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Assessing the potential impact of gender on health indicators: variations in behavior and physical condition

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Authors' contribution:
A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
D. Data interpretation
E. Preparation of manuscript
F. Literature analysis/search
G. Funds collection

Abstract

Background. Given the fundamental differences between men and women and the lack of understanding about the markers that significantly influence their overall health indices, a study in this area is vital. This study aimed to compare the behavioral traits and physical state of men's and women's bodies as health indicators.
Material and methods. There were 106 male and 51 female students overall. The research participants self-reported using 21 criteria applied to groups of health component variables (condition and activity indicators).
Results. There were established statistical differences between the averages of men and women for every physical condition variable. The nutrition indicator displayed similar and different traits in both males and females. The two study groups' indices of physical activity intensity differed noticeably.
Conclusions. Individual health can be effectively managed if health components are adequately evaluated and planned for. This enables food and exercise plans to be created to achieve the desired body condition parameters. Gender, therefore, is a major factor in the puzzle of adaptation outcomes which influence the body's physiological reactions to various stimuli and irritations and ultimately determine health.

Keywords: physical capacity, physical activity, meals, students, differences

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Introduction

According to the World Health Organization (WHO) [1], health has come to be understood as the organism's transient state, an active, progressive process that molds an individual's characteristics and carries out its biosocial functions in a changing environment, with editorial overloads and without losses, and with the underlying consequences of diseases and defects. With this knowledge of personal health, we may assert that two primary determinants of health are an individual's behavior and physical state. A person's body behavior is seen as a combination of their activities related to their surroundings. Both internal and external factors, such as genetic heritage, physiological processes, physical state, mentality, habits, and education, have an impact on the body's behavior, among others. The way that behavior manifests itself depends on

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how diverse the surrounding environment is, including social, instinctual, gender, and adaptive factors [2]. It is possible to conditionally separate the behavior of the body into two primary criteria (internal and external) and their sub-criteria. Environmental factors determine external criteria, while genetic inheritance determines internal criteria. Unwanted skills are managed by the employment of particular behavioral corrective techniques or purposeful actions. According to Olson et al. [3], intentional activities are regarded as behavior on the one hand, but they also carry a lower degree of personal accountability. The establishment of behaviors that promote health is directly correlated with intentional action. Individuals' responses to their surroundings shape their behavioral determinants of health. Health is highly valued and given much attention by society and individuals [4]. Establishing the parameters and creating the evaluation scales are also necessary to produce the desired outcomes [5]. The primary focus of research when assessing healthy behavior is "vital activity". The goal of vital life activity is to supply the body with the resources it needs to function at its best [6]. Body-vital activities and health are directly dependent on bodily functions that are stimulated by body-vital activities [7]. Physical habits influence an individual's state of well-being, flexibility, and the way their body responds to changes in their surroundings. The body may experience negative physical effects from bad habits (lack of sleep, poor nutrition, inactivity, etc.) such as obesity, low physical fitness, and increased risk of accidents, mental illnesses, and chronic conditions with exacerbations. The state of the body is determined by how its behavior interacts with both internal and external forces. Consequently, behavioral reactions are a predetermined, recognized method of a person or body engaging with their surroundings. The capacity of an individual to modify their behavior in response to both internal and external stimuli determines their condition. To accomplish this, it is vital to watch the subject's behavior and identify the variables that most affect the person's state of health and physical condition. Body behaviors and conditions have a strong relationship and mutual influence [8]. Behavioral therapy, which is founded on behavioral theory and relies on the detection of pre-existing mental deviations, is used to promote healthy behavior. Uncontrolled mental deviations, in turn, can lead to the development of negative (incorrect) behavioral patterns and, as a result, physical deformation of the body. The body's overall health, as well as each component's adherence to recognized norms, which demonstrate the body's ability to perform active functions, are combined to define the condition of the body. A person's physical condition (muscular, cardiovascular, respiratory, neurological, endocrinal, among others) represents many standards of personal fitness. One may argue that a person's bodily state conditions their active engagement, even though conduct has a major role. To sum up, an individual's physiological indicators ought to correspond with established norms or standards which are delineated by their physical state. People's intended outcomes, or, to put it another way, the quality of the body, are taken into account when posing norms for body conditions. The characteristics of a person's behavior are directly influenced by their physical condition. Based on their nature, body states can be conditionally divided into physical and functional preparation, as well as physiometric sub-criteria. When combined, nutritional and physical activity-related elements have the greatest impact on behavior and health status, defining the body's current state [9]. It is common knowledge that a person's behavior and physical condition have different impacts on their general health. The physical state of men and women has a greater impact on assessments of their ultimate health status than does their behavior. However, the male and female variables that have a significant impact on health only overlap by 45% or less [10]. Comparing activities and body composition between the sexes is essential for creating more personalized health and fitness plans, understanding sex-specific risks for diseases, and optimizing physical performance. It leads to more precise and effective strategies in health care, sports training, and nutrition. Additionally, a scientific analysis has been conducted on the comparison of body composition between the sexes, which is crucial in evaluating health [11-13]. Key differences in muscle mass, fat distribution, and bone density between men and women play important roles in determining health risks, disease susceptibility, and overall physical fitness.

