measurements and indices

To characterize participants' somatic build, selected anthropometric traits were measured. Body height and body mass were assessed using an IOI 353 body composition analyzer. Breadth measurements – elbow breadth and knee breadth – were taken using a Martin sliding caliper. Using an anthropometric tape, the following circumferences were measured: relaxed upper-arm circumference, flexed upper-arm circumference, waist circumference, hip circumference and calf circumference. Skinfold thickness was measured using a Harpenden-type caliper (Sieber Hegner & Co. AG, Switzerland) at the following sites: biceps, triceps, subscapular, suprailiac, abdominal and calf (vertical fold at the level of maximal calf circumference) [19]. All unilateral measurements were taken on the left side of the body.

In addition, the following anthropometric indices were calculated: BMI – Body Mass Index; BAI – Body Adiposity Index; WHR – Waist-Hip Ratio; trunk skinfold sum (TSS), defined as the sum of three trunk skinfolds: subscapular, abdominal, and suprailiac; extremity skinfold sum (ESS), defined as the sum of three limb skinfolds: biceps, triceps, and calf; TER distribution index (TSS/ESS).

Bioelectrical impedance analysis

Bioelectrical impedance analysis (BIA) was used to assess body composition. Measurements were performed using the IOI 353 body composition analyzer with JAWON MEDICAL software. The analysis provided values for body fat mass in kilograms (MBF; Mass of Body Fat) and percentage body fat (PBF; Percent Body Fat), lean body mass in kilograms (LBM; Lean Body Mass), soft lean mass in kilograms (SLM; Soft Lean Mass), total body water in kilograms (TBW; Total Body Water), basal metabolic rate in kilocalories (BMR; Basal Metabolic Rate), total energy expenditure in kilocalories (TEE; Total Energy Expenditure), protein and mineral mass in kilograms, and impedance values in ohms.

Diagnostic survey

A diagnostic survey was also applied to collect personal data and information on dietary behaviors and nutritional knowledge, physical activity, and other lifestyle factors. Women who were physically active additionally completed a questionnaire concerning the selected fitness modality (cardio, muscle, cardio & muscle, body & mind).

Dietary behaviors, knowledge related to food and nutrition were assessed using selected items from the Questionnaire for the Assessment of Dietary Views and Habits developed by the Behavioral Determinants of Nutrition Team of the Committee of Human Nutrition Science of the Polish Academy of Sciences [20], together with the recommended procedure for processing dietary data [21]. Diet quality was evaluated by calculating two indices: the Pro-healthy Diet Index (pHDI-10; Pro-healthy-Diet-Index-10) and the Non-Healthy Diet Index (nHDI-14; Non-Healthy-Diet-Index-14), computed by summing consumption frequencies for 10 and 14 specified food groups, respectively. Subsequently, values were summed for each participant (separately for the pro-healthy and non-healthy indices) and group means were calculated for women categorized by fitness modality.

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ; short form). This questionnaire included seven items covering all types of physical activity related to daily living, work, and leisure. Each physical activity domain (total activity, vigorous activity, moderate activity, and walking) was expressed in MET-min/week by multiplying the assigned MET coefficient by the number of days per week and the duration in minutes per day. This allowed classification into one of three activity categories: low (<600 MET-min/week), moderate (600-1500 MET-min/week), or high (>1500 MET-min/week).

Statistical analysis

For the study sample, arithmetic means, standard deviations, medians, 25th and 75th percentiles, and confidence intervals were calculated for the analyzed somatic traits, indices, and physical activity. Normality of distribution for quantitative variables was assessed using the Shapiro-Wilk test. Due to non-normal distributions, the significance of differences was evaluated using the Mann-Whitney U test.

Descriptive statistics for qualitative variables were presented as counts and percentages, and between-group differences were tested using Pearson's χ^2 test. Dietary views and habits were verified according to the KomPAN dietary data processing procedure [21]. Differences in quantitative variables were evaluated using the Mann-Whitney U test, whereas qualitative variables were compared using Pearson's χ^2 test.

Associations between adiposity and the analyzed lifestyle factors (physical activity and dietary behaviors) were assessed using Spearman's rank correlation. The significance of correlation coefficients was tested using the t-test with (n-2) degrees of freedom.

