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ORIGINAL ARTICLE

COMPARISON OF ERGOGENIC SUBSTANCE USE AND PHYSICAL ACTIVITY LEVELS IN TRAKYA UNIVERSITY SCHOOL OF MEDICINE AND SCHOOL OF HEALTH SCIENCES STUDENTS

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ABSTRACT

Aims: Ergogenic substances are nutritional supplements that are commonly used as enhancers of physical activity. The aim of this study is to examine the use of ergogenic substances and their relationship with physical activity levels in medical and health science students.

Methods: The short form of the International Physical Activity Questionnaire was applied to the students of Trakya University School of Medicine and School of Health Sciences, and a survey was used to collect data such as height, weight, gender, chronic disease, and ergogenic substance usage. The survey and questionnaire were conducted online based on voluntary participation. The Shapiro-Wilk, Mann-Whitney U, and Pearson's chi-squared and Fisher's exact tests were used to evaluate the results. A total of 196 students, of which 76 were male and 120 were female, participated in this study.

Results: Among the 196 students that participated in this study, the average body mass index of the students was 22.4 kg/m^2. Protein powder and vitamins were found as the most preferred ergogenic substances by the participants. The metabolic equivalent of task scores were calculated to determine the participants' level of physical activity. Of the participants, 32 (16.3%) were physically inactive, 134 (68.4%) were in the minimally active group, and 30 (15.3%) were in the physically active group. The mean metabolic equivalent of the task score of all participants was 1,765. The average metabolic equivalent of task score of those who used ergogenic substances was found to be significantly higher than the average score of the participants who did not use ergogenic substances.

Conclusion: The results of our study showed that physically active students in medical and health science schools may be more prone to using ergogenic substances than physically inactive students.

Keywords: Ergogenic substance, medical students, physical activity

INTRODUCTION

Ergogenic aids are defined as training techniques, biomechanical devices, nutritional support, and pharmacological support that improve training adaptation and exercise performance (1). Various nutritional supplements that are used for increasing the efficiency and the recovery period of an exercise are considered ergogenic substances (2). The use of ergogenic substances and dietary supplements as sports performance enhancers has increased in recent years (2). Vitamins, minerals, caffeine, protein powders, creatine, L-carnitine, carbohydrates, and amino acids are some of the most frequently used substances (3-5).

Restricted substances such as anabolic-androgenic steroids, beta-2 agonists, erythropoietin receptor agonists, or methods used by athletes before a competition to gain an unfair advantage by increasing performance, endurance, or speed are defined as doping (6). These substances might also be harmful

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since there is a risk they might cause health problems (6). Due to ergogenic substances being legal, athletes tend to use these with high-performance expectancy (6). The difference between these two terms is that doping creates an unfair advantage by increasing physical and/or psychological performance before the competition (6).

Due to the increase in the use of ergogenic substances in recent years, this study aims to reveal the prevalence and perspectives of ergogenic substance use among medical and health science students and to understand the relationship between the use of ergogenic substances and the physical activity levels.

MATERIAL AND METHODS

This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (protocol code: TUTF-BAEK 2020/187). This study was carried out online due to the coronavirus disease-2019 (COVID-19) pandemic between the dates 9 September 2020 to 14 October 2020, and 218 students from the Trakya University School of Medicine and School of Health Sciences participated voluntarily by filling out a 21-question survey regarding height, weight, gender, chronic disease information, ergogenic substance use, and the short form of the International Physical Activity Questionnaire-short form (IPAQ-SF) (Table 1). The answer options were added to the original IPAQ questionnaire, in order to make the score calculations easily. The data in the study was obtained from 196 participants since the data of the remaining 22 participants were found inadequate. The participants' body mass index (BMI) was calculated.

Participants who stated that they use ergogenic substances at least once were asked to answer questions about the type of substances they use, the reasons for their usage, the source of the information they received about ergogenic substances, the presence of side effects, whether they affected their sports performance, and how they obtained the substances. The results were evaluated overall with the total responses given by participants who stated that they weekly used ergogenic substances.

In addition to this questionnaire, IPAQ-SF was applied to the participants in order to determine their physical activity levels. The metabolic equivalent of task (MET) scores were calculated based on the answers given by the participants (7).

The standardized use of IPAQ is to determine the levels of exercise and sedentariness of an individual. IPAQ was developed to determine the physical activity levels of participants between the ages of 15 to 65, and the validity and reliability study of IPAQ in Turkey has already been carried out (7, 8). IPAQ has two forms of administration, long and short forms. The short form includes 7 questions about time spent sitting, walking, doing moderate and vigorous physical activities, while the long form of the questionnaire has 27 questions and categorizes activities into different aspects such as occupational, household, leisure, transport, etc. (8). In our study, the short form of the questionnaire was used for easier application.

