

Characteristics of physical activity in the adult population with different risk of overweight and obesity (illustrated by the case of Kazakhstan)

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Abstract:

Despite the ongoing successes in utilizing physical education and health technologies to address physique disorders arising from an accumulation of excess adipose tissue, the imperative to further investigate preventive measures against such metabolic disorders in the adult population remains pertinent. Research aim: To identify additional risk factors influencing the development of excess body weight and obesity among individuals in the Republic of Kazakhstan, considering varying levels of weekly physical activity. **Materials and methods.** This research project was conducted at medical clinics in the city of Semey (Republic of Kazakhstan), involving the participation of 299 individuals, comprising 86 men (28.8%) and 213 women (71.2%), with an average age of 34.9 years. An anthropometric examination was performed, measuring length (cm) and body weight (kg) to calculate body mass index (BMI). Each participant in the study answered questions in a questionnaire that contained information about gender, education, profession, and social and living conditions. Responses to each question were assessed within a range of five answer options on a Likert scale. According to the level of weekly physical activity, all respondents were divided into two groups. The first group included respondents who had moderate weekly physical activity of more than 150 minutes per week or intense physical activity of at least 75 minutes per week. The second group included respondents whose weekly moderate or intense physical activity was less than 150 or 75 minutes per week, respectively. **Results.** A normal body mass index value was found in 52.5% of respondents. Insufficient weight was noted in 7.35%. Excess body weight - in 23.41% of surveyed respondents and obesity - in 16.72%. Most often, overweight and obesity are registered at the age of 42-49 years, as well as in the group of respondents over 50 years old. This allows us to classify them as a risk group for metabolic disorders in the body. Overweight and obesity were more often recorded in the group of women with low weekly physical activity (≤ 150 min per week). With physical inactivity, women can be considered at risk for overweight and obesity. Of all the respondents, the greatest satisfaction with physical activity was recorded in the group of respondents with a normal body mass index (47.1%). In the group of respondents with overweight or obesity, the minimum number of people who are satisfied with their physical activity was found. Respondents with normal weight in most cases prefer to engage in physical activity every day or 1-3 times a week. Respondents with overweight or obesity engage in physical activity mainly once a month or not at all. **Conclusions.** When organizing physical education and recreational activities to correct body weight, it is necessary to take into account the identified age and gender characteristics of risk groups of people with excess body weight and obesity and their relationship with the level of physical activity.

Key Words: body mass index (BMI), physique disorders, risk groups, physical activity

Introduction

Parameters of the state of a person's body weight make it possible to characterise the course of metabolic and energy processes, the hormonal status of the body and serve as an indicator of the physical development of the individual (Syamsudin et al., 2021; Kolokoltsev et al., 2023).

Disruption of metabolic processes in the human body may be accompanied by the appearance of excess body weight or obesity, which is the main risk factor for the development of severe non-infectious diseases in humans (Hu et al., 2017; Wedell-Neergaard et al., 2018). The scientific literature provides a large amount of information that indicates a direct correlation between obesity and the incidence of cardiovascular diseases, particularly coronary heart disease, cardiac arrhythmia, and arterial hypertension (Ullrich et al., 2018). A

correlation has been established between obesity and the incidence of stroke, the onset of type II diabetes, and disorders of the musculoskeletal system (WHO. Report of a WHO Consultation). Obesity: preventing and managing the global epidemic, 2000. Obesity negatively affects women's reproductive function (Broughton & Moley, 2017). Often, excess adipose tissue can cause premature death at a young age (Aboma Motuma et al., 2022).

According to the World Health Organization, most countries are recording an increase in the number of people who are overweight or obese. As experts from this organisation note, by 2035, about 50% of the world's population will be overweight or obese (WHO. Obesity and overweight. Fact sheet, 2018). Observations and analysis of scientists confirm the unfavourable forecast of the situation in the world regarding obesity and excess body weight of the planet's population (Junger et al., 2019).

According to the National Centre for Public Health of the Republic of Kazakhstan, over 20% of the country's residents are obese. "According to statistics from the Ministry of Health of the Republic of Kazakhstan, at the beginning of 2021, 6,491 children were registered with obesity at the dispensary. The adult population of the republic are more often susceptible to obesity, as there is a decrease in the activity of metabolic processes, physical activity, and it is difficult to change eating habits. Obesity is getting younger: young children suffer from it 10 times more often than 40 years ago, noted the National Centre for Public Health (<https://www.inform.kz/ru/global-naya-problema-hhi-veka-svyshe-20-kazahstancev-stradayut-ozhirenie>).