In all analyses, the level of statistical significance was set at $p < 0.05$. Calculations were performed using Statistica 13.3.

Results

Table 1 presents the levels of total physical activity and its components, as well as sitting time, in women participating in different fitness modalities. All groups were characterized by high total physical activity levels, exceeding 1500 MET-min/week. Although women attending cardio & muscle classes demonstrated the highest mean values of total and vigorous physical activity, whereas the lowest values were observed in the cardio group, these differences were not statistically significant. Similarly, no significant intergroup differences were found for moderate physical activity, walking, or sitting time.

Table 1. Physical activity of the examined women in groups distinguished according to selected forms of fitness classes

Group	Descriptive statistics		Kruskal-Wallis test	
	$\bar{x}$	SD	H	p
Total Activity [MET-min/week]				
cardio	2544,6	1647,5	1,69	0,6386
muscle	2826,1	2678,4		
cardio & muscle	3280,4	3041,6		
body & mind	2966,0	2725,4		
Total	2944,9	2639,3		
Vigorous activity [MET-min/week]				
cardio	1038,6	740,3	3,43	0,3299
muscle	1299,7	1081,2		
cardio & muscle	1501,6	1417,4		
body & mind	1319,4	1584,0		
Total	1314,3	1273,2		
Moderate activity [MET-min/week]				
cardio	545,9	642,2	2,15	0,542
muscle	509,6	644,9		
cardio & muscle	616,6	775,4		
body & mind	497,7	548,6		
Total	549,1	668,5		
Walking [MET-min/week]				
cardio	960,1	1287,8	2,97	0,3964
muscle	1016,8	2139,3		
cardio & muscle	1162,2	2115,7		
body & mind	1148,9	1233,4		
Total	1081,5	1794,2		
Sitting [min/week]				
cardio	355,3	188,8	2,81	0,4226
muscle	306,1	194,9		
cardio & muscle	309,6	182,8		
body & mind	320,7	181,3		
Total	320,9	186,6		

Note: $\bar{x}$ – arithmetic mean, SD – standard deviation.

Table 2 shows Spearman's rank correlation coefficients between selected lifestyle variables and body fat percentage in physically active women. A statistically significant positive association was observed between sitting time and body fat percentage, indicating higher adiposity with increasing sedentary time. In contrast, no statistically significant associations were found between body fat percentage and total physical activity, vigorous activity, moderate activity, or walking.

Analysis of diet quality indices demonstrated moderate values of both the Pro-Healthy Diet Index (pHDI-10) and the Non-Healthy Diet Index (nHDI-14) across all fitness modalities. The highest mean pHDI-10 value was observed in the body & mind group, whereas the lowest value occurred in the muscle group; however, these differences were not statistically significant. A similar pattern was observed for the nHDI-14, with no significant intergroup differences (Tab. 3).

Table 2. Influence of physical activity (MET-min/week) and sitting time (min/week) on body fat content (%) in physically active women

Specification	Spearman coefficient value	Test t(n-2)	
		t	p
Total activity	-0.0373	-0.62	0.5377
Vigorous activity	-0.0785	-1.30	0.1934
Moderate activity	-0.0596	-0.99	0.3238
Walking	-0.0046	-0.08	0.9391
Sitting	0.1971	3.33	0.0010*

* – statistically significant difference at $p < 0.05$.

Evaluation of nutrition knowledge based on individual questionnaire items showed that, for most statements, the proportion of correct answers did not differ significantly between fitness groups. Statistically significant differences were identified only for selected questions, including the item concerning the calcium-to-phosphorus ratio in a proper diet. Despite these isolated differences, no statistically significant intergroup differences were observed in the total nutrition knowledge score (Tab. 4).

Table 3. Healthy and unhealthy diet indices of women in fitness groups

Group	Descriptive statistics		The Mann-Whitney test	
	$\bar{x}$	SD	Z	p
Health Promoting Diet Index				
cardio	5.12	2.34	1.41	0.4914
muscle	4.81	1.95		
cardio & muscle	5.02	1.89		
body & mind	5.41	1.92		
Total	5.08	2.02		
Unhealthy Diet Index				
cardio	2.92	1.33	1.92	0.4041
muscle	2.73	1.44		
cardio & muscle	3.62	1.93		
body & mind	3.74	1.74		
Total	3.25	1.63		

Note: $\bar{x}$ – arithmetic mean, SD – standard deviation.