Integral data analysis techniques should serve as the foundation for problem solutions [4]. Given the basic differences between men and women and the lack of understanding about the markers that have a significant impact on their overall health indices, a study in this area is quite vital.

Aim of the work

The research aimed to compare the behavioral traits and physical state of men's and women's bodies as indicators of health.

Material and methods

Participants

A total of 106 male students (21.358±1.106 years old) and 51 female students (21.333±1.089 years old) who were randomly selected from Vilnius Gediminas Technical University's second-third bachelor study courses at various faculties participated in the research. Each investigated participant performed self-monitoring and self-testing using a standardized methodology and submitted a report. Selected students carried out self-testing, self-observation, and self-evaluation according to 21 criteria over seven days. Students who took part in the study received instruction and training in test data accounting and gathering techniques. The study did not include research subjects whose values fell outside the 3SD mean.

Design framework

In the research, 21 evaluation criteria were applied, which were divided into the following two groups of health factors (variables):

1. Body condition indicators:
   (1) Body Mass Index (BMI), (units) [14];
   (2) Waist-to-hip ratio (WHR), (units) [15];
   (3) Body fat percentage (BFP), (%) [16,17];
   (4) Body muscle percentage (BMP), (%) [17,18];
   (5) Ruffier index (RI), (units) [19,20];
   (6) Resting heart rate (RHR), (units) [21,22];
   (7) VO_2max, (mL/kg/min) [23].
2. Body activity indicators (seven days average):
   (1) Duration of sleep per day, (min) [24];
   (2) Number of meals per day, (units) [25];
   (3) Duration of one meal, (min) [26];
   (4) Food and water consumption per day, (gr.) [27];
   (5) Energy intake per day, (Kcal),[28];
   (6) Carbohydrate intake, (%) [29];

(7) Protein intake, (%) [29];
(8) Fat intake, (%) [29];
(9) Expenditure of energy per day, (Kcal) [28];
(10) Physical activity, METs < 3, (%) [30,31];
(11) Physical activity, METs = from 3 to 6, (%) [30,31];
(12) Physical activity, METs > 6, (%),[30,31];
(13) Time of physical activity, METs = from 3 to 6, (units) [30,31];
(14) Time of physical activity, METs > 6, (units) [30,31].

Statistical tools

The sample was stratified to ensure that indicators were appropriately represented. The data was analyzed using Excel. Applicable indicators included: average (X), standard deviation (SD), standard error (SE), coefficient of variation (CV), maximal value (Max), minimal value (Min), mathematical difference (d), test reliability (t), and the Student's t-test for independent sample criteria values (p<0.05, p<0.01, p<0.001).