Numerous studies by scientist's point to two main causes of excess weight or obesity in humans. One of them is the consumption of large amounts of high calorie foods, and the second reason is low physical activity (Jordan et al., 2020; Mozolev et al., 2020; Bakiko et al., 2020; Chekhovska et al., 2020). Based on these reasons, tactics are developed to reduce body weight. The scientific literature provides research materials from various authors on the use of aerobic physical exercise, which allows one to obtain a positive result in correcting body weight with mandatory adherence to a diet. The use of fitness directions has made it possible to correct the physique and component composition of the body and improve the health indicators of young people (Zhamardiy et al., 2020; Mazin et al., 2021). In addition to aerobic exercises, strength training and training equipment are successfully utilised to reduce body weight (Mosina, & Aksarina, 2019; Eliane Aparecida Franco et al., 2021; Kryzhevsky et al., 2022). Strength fitness using mini-barbells of various weights has become popular amongst young people. The use of such sports equipment allows not only to increase a person's strength endurance but also to reduce the mass of fat deposits (Nenenko, & Maksimova, 2018).

Despite the extensive information available in the scientific literature about the genesis of excess body weight and obesity in populations of different ages, gender, social and professional status, eating habits, physical activity, etc., a number of issues of a social and everyday nature and the motivational state of a person remain unresolved. There is insufficient information about human risk factors for deviations from normal body weight and their relationship with the volume and intensity of physical activity. We believe that studying these issues will enable specialists in the field of physical culture and sports to conduct a targeted information campaign among various population groups about the importance of physical activity in the prevention of excess body weight and obesity. In addition, solving these issues will make it possible to further individualise the process of using physical activity to correct the body.

Research aim. To identify additional risk factors for the formation of excess body weight and obesity among the population of the Republic of Kazakhstan under different levels of weekly physical activity.

Material & methods

The research project was conducted at medical clinics in the city of Semey, Abay region (Republic of Kazakhstan). Each participant in the project gave written voluntary consent to participate in the study, which they could refuse at any time. The project carried out complies with the ethical parameters of the Committee on the Rights of Biomedical Experiments of the 2008 Helsinki Declaration.

An anthropometric examination was carried out with measurements of length (cm) and body weight (kg) to calculate the body mass index (BMI) using the formula: $BMI = \text{body weight} / \text{body length}^2$, kg/m^2 . Body weight status was assessed: lack of body weight was considered at a BMI value of $\leq 18.5 \text{ kg/m}^2$; normal body weight $18.5\text{-}24.99 \text{ kg/m}^2$; excess body weight $25\text{-}30 \text{ kg/m}^2$; with a BMI $\geq 30 \text{ kg/m}^2$, body weight was assessed as obesity (Memorandum of the meeting convened by USAID, WHO, PAHO and Mother Care Organization ("Mother Care"), 1991).

Each study participant answered questions in a questionnaire that contained information about gender, education, profession, and social and living conditions. Responses for each question measured a range of five Likert scale responses from "agree" to "no, disagree" (Likert, 1932). An important role in the survey was given to assessing the state of physical activity of patients. According to its level, all observed persons were divided into two groups. The first group included individuals with an activity level that corresponded to global recommendations on physical activity for the population (WHO. Global recommendations on physical activity for health, 2010). Respondents in this group had moderate weekly physical activity of 150 minutes or more per week or vigorous physical activity of at least 75 minutes per week. The other group included patients whose weekly moderate or intense physical activity was less than 150 or 75 minutes/week, respectively.

The study involved 299 outpatient patients, whose mean age was 34.9 years (95% CI (Confidence Interval (CI): 33.6-36.3). There were 86 (28.8%) men and 213 (71.2%) women. The mean age of men was 34.6 years (95% CI: 32.1-37.1). The youngest man was 15 years old, the oldest 63 years old. The mean age of women was 35.1 years (95% Confidence Interval (CI): 33.5-36.6). The youngest woman was 15 years old, the oldest participant in the survey was 68 years old.