Table 4. Percentage of correct answers given by women in fitness groups to nutrition knowledge questions

Content of the statement	cardio		muscle		Cardio & muscle		Body & mind		Test x^2
	n	%	n	%	n	%	n	%	p
1. Cereal products only need to be consumed once a day.	19	32.8	29	43.3	20	22.5	18	29.0	0.0476*
2. Only children and adolescents should consume milk.	45	77.6	56	83.6	69	77.5	40	64.5	0.0784
3. Fruit and/or vegetables should be consumed at every meal.	49	84.5	47	70.1	71	79.8	49	79.0	0.2558
4. Eating moldy bread can cause Salmonella infection.	32	55.2	34	50.7	43	48.3	19	30.6	0.0346*
5. High salt intake protects against hypertension.	47	81.0	59	88.1	79	88.8	50	80.6	0.3707
6. Limiting fatty foods in the diet helps prevent cardiovascular diseases.	52	89.7	62	92.5	76	85.4	53	85.5	0.4921
7. Frequent consumption of fatty sea fish accelerates the development of atherosclerosis.	39	67.2	47	70.1	66	74.2	42	67.7	0.7798
8. Eating grilled meat promotes cancer.	28	48.3	27	40.3	37	41.6	32	51.6	0.4997
9. The consequence of a vegetarian diet is an increased risk of anemia.	23	39.7	27	40.3	38	42.7	25	40.3	0.9816
10. Organic yoghurts contain beneficial intestinal bacteria.	45	77.6	49	73.1	71	79.8	54	87.1	0.2647
11. Oil and olive oil contain a lot of cholesterol.	38	65.5	44	65.7	50	56.2	40	64.5	0.5460
12. Wholemeal bread contains a higher amount of fiber than light bread.	53	91.4	56	83.6	81	91.0	56	90.3	0.4157
13. Fruit and vegetables are a source of "empty calories".	50	86.2	51	76.1	76	85.4	58	93.5	0.0496*
14. Butter and fortified margarines are characterized by a high content of vitamins A and D.	28	48.3	35	52.2	49	55.1	36	58.1	0.7330
15. Yellow cheese is a better source of calcium than cottage cheese.	15	25.9	22	32.8	30	33.7	21	33.9	0.7421
16. There are significant amounts of "bad" LDL cholesterol in offal.	10	17.2	17	25.4	25	28.1	11	17.7	0.3101
17. Complex carbohydrates should be replaced with simple sugars in the diet.	36	62.1	41	61.2	54	60.7	39	62.9	0.9934
18. Protein should be the main source of energy in a proper diet.	18	31.0	27	40.3	15	16.9	22	35.5	0.0086*
19. Insufficient intake of vitamin PP can cause dermatitis and diarrhea.	23	39.7	32	47.8	27	30.3	30	48.4	0.0754
20. Being in the sun promotes the production of vitamin D in the body.	53	91.4	62	92.5	82	92.1	60	96.8	0.6290
21. Phosphorus is a component of nervous tissue.	19	32.8	31	46.3	33	37.1	26	41.9	0.4302
22. The ratio of calcium to phosphorus in a proper diet should be 1:1.	11	19.0	22	32.8	24	27.0	28	45.2	0.0144*
23. Eating fruit rich in vitamin C increases the absorption of iron.	32	55.2	44	65.7	53	59.6	46	74.2	0.1373
24. Starting to cook vegetables in cold water is conducive to preserving their nutritional value.	23	39.7	23	34.3	35	39.3	23	37.1	0.9126
25. Sweets and animal fats are distinguished by their high nutritional density.	43	74.1	45	67.2	60	67.4	44	71.0	0.7995

Note: statistically significant difference at $p < 0.05$.