Methodological limitations

About 2% of students were randomly selected to participate in the study at Vilnius Gediminas Technical University. To assess the health indicators of other universities, extensive research is necessary. It is necessary to conduct research with dependent samples (the same research subjects at the beginning of the first year and the end of the fourth year). Only assumptions can be made when evaluating the self-esteem data from independent samples. It is planned to perform research with dependent samples in the future. The authors of the tests provide rating scales and do not specify target audiences; therefore, specialized research is necessary based on which target rating scales are created. To ensure the internal validity of the research, approved tests were used.

Results

It was found that there are statistical differences in the averages of all indicators of body condition for men and women in the study (Table 1). The body condition indicators under study can be classified into two categories: functional body components (RI, RHR, and VO_2max) and structural body components (height, weight, BMI, WHR, BFP, and BMP). Upon analyzing the structural elements, it was discovered that the investigated males measured 184.269±6.693 cm, whereas the investigated females measured 170.824±5.645 cm. Men are therefore consistently 13.445 cm taller on average than women (p<0.001). The CV of heights attests to the normal distribution of this criterion between men and women, which varies between 3.5% and 4.5%. The average weight of the men's and women's study groups was 18.017 kg, indicating a significant difference (p<0.001). Because of the significant variability of the weights in the tested groups, the spread of this indicator was also large, with men's spread being 13.400% and women's spread being 15.961%. There was a substantial and consistent difference (p<0.001) in the BMI, which was calculated using height and weight, between the male and female study groups. This difference totaled 2.259 units. Men's BMI was 23.682±2.516 units, while women's was 21.423±3.214 units. This demonstrates that the BMIs of the groups under study are normal; nonetheless, the indicator showed a wide range among women (15.004%) and an average among males (10.626%). Body composition and body fat distribution are reflected in WHR. This indication was modest in the men under study, averaging

0.940±0.061 units, indicating a normal distribution of body fat and a low level of visceral fat with all the associated risks. The waist-to-hip ratio indication in the men under study had a normal dispersion of 6.511%. The women in the study had an average WHR ratio indication of 0.795±0.073 units, with a larger spread of 9.178%. This illustrates how the distribution of fat in women is more uneven. The groups under study were found to have an incredibly wide range of the BFP indicator upon analysis. This implies that there is an abnormal distribution of BFP in men and women. The body fat percentage indication for the study's female participants was 20.974±6.296%, with a 30.016% spread. The BFP indicator of the studied men was 16.457±3.529%; its dispersion reached 21.441%. Meanwhile, it was found that the distribution of BMP indicators between women and men is normal (women: 7.740%; men: 5.672). This indicator reflects the ratio of body muscles, which includes skeletal muscle, smooth muscle, and cardiac muscle. The studied students had high BMP indicators (43.317±3.353% of women; 48.183±2.733% of men). When evaluating the functional body components of the subjects, significant physiological differences between women and men are observed. RI reflects the body's ability to maintain cardiorespiratory fitness (CRF). That is the ability of the circulatory and respiratory systems to supply skeletal muscles with oxygen. It was found that among the studied women and men, this indicator has a very high dispersion (39.041% and 47.341%). The RI indicators of female and male subjects (7.302±2.851 and 5.702±2.700 units) can be considered average. The RHR index of healthy people provides information about health status and functional capacity. The RHR indicators of the studied women and men (70.510±7.998 and 66.547±8.564 units) are considered average. The RHR indicators in the two groups under study had a considerable dispersion (11.344% and 12.869%). VO_2max evaluates an individual's degree of aerobic fitness and represents the maximal rate of oxygen consumption possible during physical exercise. This measure is related to longevity, performance, and health. Both male and female individuals' average VO_2max is assessed as good, averaging 42.980±5.634 and 47.321±6.922 mL/kg/min, respectively. Nonetheless, there is a significant variation in this indicator across the patients (13.108% and 14.628%). In summary, the body condition indicators of both groups under study are rated as good and average. However, the majority of the indicators have a large dispersion. This shows how bodily conditions and health indicators varied in the researched groups.