The age group up to 29 years old included 110 individuals (36.8%), the group 30-39 years old - 81 (27.1%), the group 40-49 years old - 69 (23.1%), 50 years old and over - 39 participants (13.0%).

There were 218 (72.9%) patients with higher education, 45 (15.1%) with secondary specialised education, and 36 (12.0%) with secondary education. There were 207 (69.2%) urban residents and 92 (30.8%) rural residents. There were 147 (49.2%) employees, 19 (6.4%) service workers, 11 (3.7%) workers, 27 (9.0%) working in the business sector, and 95 (31.8%) non-employees.

Descriptive statistics were used to analyse the obtained data. To obtain qualitative data, we used the Pearson chi-square criterion for calculations. With $df = 12.0$, the critical value is $X^2_{critical} = 21.026$. We processed statistical data using the sociological software SPSS version 20.0 (IBM Ireland Product Distribution Limited, Ireland). The level of statistical significance was set at $p < 0.05$.

Results

The distribution of the examined individuals by age and BMI value is presented in Table 1.

Table 1. Age distribution of observed persons by BMI value, absolute, %

Age group	Characteristics of body weight, kg/m ²			
	Insufficient body weight, ≤ 18.5	Normal body weight, 18.5–24.9	Overweight, 25.0-29.9	Obesity, ≥ 30.0
Under 29 years old	16 (14.5)	70 (63.6)	19 (17.3)	5 (4.5)
30-39 years	4 (4.9)	38 (46.9)	25 (30.9)	14 (17.3)
40-49 years	1 (1.4)	34 (49.3)	14 (20.3)	20 (29.0)
Over 50 years old	1 (2.6)	15 (38.5)	12 (30.8)	11 (28.2)
Total	22 (7.35)	157 (52.5)	70 (23.41)	50 (16.72)

In the examined individuals, the average BMI value was 24.9 kg/m². The minimum BMI value was 13.2 kg/m², the maximum was 60.5 kg/m². At the same time, more than 52.5% of the examined persons had a normal body weight, almost every fourth examined person was overweight, 7.35% of respondents were underweight and 16.72% of respondents were obese. It has been established that with age the number of respondents with underweight and normal weight decreases and the number of people with overweight and obesity increases, Figure 1.

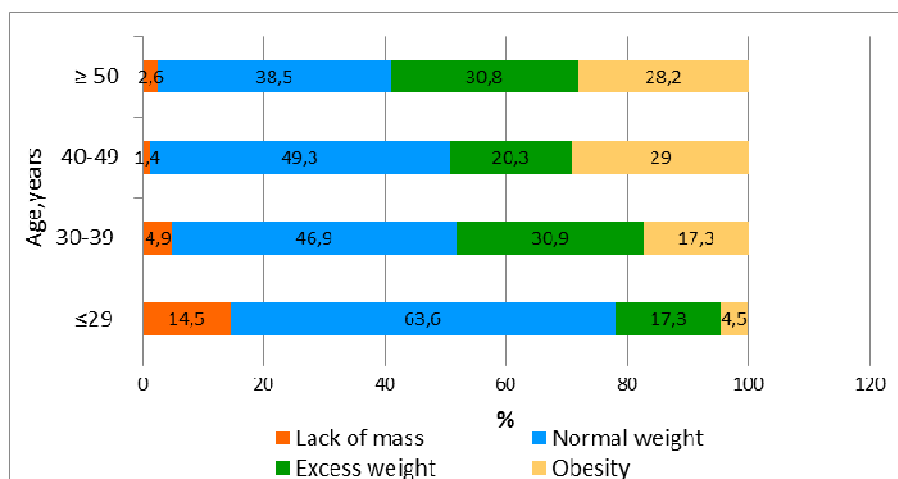


Fig. 1. Distribution of respondents by age and body mass index characteristics

In the age group up to 29 years, over 63% of respondents have a healthy weight; we identified over 17% and 4% of respondents as overweight and obese, respectively. In the age group 30-39 years, the proportion of people with an inadequate body weight decreases by over 66%, and there is an increase in those with a healthy weight by over 26%, compared to the age group ≤ 29 years. At the same time, the number of respondents with excess body weight increases by 78.6% and the number of obese individuals increases by 3.8 times compared to the previous age group. In the next age group of 40-49 years, a continued decrease in the number of respondents with underweight to 1.4% was established against the background of approximately the same number of people

with normal body weight compared to the previous age group, a decrease in the number of people with excess body weight to 20.3% and an increase of 67.6% of patients are obese. In the age group ≥ 50 years, the number of respondents with underweight almost doubles and the number of people with normal body weight decreases by 22% compared to the previous age group. At older ages, the number of patients with excess body weight increases by 34% against the background of obesity being registered in almost every third patient.