Subsequently, the total number and percentage of correct answers were calculated separately for each group. Women attending body & mind classes demonstrated the highest level of nutrition knowledge. Slightly lower results were obtained by women from the muscle group. The lowest percentage of correct answers was observed among women attending cardio & muscle classes. The observed intergroup differences were not statistically significant.

Comparison of basic somatic characteristics revealed similar values of body height, body mass, and skeletal breadth measurements across all examined fitness modalities. The Kruskal-Wallis test did not indicate statistically significant intergroup differences for any of the analyzed parameters (Tab. 5).

Table 5. Body height, body mass, elbow width and knee width of women in fitness groups

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
Body height [cm]				
cardio	168.2	5.1	7.49	0.0578
muscle	167.1	7.2		
cardio & muscle	166.0	6.0		
body & mind	166.4	6.3		
Total	167.1	6.1		
Body weight [kg]				
cardio	66.03	10.40	5.94	0.1147
muscle	62.19	7.85		
cardio & muscle	62.26	8.90		
body & mind	65.10	12.13		
Total	63.68	9.90		
Elbow width [cm]				
cardio	6.09	0.48	4.85	0.1834
muscle	5.97	0.59		
cardio & muscle	5.95	0.44		
body & mind	6.13	0.60		
Total	6.03	0.53		
Knee width [cm]				
cardio	9.28	0.74	4.86	0.1826
muscle	9.13	0.70		
cardio & muscle	9.01	0.64		
body & mind	9.12	0.80		
Total	9.12	0.72		

Note: x̄ – arithmetic mean, SD – standard deviation.

Differences in selected body circumferences were observed between fitness modalities, although they were limited to specific parameters. Statistically significant intergroup differences were found for relaxed arm circumference, waist circumference, and calf circumference. In these cases, lower mean values were generally noted in the muscle group, whereas higher values were observed in the body & mind group. No statistically significant differences were identified for hip circumference (Tab. 6).

Table 6. Body circumferences of women in fitness groups

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
Arm circumference at rest [cm]				
Cardio	26.74	2.70	9.17	0.0271*
muscle	26.14	2.48		
Cardio & muscle (4)**	25.78	2.21		
Body & mind (3)**	26.97	2.73		
Total	26.34	2.54		
Flexed arm circumference [cm]				
cardio	28.34	2.67	11.40	0.0098
muscle	27.68	2.40		
cardio & muscle	27.39	2.27		
body & mind	28.78	2.88		
Total	27.97	2.58		
Waist circumference [cm]				
cardio	76.07	8.00	8.85	0.0313*
muscle (4)**	73.32	6.88		
Cardio & muscle	73.41	6.25		
Mody & mind (2)**	76.60	7.65		
Total	74.66	7.23		
Hip circumference [cm]				
cardio	98.33	7.00	7.30	0.0629
muscle	95.76	6.04		
cardio & muscle	96.09	6.63		
body & mind	98.08	7.67		
Total	96.93	6.88		
Lower leg circumference [cm]				
cardio (3)**	35.34	3.07	9.31	0.0254*
muscle	34.23	2.65		
Cardio & muscle (1)**	33.84	2.54		
Body & mind	34.70	2.97		
Total	34.44	2.82		

Note: x̄ – arithmetic mean, SD – standard deviation; statistically significant difference at $p < 0.05$; ** – groups between which statistically significant differences were observed in the post-hoc Kruskal-Wallis test.

Assessment of skinfold thickness across fitness modalities indicated that most measured sites did not differ significantly between groups. A statistically significant difference was observed only for the subscapular skinfold, with the lowest mean value in the muscle group and the highest in the body & mind group, as confirmed by post hoc analysis (Tab. 7).

Global body composition parameters assessed by bioelectrical impedance analysis showed comparable values across all fitness modalities. Although the lowest mean values of percentage and mass of body fat were observed in the muscle group and the highest in the body & mind group, these differences were not statistically significant. No significant intergroup differences were found for lean body mass, total body water, or soft lean mass (Tab. 8).