Table 1. Body condition indicators of the Vilnius Gediminas Technical University students

Indicators		Height (cm)	Weight (kg)	BMI (units)	WHR (units)	BFP (%)	BMP (%)	RI (units)	RHR (units)	VO_2max (mL/kg/min)
Male (n=106)	X	184.269	80.576	23.682	0.940	16.457	48.183	5.704	66.547	47.321
	SD	6.693	10.795	2.516	0.061	3.529	2.733	2.700	8.564	6.922
	SE	0.650	1.048	0.244	0.006	0.343	0.265	0.262	0.832	0.672
	CV	3.630	13.400	10.626	6.511	21.441	5.672	47.342	12.869	14.628
	Min	163.000	58.000	18.992	0.783	10.630	39.767	-1.200	44.000	33.000
	Max	200.000	126.000	34.903	1.190	29.475	55.295	15.200	88.000	68.000
Female (n=51)	X	170.824	62.559	21.423	0.795	20.974	43.317	7.302	70.510	42.980
	SD	5.645	9.985	3.214	0.073	6.296	3.353	2.851	7.998	5.634
	SE	0.790	1.398	0.450	0.010	0.882	0.469	0.399	1.120	0.789
	CV	3.305	15.961	15.004	9.178	30.016	7.740	39.041	11.344	13.108
	Min	160.000	43.000	15.055	0.628	11.073	36.805	0.800	52.000	32.000
	Max	193.000	87.000	31.572	0.953	37.731	52.388	15.200	92.000	58.000
Reliability in group differences	d	13.445	18.017	2.259	0.145	4.517	4.866	1.598	3.963	4.341
	t	13.138	10.311	4.413	12.434	4.773	9.033	3.348	2.840	4.189
	p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.001

Notes: BMI – Body Mass Index, WHR – waist-to-hip ratio, BFP – body fat percentage, BMP – body muscle percentage, RI – Ruffier index, RHR – resting heart rate, X – average, SD – standard deviation, SE – standard error, CV – coefficient of variation, Min – minimal value, Max – maximal value.

Meals and physical activity indicators were used for body activity and health markers (Table 2). The group of similarities between women and men includes the number of meals per day, the length of one meal, the intake of protein, and the intake of fat. The group of differences includes the amount of food and water consumed daily, the amount of energy consumed, and the amount of carbohydrates consumed. On average, the study participants – both men and women – ate four meals a day. A single meal took them approximately 14.5 minutes. On average, men and women consumed 22% protein and 18.5% fat daily. All of these indicators, however, are characterized by very wide dispersion, ranging from 15% to 41%, indicating that the distribution of meal activity variables for men and women is anomalous. The amount of water, food volume, and calories consumed during meals varied across the men and women under study. The caloric content of women's daily food consumption is higher (1,484.210±486.845 g and 1,793.340±237.930 Kcal), even though the absolute indicators of men's daily food consumption (1,697.764±352.502 g and 2,501.877±389.332 Kcal) are consistently higher. Women consumed more carbohydrates than men did at the same time (60.067±6.937% and 57.526±7.041%, $p<0.05$). After analyzing the distribution of nutrients ingested, it was shown that women's diets typically include 60% carbohydrates, 22% protein, and 18% fat. In the meantime, men's diets were composed of 58% carbohydrates, 23% protein, and 19% fat.