In reducing the content of fat mass in the human body, the leading role is given to aerobic physical exercise. Therefore, when surveying patients, the question was asked: "Are aerobic exercises such as walking, running, swimming, fitness, outdoor sports, etc. important for losing weight?" The distribution of the number of respondents according to their answers to this question is shown in Figure 2.

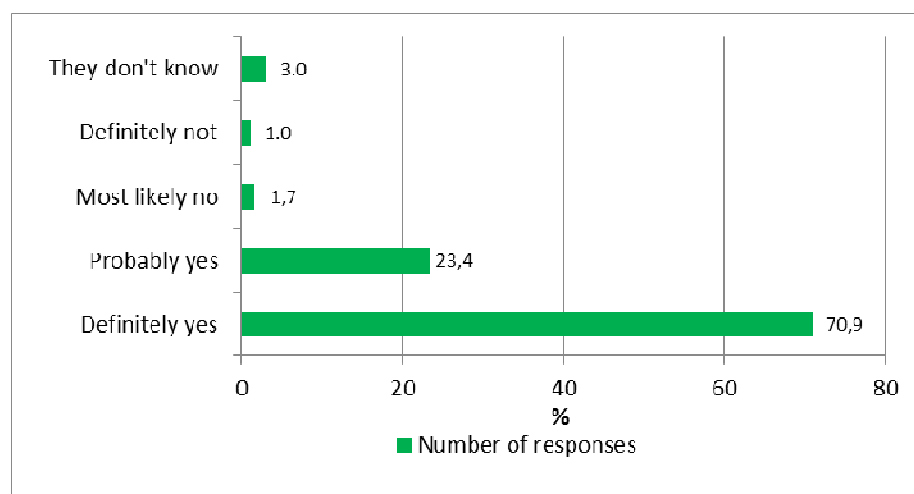


Fig.2. Number of respondents in response to the question "Are aerobic exercises such as walking, running, swimming, fitness, and playing sports an important way to lose weight in the fresh air?"

It was found that more than 70% of respondents believe that regular aerobic exercise "definitely yes" affects a person's weight loss and 23.4% answered "probably yes". Only a few respondents answered "most likely no" and "definitely no".

These results indicate a high level of knowledge of the people surveyed about the positive effects of aerobic physical activity on reducing the amount of fat mass in the body of those involved. At the same time, the largest number of respondents (39.8%) were "satisfied" with their level of physical activity and 65 (21.7%) people responded that they were "very satisfied" with their level of physical activity, Table 2.

Table 2. Respondents' answers about the current level of physical activity, absolute, %

Characteristic body weight	Very satisfied (a)	Satisfied (a)	Neither one nor the other	Not satisfied (a)	Very dissatisfied (a)	Statistical criterion
Insufficient	6 (27.3)	8 (36.4)	4 (18.2)	4 (18.2)	0 (0.0)	$\chi^2=35.54$, $df=12.0$, $p=0.000$
Normal	43 (27.4)	74 (47.1)	16 (10.2)	21 (13.4)	3 (1.9)	
Excessive	12 (17.1)	23 (32.9)	16 (22.9)	17 (24.3)	2 (2.9)	
Obesity	4 (8.0)	14 (28.0)	9 (18.0)	19 (38.0)	4 (8.0)	
Total	65 (21.7)	119 (39.8)	45 (15.1)	61 (20.4)	9 (3.0)	

The number of respondents who rated their physical activity as "not satisfied" was 48.7% fewer than the number of respondents with the answer "satisfied". The number of respondents rated "very dissatisfied" with their physical activity was minimal and amounted to 9 (3.0%) people.