Table 7. Skinfold thickness in groups distinguished according to selected forms of fitness classes

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
Triceps skinfold thickness [mm]				
cardio	17.74	5.82	6.33	0.0964
muscle	15.61	4.99		
cardio & muscle	16.01	5.89		
body & mind	17.69	6.59		
Total	16.65	5.88		
Biceps skinfold thickness [mm]				
cardio	12.22	5.38	5.21	0.1572
muscle	10.50	3.52		
cardio & muscle	11.76	4.66		
body & mind	12.33	4.73		
Total	11.68	4.62		
Subscapular skinfold thickness [mm]				
cardio	18.57	7.11	8.48	0.0370*
muscle (4)**	16.43	6.27		
Cardio & muscle	17.61	6.59		
Body & mind (2)**	19.11	6.31		
Total	17.86	6.60		
Abdominal skinfold thickness [mm]				
cardio	20.09	6.71	3.64	0.3034
muscle	18.38	4.90		
cardio & muscle	19.07	7.22		
body & mind	20.13	6.36		
Total	19.36	6.42		
Suprailiac skinfold thickness [mm]				
cardio	19.86	7.55	0.53	0.9114
muscle	19.39	6.40		
cardio & muscle	19.62	6.85		
body & mind	20.17	6.69		
Total	19.74	6.83		
Calf skinfold thickness [mm]				
cardio	18.90	6.96	0.57	0.9041
muscle	18.09	6.56		
cardio & muscle	18.39	6.12		
body & mind	19.27	7.54		
Total	18.62	6.72		

Note: x̄ – arithmetic mean, SD – standard deviation; statistically significant difference at $p < 0.05$; ** – groups between which statistically significant differences were observed in the post-hoc Kruskal-Wallis test.

Table 8. Body composition analysis in groups distinguished according to selected forms of fitness classes

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
PBF				
cardio	27.93	5.31	3.45	0.3269
muscle	26.20	4.39		
cardio & muscle	27.46	4.93		
body & mind	28.07	5.67		
Total	27.39	5.09		
MBF				
cardio	18.85	6.40	4.29	0.2319
muscle	16.50	4.27		
cardio & muscle	17.59	5.64		
body & mind	18.91	6.68		
Total	17.89	5.82		
LBM				
cardio	47.24	5.26	5.14	0.1621
muscle	45.78	4.82		
cardio & muscle	45.22	4.32		
body & mind	46.91	6.69		
Total	46.16	5.28		
TBW				
cardio	34.00	3.79	5.00	0.1717
muscle	32.97	3.47		
cardio & muscle	32.56	3.12		
body & mind	33.78	4.82		
Total	33.24	3.80		
SLM				
cardio	43.45	4.77	4.66	0.1986
muscle	42.21	4.43		
cardio & muscle	41.63	3.89		
body & mind	43.15	6.10		
Total	42.50	4.80		

Note: PBF – percentage body fat (%), MBF – mass of body fat (kg), LBM – lean body mass (kg), TBW – total body water (kg), SLM – soft lean mass (kg), x̄ – arithmetic mean, SD – standard deviation.

Additional parameters obtained from bioelectrical impedance analysis, including basal metabolic rate, total energy expenditure, protein mass, mineral mass, and impedance, exhibited similar mean values across all examined groups. The Kruskal-Wallis test did not reveal statistically significant intergroup differences for any of these variables (Tab. 9).

Table 9. Other parameters characterizing the human body obtained from the body composition analyzer in groups distinguished according to selected forms of fitness classes

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
BMR				
cardio	1266.33	83.53	2.25	0.5227
muscle	1252.04	72.44		
cardio & muscle	1241.70	65.15		
body & mind	1250.73	90.27		
Total	1251.41	77.13		
TEA				
cardio	1950.14	128.67	2.25	0.5227
muscle	1928.10	111.53		
cardio & muscle	1912.27	100.31		
body & mind	1926.10	139.02		
Total	1927.18	118.78		
Impedance				
cardio	501.66	59.92	3.60	0.3082
muscle	504.34	62.15		
cardio & muscle	509.47	54.48		
body & mind	489.61	74.32		
Total	502.12	62.45		
Proteins				
cardio	9.45	1.01	3.65	0.3022
muscle	9.25	0.98		
cardio & muscle	9.07	0.80		
body & mind	9.37	1.31		
Total	9.26	1.02		
Minerals				
cardio	3.78	0.56	7.19	0.0661
muscle	3.56	0.43		
cardio & muscle	3.58	0.49		
body & mind	3.76	0.66		
Total	3.66	0.54		

Note: BMR – basal metabolic rate (kcal), TEE – total energy expenditure (kcal), impedance – electrical resistance of a conductor in alternating current circuits (Ohm), proteins (kg), minerals – mineral mass (kg), x̄ – arithmetic mean, SD – standard deviation.