Table 2. Body activity (meals indicators seven days average) of the Vilnius Gediminas Technical University students

Indicators		Number of meals per day, (un.)	Duration of one meal, (min)	Food and water consumption per day, (g)	Energy intake per day, (Kcal)	Carbohydrate intake, (%)	Protein intake, (%)	Fat intake, (%)
Male (n=106)	X	3.811	13.882	1697.764	2501.877	57.526	23.378	19.096
	SD	0.558	4.123	352.502	389.332	7.041	5.279	5.378
	SE	0.054	0.400	34.238	37.815	0.684	0.513	0.522
	CV	14.630	29.700	20.760	15.560	12.240	22.580	28.162
	Min	3	6	1105.714	1837.519	33.717	7.081	3.447
	Max	6	25	2485.714	3832.953	89.471	44.036	32.437
Female (n=51)	X	3.922	15.078	1484.210	1793.340	60.067	21.908	18.024
	SD	0.821	6.273	486.845	237.930	6.937	4.878	4.176
	SE	0.115	0.878	68.172	33.317	0.971	0.683	0.585
	CV	20.931	41.604	32.802	13.267	11.548	22.264	23.171
	Min	2	8	818.466	1442.921	39.508	6.631	6.766
	Max	7	34	2910.237	2451.713	86.604	30.953	29.539
Reliability in group differences	d	0.111	1.196	213.554	708.537	2.541	1.470	1.072
	t	0.874	1.240	2.799	14.059	2.139	1.721	1.367
	p	-	-	<0.01	<0.001	<0.05	-	-

Notes: X – average, SD – standard deviation, SE – standard error, CV – coefficient of variation, Min – minimal value, Max – maximal value.

The average time that the study's men and women slept each day was roughly eight hours, with no statistical differences (Table 3). This indicator has a wide dispersion that approaches the 10% arithmetic mean. This demonstrates the great range of sleep patterns seen in the researched groups (the difference between the average daily sleep length of the male and female subjects is 3.5 hours). The energy activity expenditure per day (2,275.450±269.4887 Kcal and 2,725.974±393.138 Kcal) differed statistically significantly ($p<0.001$) between the men and women in the study based on their physical activity factors. The difference was 450.524 Kcal. The differences in the physiology of men and women may explain this. The intensity of physical activity was measured at three different levels using metabolic equivalents (METs) volumes: low (<3.0 METs), moderate (3.0-6.0 METs), and vigorous (>6.0 METs). During the week under investigation, there was no statistically significant variation observed in any of the intensity zones of the physical activity volume between the study groups. The distribution of women's time in physical activity was as follows: 8% of the time was spent engaging in intense physical activity, 15% engaged in moderate intensity, and 77% engaged in light intensity. Men's time spent on physical activities was distributed as follows: 10% of the time was spent physically demanding oneself, 16% in a moderately demanding manner, and 75% in a lightly demanding manner. It is crucial to assess both the volume and frequency of physical activities. It was discovered that men engaged in moderate-intensity activities 5.425±3.380 times a week on average, while women engaged in them 7.216±5.029 times ($p<0.05$). It may be concluded that women engage in 1.791 more frequent moderate-intense activities on average than do men. For both men and women, the volume of moderate-intensity activities was comparable. Men therefore exercised at a moderate intensity for a longer period than did women. Men and women recorded 2.528±2.466 and 2.333±1.987 units of vigorous-intensity activities, respectively, with no statistically significant difference seen. It should be noted that the physical activity intensity indicators for both study groups displayed an extremely broad dispersion, suggesting that these indicators were abnormally highly distributed in the groups that were the subject of the analysis. It is crucial to emphasize that the daily energy expenditure and consumption measurements of the groups under examination show negative disparities.

Table 3. Body activity (physical activities indicators seven days average) of the Vilnius Gediminas Technical University students