There was a correlation between the value of body weight and the level of physical activity of respondents, as shown in Table 2. Among respondents with insufficient body weight, 36.4% of people were satisfied with their level of physical activity and 27.3% of people were "very satisfied". The highest rate of satisfaction with their physical activity was noted among respondents with normal weight (47.1%). This group recorded the largest number of respondents rated "very satisfied" with their physical activity - 27.4%. Among overweight individuals, the number of respondents who are satisfied with their level of physical activity decreases to 32.9% and "very satisfied" with their level of physical activity to 17.1%. The number of respondents rated "very satisfied" and "satisfied" with their physical activity in obese patients decreases even more. A significant portion (38.0%) of these respondents responded that they were "not satisfied" with their physical activity and 8.0% said that they were "very dissatisfied" with their physical condition.

In reducing body fat, the volume and intensity of physical activity play an important role. According to WHO recommendations, physical activity of the population should be ≥ 150 min/week of moderate exercise or ≥ 75 min/week of intense exercise. Table 3 presents the survey participants' responses on the frequency of their physical activity, which lasted ≥ 30 minutes each time in the last 6 months.

Table 3. Frequency of respondents performing physical activity, absolute, %

Characteristic body weight	Частота физической активности					Statistical test
	Almost every day Почти каждый день	4-6 times a week	1-3 times a week	Once a month	Never	
Insufficient	9 (40.9)	8 (36.4)	2 (9.1)	2 (9.1)	1 (4.5)	$\chi^2=29.399$, $df=12.0$, $p=0.000$
Normal	52 (33.1)	67 (42.7)	16 (10.3)	18 (11.5)	4 (2.5)	
Excessive	3 (4.3)	14 (20.0)	8 (11.4)	18 (25.7)	27 (38.5)	
Obesity	1 (2.0)	3 (6.0)	9 (18.0)	18 (36.0)	19 (38.0)	
Total	65 (21.7)	92 (31.1)	35 (11.7)	56 (18.9)	51 (17.1)	

The number of respondents whose weekly physical activity complied with WHO recommendations for the level of weekly physical activity is represented by the groups "almost every day" (21.7%) and "4-6 times a week" (31.1%). The remaining observation participants (47.2%) had weekly physical activity less than recommended by WHO. Among the respondents in this group, 36.0% have a very low frequency of physical exercise. They engage in physical activity once a month (18.9%) or have not performed any physical exercise in the last 6 months (17.1%).

The interdependence of the body weight characteristics of respondents on the frequency of physical activity was established, Figure 3.

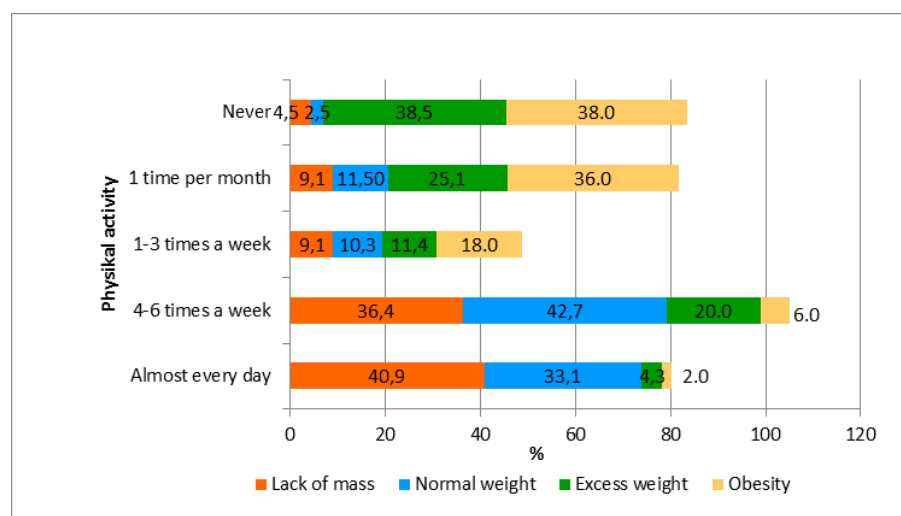


Fig. 3. Relationship between body weight characteristics of respondents and frequency of exercise physical activity

From Figure 3, it can be seen that in the group of surveyed patients who perform physical activity every day, a significant number of people with normal body weight (33.1%) and its deficiency (31.8%) were found. In this group, there is a small number of patients with overweight (4.3%) and obesity (2.0%), $p \leq 0.05$. A similar relationship between the characteristics of body weight and frequency of physical activity was noted in the group of individuals who reported engaging in physical activity 4-6 times a week.