Analysis of body fatness indices, including BMI, BAI, waist-to-hip ratio, and skinfold-based indices, revealed only minor between-group variation. Although lower mean values of most indices were observed in the muscle group and higher values in the body & mind group, none of these differences reached statistical significance (Tab. 10).

Table 10. Body fatness indices characterizing physically active women

Group	Descriptive statistics		Kruskal-Wallis test	
	x̄	SD	H	p
BMI				
cardio	23.47	3.89	4.37	0.2239
muscle	22.36	2.48		
cardio & muscle	22.81	2.95		
body & mind	23.76	3.72		
Total	23.06	3.28		
BAI				
cardio	27.09	3.46	2.96	0.3984
muscle	26.49	3.35		
cardio & muscle	27.10	3.36		
body & mind	27.89	3.69		
Total	27.13	3.47		
WHR				
cardio	0.77	0.05	4.42	0.2191
muscle	0.77	0.06		
cardio & muscle	0.76	0.05		
body & mind	0.78	0.05		
Total	0.77	0.05		
Sum of folds				
cardio	107.38	34.11	4.05	0.2564
muscle	98.40	26.16		
cardio & muscle	102.46	32.26		
body & mind	108.69	31.84		
Total	103.91	31.29		
TSS				
cardio	58.52	19.79	3.53	0.3169
muscle	54.20	15.64		
cardio & muscle	56.30	18.95		
body & mind	59.41	17.57		
Total	56.96	18.08		
ESS				
cardio	48.86	16.14	3.88	0.2742
muscle	44.20	13.13		
cardio & muscle	46.16	15.01		
body & mind	49.28	16.91		
Total	46.95	15.33		
TUE				
cardio	1.22	0.31	0.83	0.8414
muscle	1.27	0.35		
cardio & muscle	1.24	0.26		
body & mind	1.26	0.32		
Total	1.25	0.30		

Note: BMI – body mass index, BAI – body adiposity index, WHR – waist-to-hip ratio estimate, TSS – sum of the thickness of three trunk skinfolds: subscapular, abdominal, and suprailiac, ESS – sum of the thickness of three limb skinfolds: biceps, triceps, and calf, TER – distribution index (TSS/ESS), x̄ – arithmetic mean, SD – standard deviation.

Discussion

The present study demonstrated that young adult women participating in different fitness modalities achieved comparably high levels of total physical activity, with no statistically significant differences between groups. Although women attending combined cardio & muscle classes showed the highest mean levels of total and vigorous physical activity, these differences did not translate into clear between-group distinctions. This finding supports the growing body of evidence indicating that among already physically active individuals, overall exercise dose – defined by volume, intensity, and regularity – rather than the specific training modality is the primary determinant of lifestyle-related and somatic outcomes [22, 23].

A particularly important observation was the significant positive association between sitting time and body fat percentage, despite high physical activity levels across all examined groups. This result is consistent with recent large-scale studies demonstrating that sedentary behavior constitutes an independent risk factor for adiposity and cardiometabolic risk, even among individuals meeting physical activity recommendations [24, 25]. Macías et al. [3] further showed that prolonged sitting is associated with increased total and central adiposity irrespective of physical activity level, emphasizing that regular participation in structured exercise does not fully counteract the adverse effects of sedentary behavior. Similar associations have also been observed in young adult populations, where higher levels of physical activity were accompanied by a lower prevalence of metabolic risk factors; however, excessive sitting time attenuated these beneficial effects [26]. Together, these findings highlight the relevance of the so-called "active but sedentary" paradox and underline the importance of addressing sitting time as a distinct behavioral target in health promotion.