Indicators		Duration of sleep per day, (min)	Expenditure of energy per day, (Kcal)	Physical activity, METs<3, time per day, (%)	Physical activity, METs=from 3 to 6, time per day, (%)	Physical activity, METs>6, time per day, (%)	Time of physical activity, METs=from 3 to 6, per week, (un.)	Time of physical activity, METs>6, per week, (un.)
Male (n=106)	X	479.802	2725.974	74.475	15.961	9.563	5.425	2.528
	SD	46.996	393.138	13.224	11.889	8.958	3.380	2.466
	SE	4.565	38.185	1.284	1.155	0.870	0.328	0.239
	CV	9.790	14.420	17.756	74.485	93.672	62.320	97.530
	Min	360	1823.571	17.289	0	0	0	0
	Max	589	4200.714	96.736	56.139	41.793	14	9
Female (n=51)	X	488.549	2275.450	77.130	15.206	7.665	7.216	2.333
	SD	53.547	269.487	11.336	9.872	7.260	5.029	1.987
	SE	7.498	37.736	1.587	1.382	1.017	0.704	0.278
	CV	10.960	11.843	14.698	64.920	94.724	69.698	85.141
	Min	360	1505.198	55.930	0	0	0	0
	Max	593	2938.365	99.176	31.816	31.018	22	8
Reliability in group differences	d	8.747	450.524	2.655	0.755	1.898	1.791	0.195
	t	0.996	8.392	1.300	0.419	1.418	2.306	0.532
	p	-	<0.001	-	-	-	<0.05	-

Notes: X – average, SD – standard deviation, SE – standard error, CV – coefficient of variation, Min – minimal value, Max – maximal value.

Discussion

One of the essential biological variables is gender [32]. As such, the primary criterion for assessing the physical attributes and actions of target audiences ought to be gender. It is important to comprehend the anatomical and functional distinctions between the sexes and their behavioral relationships. Men and women differ from one another in both qualitative and quantitative areas. Even though these elements are rarely well studied, this divergence is more quantitative at every level of the biological and morphological basis [33,34]. It is to distinguish genders by absolute and relative sizes when examining the anatomical and physiological manifestations of bodily structures. Men are generally larger than women in terms of the body's absolute values (length and mass) and the size of its organs (heart, liver, kidneys, brain, and lungs). However, on average, women outperform men in terms of the relative weight of these organs as a percentage of body weight. This is because a man's body weight, unlike that of a woman, is composed more of muscle than fat [35,36]. Our research showed that women, in contrast to men, have a wider range of relative body morphological markers. Absolute and relative body morphological indications in women are frequently outside the usual distribution bounds. It can be inferred from these statistics that women have a more comprehensive range of body-related factors than men do.

The comparison of body composition between the sexes is crucial in assessing overall health and disease risk. Research has indicated that the differences in fat distribution, muscle mass, and bone density contribute to distinct health outcomes for men and women. Understanding these differences enables the development of more personalized health interventions and fitness programs tailored to the unique physiological characteristics of each sex. Factors that affect aging, genetic variation, and the balance of gender hormones also affect body fat distribution between the sexes and have a significant overall effect on health indices [37]. Visceral fat, which is more prevalent in men, is strongly linked to higher risks of metabolic syndrome, diabetes, and cardiovascular illnesses. Even though subcutaneous fat is less harmful and more prevalent in women, it can nonetheless have long-term health effects. Therefore, the distribution of fat in men and women has a substantial impact on the incidence of metabolic illnesses, with men more sensitive to these issues due to the type of fat they store [38]. Men burn more calories at rest than women do because they have higher basal metabolic rates due to their larger muscular mass [39]. Despite having less muscular mass, women typically use fat as their primary energy source in endurance activities. It has been established that men's bodies use fat and muscle differently than women's, with men's higher muscle mass resulting in a faster metabolism and more caloric burn during exercise [40]. Women's estrogen affects fat storage and protects against heart disease until menopause, when the risk of cardiovascular disease in women reaches that of men [41]. Although testosterone helps men gain mass that is more muscular and have lower body fat percentages, it can also raise their chance of developing certain illnesses, such as heart disease [42]. Differentiated health assessments are necessary due to the disparities in body composition between the sexes [35]. For example, women's BMI may be less accurate because of their higher body fat percentage and varied distribution of fat. The waist-to-hip ratio, the fat-free mass index, and other sophisticated body composition metrics are used to identify health concerns particular to a given sex.