The MET score is an indicator of physical activity based on how long a person exercises per day, how many days per week, and the type of physical exercise (7, 8). The exercises are divided into three groups according to IPAQ: vigorous (e.g., weightlifting, aerobic exercise), moderate (e.g., tennis, speed cycling at normal speed, swimming), and low intensity (e.g., walking) (7, 8). There are MET coefficients for each category. The coefficient of vigorous-intensity activity was determined as 8 MET, the coefficient of moderate-intensity activity was determined as 4 MET, and the coefficient of low-intensity activity was determined as 3.3 MET (7, 8).

Participants were divided into 3 groups according to their MET scores. Participants with a MET score below 600 were considered physically inactive, those with a score between 600-3000 were considered minimally active, and those with a MET score above 3000 were considered physically active. The exercise times of the participants were taken at intervals (for example, 30-60 minutes), and the maximum and minimum MET scores of

Table 1: IPAQ-short form questions and options.

Questions	Options
1A. During the last 7 days, how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?	None, 1 day, 2 days, 3 days, 4 days and more
1B. How much time did you usually spend doing vigorous physical activities on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
2A. During the last 7 days, how many days did you do moderate physical activities like carrying light loads, cycling at a regular pace, or doubles tennis? (Do not include walking.)	None, 1 day, 2 days, 3 days, 4 days and more
2B. How much time did you usually spend doing moderate physical activities on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
3A. During the last 7 days, how many days did you walk for at least 10 minutes at a time?	None, 1 day, 2 days, 3 days, 4 days and more
3B. How much time did you usually spend walking on one of those days?	Do not know/Not sure, 30-60 minutes, 60-90 minutes, 90-120 minutes, 120-150 minutes, 150 minutes and more
4. During the last 7 days, how much time did you spend sitting on a weekday?	Do not know/Not sure, 3-4 hours, 4-5 hours, 5-6 hours, 6-7 hours, 7-8 hours, 8 hours and more

IPAQ: International Physical Activity Questionnaire

the individuals were calculated according to the responses given to calculate the MET score.

Statistical Analysis

Minimum MET scores were used in the statistical analysis of the study with the aim of being more inclusive (7, 8). IBM SPSS version 28.0.1 was used for statistical analysis. The conformity of the quantitative data to the normal distribution was examined via IBM SPSS using the Shapiro-Wilk test. The mean BMI, standard deviation, 95% confidence interval, and median (minimum-maximum) values were calculated. The Mann-Whitney U test was used to compare the total MET score between the groups of ergogenic substance use. The Pearson's chi-squared and Fisher's exact tests were used to compare students' ergogenic substance use status according to physical activity categories. The value of $p<0.05$ was accepted as the cut-off value of statistical significance.

RESULTS

Gender distribution of 196 participants included in this study was found to be 76 and 120, for men and women, respectively. One hundred ninety one (97.4%) of the participants were between the ages of 18-24, while 5 (2.6%) were aged 25 years or above. The average BMI of the students participating in the study was 22.4±3.4 kg/m^2. The 95% confidence interval was found to be between 21.9 and 22.9 kg/m^2. The minimum BMI value was 16.8 kg/m^2 and the maximum BMI value was 32.4 kg/m^2. The BMI of the participants were classified according to the Obesity Diagnosis and Treatment 2019 Guidelines of the Turkish Endocrinology and Metabolism Society (9). Twenty one participants were in the underweight (BMI: <18.5 kg/cm^2) group, 131 participants were in the normal (BMI: 18.5-24.9 kg/cm^2) group and 41 participants were in the overweight (BMI: 25-29.9 kg/cm^2) group, 3 participants were in the slightly obese (BMI: 30-34.9 kg/cm^2) group. There were no participants with BMI above 35 kg/cm^2.

The number of participants who regularly use ergogenic substances was found to be 21 (10.7%). Nine (4.6%) participants stated that they used ergogenic substances at some point in their lives, but they do not use them regularly. It was determined that ergogenic substances are mostly used by the participants to increase their body muscle mass rapidly (Figure 1). There was a total of 175 participants who stated that they did not use ergogenic substances, of which 140 participants stated that they did not feel the need to use ergogenic substances. Thirty of the participants said that they found ergogenic substances to be unhealthy, and 2 of the participants said that they had read harmful information regarding these substances. Three participants who do not use ergogenic substances did not answer this question.

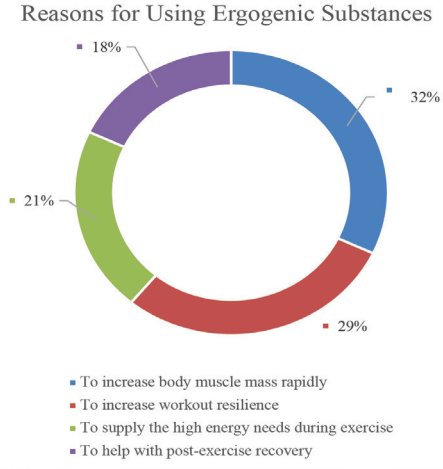

Figure 1: Reasons for taking ergogenic substances.