It was discovered that in the group of individuals who engaged in physical activity 1-3 times a week, the percentage of respondents with a normal body weight decreased to 17.2%, and to 18.2% with underweight, while the percentage of overweight patients increased to 18.0%. The number of obese respondents is even higher in the group of people who perform physical activity once a month or never do it - 36.0% and 38.0%, respectively. In this group, the number of respondents with excess body weight increases to 25.7% and 38.5%, respectively, and the number of respondents with normal body weight decreases.

The difference in the frequency of performing the amount of physical activity associated with gender differences has been established, as shown in Figure 4.

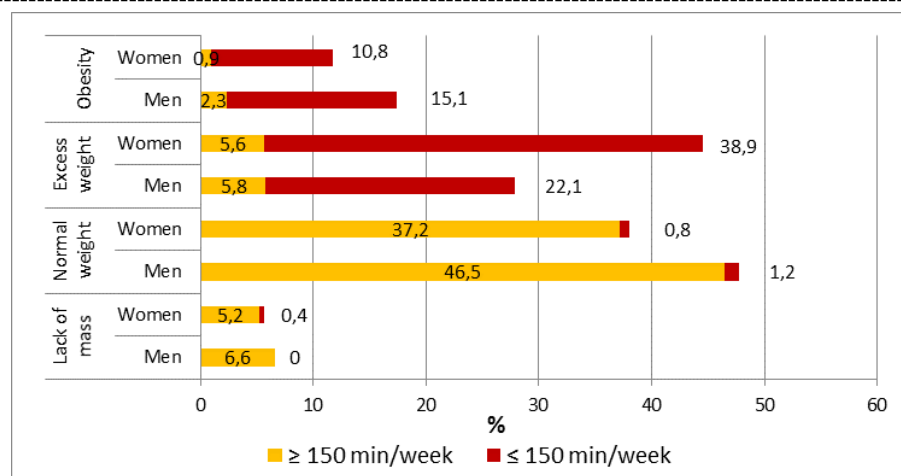


Fig. 4. Gender differences in the frequency of physical activity in individuals with different characteristics of body weight

The relationship between the level of physical activity and body weight characteristics in both gender groups is noteworthy. The number of men with underweight and normal weight is slightly higher in the group of respondents with a high level of physical activity - 6.6 and 46.5%, respectively, than among women - 5.2 and 37.2%, respectively. It was recorded that overweight was 3.8 times more common among men and 6.9 times more often among women with low levels of physical activity than among respondents with WHO recommended physical activity. Obesity was 6.6 times more common among men and 12 times more likely among women with physical activity levels ≤ 150 min/week than among respondents with physical activity ≥ 150 min/week. We believe that women with low physical activity should be identified as a risk group for excessive fat mass in their body. Identification of a risk group will make it possible to individualise physical education and health activities more in this category of women.

Dicussion

Disturbances in metabolic processes that occur in the human body can often lead to the appearance of excess body weight or obesity (Syamsudin et al., 2021; Kolokoltshev et al., 2023). Such deviations in body weight lie in the genesis of severe chronic diseases (Hu et al., 2017; Wedell-Neergaard et al., 2018) and can be a cause of premature death (Aboma Motuma et al., 2022).

Currently, scientists and specialists involved in the prevention of obesity and excess body weight are well aware of the algorithm for correcting body image and its component composition. This is a reduction in caloric intake and regular aerobic or strength-oriented physical activity. The fulfilment of these two conditions leads to a pronounced positive result in body weight correction (Mosina & Aksarina, 2019; Zhamardiy et al., 2020; Eliane Aparecida Franco et al., 2021; Kryzhevsky et al., 2022). At the same time, all authors note difficulties in correcting physique and preventing obesity, which are associated mainly with the difficulty of giving up the usual intake of high-calorie foods and poor motivation for regular physical activity. In addition, we believe that there are little-studied issues, in particular, the relationship between bodyweight parameters and the volume of physical activity performed has been poorly studied. This reduces the possibility of using the important principle of physical education of individualisation of physical activity, which makes it ineffective in correcting bodyweight due to a decrease in motivation and interest in regular physical education and health activities. The scientific literature does not sufficiently cover the rationale for identifying risk groups among the population who are overweight or obese. We believe that identifying risk groups will make it possible to carry out targeted individual preventive work using means and methods of physical culture. When developing physical education and health activities, it is important to take into account the principle of individualising physical activity depending on the characteristics of the body weight of a particular person.