There may be a connection between women's diverse physical indicators of greater distribution and their lower self-esteem regarding their bodies [43]. Research showed that the ability of men and women to maintain cardiorespiratory fitness varied. The Ruffier test can be used to find aggravating factors that affect the cardiorespiratory system [44]. Research found that the average RI indices for men and women in our study were around 6 and 7 units, respectively; this difference is statistically significant. Although the Ruffier index estimations align with the average [20], it is necessary to distinguish between the two analyzed groups because of their consistent differences. Similar tendencies were seen in other assessed markers of men's and women's cardiorespiratory fitness, such as VO_2max and RHR, which correlated with the average rating scale values and demonstrated a consistent difference between the groups under study. RHR can serve as an indicator of the health of the cardiovascular system and can reveal information about the underlying state of cardiovascular physiology in both healthy and diseased people. Indicators of VO_2max vary depending on factors like age, gender, and level of fitness [45]. A traditional test that gauges the maximal rate of oxygen consumption (VO_2max) is the best way to assess cardiorespiratory fitness [46]. The accuracy of the VO_2max equations that are currently available is poor. As a result, indications of cardiorespiratory fitness other than VO_2max should be included when assessing an individual. This is beneficial for an objective evaluation. The cardiorespiratory fitness metrics found in our study support this claim. The studied groups' cardiorespiratory fitness markers are within the range of the average evaluation values. The bodily condition markers correspond to the average levels of young Lithuanian people (20-25 years old).