The distribution of ergogenic substance preferences is shown in Figure 2. There are participants who used different ergogenics at the same time. Our study determined that the 21 participants who used ergogenic substances regularly mainly preferred protein powder 11 (26%) and vitamins 11 (26%). Ten (45.5%) of our participants obtained ergogenic substances via the internet and 7 (31.8%) from pharmacies. It was also stated that ergogenic substances were supplied from supermarkets, sports facilities, or sports stores. Seventeen (81%) of the participants stated that they decided to use ergogenic substances by their preferences, and 4 (19%) stated that they started with the recommendation of a medically licensed professional.

When the sources of information participants received about ergogenic substances were questioned, it was found that among 21 participants who regularly use ergogenic substances, 12 (57.1%) received information through the internet, radio, television, or social media, 3 (14.3%) from a medical doctor, and 3 (14.3%) from a dietitian. In addition, 1 (4.8%) participant received information from a friend and 1 (4.8%) from articles while 1 (4.8%) did not receive any information.

The effects of ergogenic substances on exercise performance were questioned. Eighteen (85.7%) of the participants who used ergogenic substances stated that they had a significant positive or negative effect, and 3 (14.3%) stated that they were undecided. Eighteen (85.7%) of the 21 participants who used ergogenic substances stated that ergogenic substances had

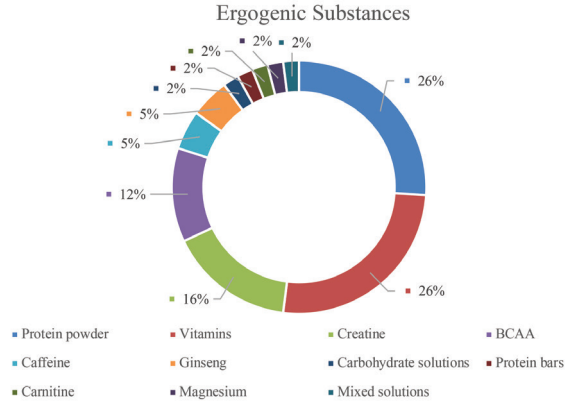

Figure 2: Preference of ergogenic substances among the participants.
BCCA: Branched-chain amino acids

a significant effect on their sports performance and a positive effect on their exercise performance.

In our study, out of the 21 participants who used ergogenic substances regularly, 8 (38.1%) participants stated that they did not cease the use of ergogenic substances, 6 (28.6%) participants stated that they stopped using them and this negatively affected their sports performance, 4 (19%) participants stated that they suspended the use, but their sports performance was not affected, 3 (14.3%) participants did not answer the question.

The presence of side effects of ergogenic substances was questioned among 21 participants who used them regularly, 16 (76.2%) stated that they did not observe any side effects, and 2 (9.5%) stated that they experienced side effects such as nausea, vomiting, and sleep problems, 3 (14.3%) of them did not answer the question.

According to their MET scores, 32 (16.3%) of the participants were in the physically inactive group, 134 (68.4%) were in the minimally physically active group, and 30 (15.3%) were in the physically active group. The mean MET score of all participants was determined as 1765.6.

The participants in the study were divided into two groups as those who used ergogenic substances and those who did not, and their physical activity levels were compared with the average MET score. The result of our study showed that the mean MET score of ergogenic substance users was found to be significantly higher than the mean score of non-users, as can be seen in Table 2 (p=0.004).

Physical activity categories were compared in accordance with ergogenic substance usage. It was found that there was a statistically significant difference in ergogenic substance use between the inactive, minimally active, and physically active groups (p=0.003) (Table 3). The data showed that ergogenic substance use was significantly higher in the physically active group than in the minimally active and inactive groups (p=0.029 and p=0.002, respectively). Although the use of ergogenic substances was higher in the minimally active group than in the inactive group, there was no statistically significant difference between the two groups (p=0.075).

DISCUSSION

Students at Trakya University School of Medicine and Health Sciences were evaluated regarding their physical activeness and ergogenic substance usage characteristics. According to the data in our study, it was observed that there was a significant relationship between the level of physical activity and the use of ergogenic substances.

Physical activity is defined as at least 150 minutes of moderate aerobic physical activity or at least 75 minutes of vigorous aerobic physical activity per week for individuals aged 18-64 years (10). Physical activity is protective against many diseases that increase the risk of mortality and morbidity (10). In terms of obesity assessment, the average BMI values of the participants were in the normal range. Considering that these students will work as healthcare professionals, this is a promising result. However, when the MET scores of the participants were calculated, it was determined that only 15.3% of the participants were physically active. This may be due to the fact that the survey was conducted during the COVID-19 pandemic and the participants were affected by the quarantine conditions between September 2020 - October 2020. It would be appropriate to expect a tendency toward a sedentary lifestyle in university students under quarantine conditions (11).