Although most between-group differences in body composition parameters did not reach statistical significance, consistent trends were observed. Women attending muscle-oriented classes demonstrated the lowest mean values of adiposity-related indicators, whereas the highest values were noted in the body & mind group. These tendencies are in line with recent meta-analyses indicating that resistance training and concurrent training are more effective than aerobic training alone in improving body composition, particularly through reductions in fat mass and preservation of fat-free mass [4, 5]. Similar associations between physical activity patterns, dietary habits, and body fat distribution have also been reported in studies conducted among young women, supporting the relevance of lifestyle-related factors in shaping adiposity profiles [27].

Furthermore, evidence synthesized by Binmahfoz et al. [7] suggests that resistance exercise plays a crucial role in maintaining lean body mass and cardiometabolic health, even when overall changes in body weight are modest. This qualitative advantage of resistance-based exercise may explain the more favorable body composition profile observed in the muscle group in the present study. In contrast, body & mind modalities, while offering substantial benefits related to flexibility, postural control, and stress reduction, are typically characterized by lower metabolic demand and may be insufficient to induce pronounced reductions in adiposity without adequate training volume or complementary lifestyle modifications.

The relatively small magnitude of between-group differences may also be attributed to the homogeneous profile of the participants, all of whom met criteria for high physical activity. In such populations, modality-specific adaptations may manifest earlier at the level of regional fat distribution, rather than global indices of body composition, as suggested by the significant differences observed in subscapular skinfold thickness. Similar conclusions have been reported in recent reviews emphasizing that variability in training volume, intervention duration, and dietary control strongly moderates observed training effects [23, 28].

Diet quality and nutrition knowledge were moderate across all fitness modalities, with no statistically significant intergroup differences. Women attending body & mind classes demonstrated the highest level of nutrition knowledge; however, this did not translate into more favorable dietary behaviors or improved body composition. This finding is consistent with recent research indicating that nutrition knowledge alone is insufficient to ensure healthy dietary practices, particularly among physically active women [29].

Recent studies suggest that different fitness environments may foster distinct nutritional orientations – such as increased protein intake among women engaged in resistance training or greater interest in plant-based foods among participants of mind-body practices – without necessarily improving overall diet quality [13, 14]. The present results support this interpretation, demonstrating a persistent gap between nutritional awareness and practical implementation, which may partially explain the weak associations observed between dietary indices and body composition parameters.

Taken together, the findings indicate that fitness modality alone is not a decisive determinant of physical activity level, diet quality, nutrition knowledge, or global body composition among young, physically active women. Instead, total exercise dose and sedentary behavior appear to play a more prominent role in shaping adiposity-related outcomes. This interpretation is consistent with recent dose-response meta-analyses demonstrating that although aerobic exercise contributes to reductions in body mass and fat mass, the magnitude of these effects is moderate and highly dependent on total exercise volume and broader lifestyle context [9]. This broader perspective is further supported by evidence indicating that health- and physical literacy are associated with engagement in physical activity among women, although such competencies do not necessarily translate directly into specific body composition outcomes [30].

From a practical standpoint, the results emphasize the need for comprehensive health promotion strategies that extend beyond the selection of fitness modality and incorporate targeted interventions aimed at reducing sedentary behavior and facilitating the practical application of nutrition knowledge alongside regular exercise participation.

Conclusions

The findings of this study indicate an absence of statistically significant differences between fitness modalities with respect to most analyzed variables, including total physical activity level, overall diet quality, nutrition knowledge, and global body composition parameters. Although certain modality-specific trends were observed, they did not reach statistical significance, suggesting that regular participation in fitness classes itself, rather than the specific type of training, plays a more decisive role in shaping lifestyle behaviors and somatic characteristics in young adult women.

A particularly important observation concerns the significant association between sitting time and body fat level, highlighting sedentary behavior as a relevant determinant of adiposity even among physically active women. Additionally, the results demonstrate that higher nutrition knowledge does not consistently translate into healthier dietary behaviors or more favorable body composition outcomes, indicating a disconnect between knowledge and practice. These findings emphasize the need for comprehensive health promotion strategies that address not only structured exercise, but also reductions in sedentary time and the practical implementation of nutrition knowledge.

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