As a result of our research project, it was found that with age, the number of respondents with normal weight decreases and the number of people with overweight and obesity increases. The significant prevalence of overweight and obesity, reaching almost 50 and 60% in people aged 40-49 years and over 50 years, allows us to classify such patients as a risk group for metabolic disorders. It was found that over 70% of respondents believe that regular aerobic exercise "definitely does" influence the reduction of fat mass in a person's body. In our view, the high level of knowledge can be explained by the respondents' level of education. According to our data, 72.9% of all individuals surveyed had higher education.

Our data has established a relationship between the level of weekly physical activity and body weight characteristics for both men and women. At the same time, the number of men with underweight and normal weight is greater in the group of respondents with an optimal level of physical activity than among women in

these groups. Overweight and obesity were more often recorded in women with weekly physical activity ≤ 150 min/week. These data indicate that, under conditions of physical inactivity, the female population can be classified as at risk for overweight and obesity. These gender characteristics should be taken into account when planning physical education and health activities in the organisation of health improvement and prevention of metabolic disorders.

We noted the greatest satisfaction with physical activity in the group of people with normal body weight (47.1%) or its deficiency (36.4%). These data may indirectly indicate high motivation for physical activity among respondents with normal weight characteristics due to the good results of body image correction. In the group of respondents with overweight or obesity, the number of people who are satisfied with their physical activity decreases. It was found that amongst obese people, 38.0% of respondents were not satisfied with the level of their physical activity. These data may indicate a possible violation of the principle of individualisation of physical activity in this group of patients, which led to a decrease in the effectiveness of physical activity aimed at correcting obesity. Perhaps other physical culture and health technologies are required that differ from physical activity in a group of people with normal body weight or its deficiency.

There is a relationship between body weight and the level of physical activity. Respondents with normal weight prefer to engage in physical activity almost every day or 4-6 times a week. Among overweight and obese individuals, once a month or even no physical activity is more common. These data are consistent with the opinion of scientists who have identified the relationship between obesity and the level of physical activity (Jordan et al., 2020; Mozolev et al., 2020; Mazin et al., 2021).

The study results highlight the need for information campaigns and education among all population groups to raise awareness of the importance of regular physical activity and its positive effects on health. It is important to take into account the individual preferences and characteristics of each group when developing programmes to stimulate physical activity.

In the future, it is necessary to conduct more in-depth research to identify the causes and factors influencing the level of physical activity in each group. This will help develop more targeted and effective methods of supporting a healthy lifestyle depending on body weight.

Conclusions

It was found that among the adult population of the Republic of Kazakhstan, a normal value of body mass index is registered in 52.5%, underweight in 7.35%, overweight in 23.41% and obesity in 16.72% of surveyed respondents. Most often, overweight and obesity are registered at the age of 40-49 years and over. This allows us to classify them as a risk group for excessive fat mass in the body.

It was found that over 70% of respondents answered the question correctly regarding the positive impact of aerobic exercise on body correction, which, in our opinion, is related to the high level of education of the surveyed participants, of which 72.3% have higher education.

We observed a correlation between body weight characteristics and the level of physical activity. The number of men with underweight and normal weight are higher in the group of respondents with a high level of weekly physical activity than among women in these groups. Overweight and obesity were more often recorded in the group of women with low weekly physical activity (≤ 150 min per week). We believe that in conditions of physical inactivity, the female population can be classified as a risk group for overweight and obesity. The greatest satisfaction with physical activity was found in the group of respondents with normal body weight (47.1%). These data indicate high motivation for physical activity amongst respondents with normal body weight characteristics. In the group of respondents with overweight or obesity, the minimum number of people who are satisfied with their physical activity were found. Respondents with normal weight in most cases prefer to engage in physical activity almost every day or 1-3 times a week. Respondents who are overweight or obese engage in physical activity mainly once a month or not at all.

The identified features of the spread of overweight and obesity in risk groups, and the relationship with the volume of weekly physical activity performed, must be taken into account for the individualisation of physical education and health activities, which are aimed at correcting a healthy body weight.

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

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