Some of the ergogenic substances, which are known to have hypertrophic effects on the muscles that delay fatigue mechanisms by acting directly on muscle fibers and therefore increase sports performance, are gaining popularity (12). This increase in popularity is not only seen among elite athletes and students studying in sports departments but also among amateur athletes and the general public (12). Therefore, studies investigating the use and effects of ergogenic substances on the general public and amateur athletes are essential.

In accordance with the aims of this study, the physical activity levels of the participants using ergogenic substances, calculated according to their MET scores, were found to be significantly higher than those who did not use ergogenic substances. The fact that the use of ergogenic substances is more preferred in the physically active group may indicate that the need for nutritional support increases as physical activity increases. This

Table 2: Comparison of MET total scores between groups formed according to ergogenic substance use.

Ergogenic substance use	N	Mean*	Median	Minimum	Maximum
User	21	2593±1486	2316	636	5592
Non-user	175	1666±1232	1356	0	9180

MET: Metabolic equivalent of task, *p=0.004

Table 3: Comparison of students' ergogenic substance use according to the physical activity categories.

Ergogenic substance use*	Physical activity categories			
	Physically inactive participants n (%)	Minimal active participants n (%)	Physically active participants n (%)	Total (n)
Users	0 (0.0)	13 (9.7)	8 (26.7)	21
Non-users	32 (100)	121 (90.3)	22 (73.3)	175
Total	32 (100)	134 (100)	30 (100)	196

*p=0.003

suggests that ergogenic substances are used for their intended use. However, it has been shown that ergogenic substances, which can be obtained without a prescription from easily accessible points such as the internet, pharmacies, grocery stores, or sports stores, may contain anabolic steroids, even if they are not specified on the label. This situation leads to the inadvertent anabolic steroid intake while using ergogenic substances. For this reason, athletes may be exposed to the undesirable effects of these substances such as addiction, hypertension, left ventricular hypertrophy, acute renal failure, impotence, decreased high-density lipoprotein cholesterol, etc. (13). Likewise, health sciences and medical students who are physically active may also be exposed to these effects. Therefore, it is important to examine the contents of ergogenic substances in detail before placing them on the market and to ensure that they are specified on their labels (14).

According to the findings of this study, it was determined that the most preferred ergogenic substances among the students studying at the School of Medicine and Health Sciences of Trakya University are vitamins and protein powders. In the results of similar studies, it has been shown that vitamins or protein powders were preferred most frequently (3, 15, 16).

Among the 21 participants who claimed to use ergogenic substances regularly, 18 of them stated that the substances had a significant positive effect on their exercise performance. The findings obtained in our study show a higher percentage of positive impressions than in previous similar studies (1, 16). Ergogenic substances may have positive biochemical or psychological effects on users, but these surprisingly high positive impressions perceived by the participants may stem from the placebo effect.

The increasing use and popularity of these substances may lead to misuse considering that they can be bought without medical supervision and prescription. The fact that the participants using ergogenic substances in this study mostly started to use them by their own decision differs from the data of similar studies that show that they often started with the recommendation of a sports trainer (1). The reason for this may be due to the fact that similar surveys are mostly applied to individuals who receive sports and athletics training under the guidance of a trainer, such as elite athletes or students at the schools of physical education and sports (1, 16). The scarcity of similar studies applied to students studying health-related majors has made it important to carry out studies focusing specifically on this group.

A limitation of the study could be that, as previously stated, the survey was conducted during the COVID-19 pandemic and the participants were affected by the quarantine conditions between September 2020 - October 2020. It would be appropriate to expect a tendency toward a sedentary lifestyle in university students under quarantine conditions.

CONCLUSION

In conclusion, it was determined that health sciences and medical students using ergogenic substances were more physically active. The fact that the participants often start to use ergogenic substances without professional advice shows that the relevant population should be more conscious about these nutritional supplements. The usage of protein powders and vitamins was found to be most prevalent than the other substances in the group, and new studies are yet to be conducted to determine their long-term benefits and harmful effects on health. In addition, increasing the level of awareness of the people who will work in the field of health sciences is also valuable in order to correctly guide society on the usage of these substances.

Ethics Committee Approval: This study was approved by the Scientific Research Ethics Committee of Trakya University School of Medicine (Protocol Code: TÜTF-BAEK 2020/187, date: 29.06.2020).

Informed Consent: Informed consent was obtained from all the subjects.

Conflict of Interest: The authors declared no conflict of interest.

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