Researching the habits that greatly affect an individual's health, such as nutrition and physical activities, is crucial [47,48]. A thorough analysis of behavioral habits that affect health is also necessary to achieve most health and wellness objectives, in addition to long-term planning, reasoning, and logic [49]. Women consumed food with an average daily caloric intake that was 700 Kcal lower than that of men; the daily energy intake indicators of the men and women under research are consistently different. The data from our study closely match the recommendations made by Braitman et al. [50], who state that daily requirements for men and women are 2,359 and 1,639 Kcal, respectively. It is important to understand that the minimal daily calorie intake for males and females who are inactive is 2,400 calories and 1,800 calories, respectively [51]. Women consume higher-calorie foods at the same time. In addition, women's diets contain more carbohydrates. The distribution of nutrients in women's diets was as follows: 18% are lipids, 22% are proteins, and 60% are carbohydrates. Men consumed 58% of their calories from carbohydrates, 23% from proteins, and 19% from fats. For both men and women, the WHO advises a diet of 55% carbohydrates, 30% proteins, and 15% fats [52,53]. No variations were seen between the nutrition time characteristics of men and women; a single meal took approximately 14 minutes for males and 15 minutes for females. The respondents' meal times did not adhere to the WHO's recommendation of 20 minutes. The average number of meals consumed by the men and women in the study was four; nevertheless, the WHO recommends five meals a day [52]. Some writers argue that eating three to five times a day is essential. When assessing the physical activity indicators of the subjects, it was found that women and men sleep, on average, about 8 hours a day. This is in line with recommendations to sleep at least 7 hours per day [54]. Other recommendations indicate that sleep should not exceed 8 hours. Regularly getting more than 9 hours of sleep every day may be suitable for young adults, people getting over their sleep debt, and people who are ill [55]. The total amount of energy burned on average over a day is known as the total daily energy expenditure. This depends upon numerous aspects, such as physiological state, physical activity, food-induced metabolic response, and basal metabolism [56]. It was noticed that there is a reliable difference of 450 Kcal daily energy expenditures between men and women. Thus, women consume an average of 2,275 Kcal per day and men 2,725 Kcal. According to data from a study conducted ten years ago, the daily energy expenditure difference between men and women amounted to 580 Kcal [57]. In recent decades, a significant reduction in humans' adjusted total energy expenditure can be traced to a decline in basal energy expenditure rather than any reduction in activity energy expenditure linked to declining physical activity levels [56]. The Physical Activity Guidelines include 150 minutes a week of moderate-intense (METs 3 to 6) and 75 minutes a week of vigorous-intense (METs greater than 6) physical activity [58,59]. The daily physical activity recommendations are thus broken down into two categories: METs 3 to 6-21 minutes and METs greater than 6-11 minutes. It is also indicated that adults should engage in moderate-intense aerobic physical activity (METs 3 to 6) for at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) per week, vigorous-intensity aerobic physical activity (METs greater than 6) for 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) per week, or an equivalent combination of moderate- and vigorous-intensity aerobic physical activity for significant health benefits [31]. Aerobic exercise should ideally be distributed throughout the week. Consequently, 3% of a person's weekly time should be dedicated to moderate-intense aerobic physical activity (METs 3-6) and 1.5% to vigorous-intense aerobic physical activity (METs greater than 6). The subjects' physical activity significantly exceeded these recommendations. No statistical difference was observed between the physical activity intensity measures for men and women. Throughout the entire observation period, 8% of physical activity was vigorous-intense (METs greater than 6) and 15% was moderate-intense (METs 3-6). To stimulate different energy systems and prevent overtraining, a combination of medium-, high-, and low-intensity cardiac exercises is advised [60]. Women were more likely than men to engage in moderate-to-intense aerobic physical activity (METs 3-6) during a week. Women engaged almost seven times throughout the week, compared to men's five times. The activity guidelines recommend 30 to 60 minutes of cardio. Thus, the length of each exercise will differ based on the type of exercise and the fitness level of the performer [61]. One moderate-intense aerobic physical activity lasted an average of 210 minutes for males and 275 minutes for females. A 48-72-hour rest period is necessary in between sessions to optimize the development of the cellular and molecular changes that cause muscle hypertrophy and the accompanying strength gains [62]. In our study groups, the dispersion of this indicator is quite wide. For both men and women, the weekly amount of vigorous-intense aerobic physical exercise amounted to 800 minutes, or roughly 2.5 times; one action lasted for almost 320 minutes. It should be highlighted that there is a significant disparity in the frequency and intensity of physical exercise among the study groups. The research participants exceeded the recommended level of activity by a wide margin. 8% of physical activity was vigorous-intense (METs greater than 6) and 15% was moderate-intense (METs 3-6) throughout the observation period. A mix of low-, medium-, and high-intensity cardiac exercises is recommended to activate various energy systems and avoid overtraining [60]. In terms of moderate-to-intense aerobic physical activity (METs 3-6), women were more likely than men to participate.

Conclusions

To improve performance, a structural and functional examination of the body's parts and their interactions is necessary. If health components are sufficiently assessed and planned for, there is a possibility for effective management of individual health. This makes it possible to program diet and exercise and reach the ideal body condition parameters. This can be used to improve physical performance, improve mental and physical well-being, and reduce risk factors for a variety of noncommunicable diseases. Population assessment should make use of low-cost, self-operated devices and techniques that are simple to use. The key to arranging physical activities and nutrition for both men and women in a way that maximizes health is to consider gender. Different responses to a variety of bodily activities and conditions are a result of gender differences in the phenotype of physiological systems, and physical activity is no exception. The gender differences in the integrative response to physical exercise are assumed to be caused by differences in the muscular systems' capacity to carry and use oxygen, as well as their tolerance to fatigue. These differences have a direct impact on nutrition. Women probably find it more difficult to optimize their physical activity and food intake. To optimize adaptation results for both genders, it is crucial to consider the diversity of physical adaptations arising from different physiological responses to a physical state, nutrition, and physical activity events. Gender plays a crucial role in the puzzle of adaptation outcomes, which influence the physiological responses of the body to different stimuli and irritations and ultimately dictate health. Future research will need to examine how the two genders' biological backgrounds combine with the physiological responses that are influenced by differences in dietary habits and levels of physical activity. This will enable the identification of the gender-specific behavioral patterns that most effectively promote favorable health outcomes.

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