Apuntes Universitarios

TYPE: Article
PUBLISHED: 28 September 2023
DOI: https://doi.org/10.17162/au.v13i4.1493

Predictores del Nivel de Actividad Física, Fatiga Física y Mental Autoinformada en Estudiantes de Ciencias del Deporte

Predictors of Physical Activity Level, Self-Reported Physical and Mental Fatigue in Sports Science Students

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RECEIVED 21 May 2023
ACCEPTED 01 Sept 2023
PUBLISHED 28 Sept 2023

CITATION
Akpınar, Ö., Güler, M., & Yanar, N. (2023). Predictors of Physical Activity Level, Self-Reported Physical and Mental Fatigue in Sports Science Students. *Apt. Univ.*, 13(4), https://doi.org/10.17162/au.v13i4.1493.
ISSN. 2304-0335
doi: https://doi.org/10.17162/au.v13i4.1493

Resumen

El objetivo de este estudio fue revelar la posibilidad de que los niveles de actividad física de los estudiantes universitarios predigan los niveles de fatiga autoinformados. Participaron voluntariamente en la investigación un total de 331 estudiantes (mujeres: 130, hombres: 201) de la Facultad de Ciencias del Deporte de la Universidad Karamanoğlu Mehmetbey ; y se utilizaron el Cuestionario de información personal, el Cuestionario Internacional de Actividad Física y la Escala de Fatiga de Chalder. Los datos recogidos en el estudio se analizaron en el programa estadístico Jamovi (2.0.0) con intervalo de confianza del 95% y nivel de significancia de 0,05. Para analizar los datos se utilizó la prueba t de muestra independiente, la prueba de correlación de Pearson, la prueba de regresión multinomial y el diagrama de dispersión. Las mujeres tuvieron puntuaciones de fatiga total y fatiga física significativamente más altas que los hombres, mientras que los hombres tuvieron puntuaciones totales de MET significativamente más altas que las mujeres ($p<0,05$). A medida que aumentaron las puntuaciones totales de MET de los participantes, su fatiga total y fatiga mental disminuyeron significativamente ($p<0,05$). La investigación demostró que el aumento de los niveles de actividad física de los estudiantes de ciencias del deporte puede disminuir los puntajes de fatiga física y mental autoinformados.

Palabras Clave

actividad física, estudiantes universitarios, fatiga física, fatiga mental.

Abstract

In this study, it was aimed to reveal the possibility that physical activity levels of university students predict self-reported fatigue levels. A total of 331 students (female: 130, male: 201) from the Faculty of Sports Sciences of Karamanoğlu Mehmetbey University participated in the research voluntarily; and were used Personal information questionnaire, International Physical Activity Questionnaire and Chalder Fatigue Scale. The data collected in the study were analyzed in Jamovi (2.0.0) statistical program with 95% confidence interval and 0.05 significance level. Independent sample t test, Pearson's correlation test, multinomial regression test and scatter diagram were used to analyze the data. Results: Females had significantly higher total fatigue and physical fatigue scores than males, while males had significantly higher total MET scores than females ($p<0.05$). As the total MET scores of the participants increased, their total fatigue and mental fatigue decreased significantly ($p<0.05$). The research showed increasing physical activity levels of sport sciences students may decrease self-reported physical and mental fatigue scores.

DOI: https://doi.org/10.17162/au.v13i4.1493

Keywords

mental fatigue, physical activity, physical fatigue, university students.

1 Introduction

Physical activity, which has a great importance in evaluating the individual as healthy in all aspects, is a way that has positive effects not only physically but also mentally, socially, and emotionally. While the World Health Organization (WHO) defines diseases caused by physical inactivity as a risk factor in the 4th place among the causes of death (WHO, 2020), the fact that physical inactivity is gradually increasing today is a separate handicap. In addition to achieving ideal body composition, cardiorespiratory fitness, muscular endurance and strong bones, mental and social health can also be gained through physical activity (Kapoor et al., 2022). Physical activity provides protection from chronic diseases as well as recovery of lost health (Barr et al., 2018). The effects of physical inactivity on human physiology are not only physical; a sedentary lifestyle also leads to negative mental health (Vancampfort et al., 2020). Studies (Mcmahon et al., 2017; Chekroud et al., 2018; Stubbs et al., 2018) suggest that adopting an active lifestyle positively supports not only physical health but also mental health.

The American College of Sports Medicine (ACSM) recommends that adults should engage in at least 150 minutes of physical activity per week of 3-6 metabolic equivalents (MET) (Haskell et al., 2007). Although a recent study showed a positive association between university students' physical activity level and their mental health (Rodríguez-Romo et al., 2022), some studies suggest that university students are less active than other adults (Chacón-Cuberos et al., 2019). This result is interesting in that young people are expected to be more physically active, which raises the question of what are the reasons that prevent physical activity. Among the barriers to physical activity, there are many reasons arising from the person and the environment, and fatigue is one of the reasons among the internal barriers (Koh et al., 2022).

According to the results of a community-based 4-year longitudinal study, fatigue ranked 3rd among the barriers to physical activity mentioned by participants (Richards & Woodcox, 2021). Fatigue is defined as 'a complex phenomenon involving both physiological and psychological mechanisms' (Tornero-Aguilera et al., 2022). It is known to cause changes in the brain, central and peripheral system at the cellular and molecular level during and after physical movement (Di Liegro et al., 2019). Movements involving full body movements cause not only physical but also mental fatigue (Weavil & Amann, 2019).

Fatigue is objectively expressed as a decrease in performance or fatigue perceived by the person himself, which is defined as a sensory disorder (Enoka & Duchateau, 2016). At this point, the fatigue of athletes and individuals engaged in physical activity may be different from each other. The studies conducted have shown that mental fatigue affects muscle endurance in sports performance (Alix-Fages et al., 2023), the efficiency of training (Staiano et al., 2023) and the revealed power (Alix-Fages et al., 2022) reported that it had a negative effect. For athletes, training or competition is also a cognitive and physical task, but physical activity can be said to be based more on volunteering. In this context, it can be said that the perceived fatigue caused by physical activity depends on the psychophysiological state of the person (Enoka & Duchateau, 2016). At the point of better understanding of perceived fatigue; Venhorst et al.'s 3 dimensions (1: perceptual discriminatory-2: emotional-motivational-3: tempo behavior) can help in understanding motor fatigue (Venhorst et al., 2018). The physical and mental fatigue that is felt after any physical activity can affect the likelihood of repeating physical activity in the future. When the literature was examined, no study was found that predicted the physical activity levels, physical and mental fatigue of sport sciences faculty students. In addition, it has been found that the number of studies investigating the relationship between physical activity and mental and physical fatigue in the field is quite low. In this context, it was aimed to reveal the possibility of predicting the self-reported physical and mental fatigue levels of the physical activity levels of sport sciences faculty students who are expected to have high physical activity levels.

DOI: https://doi.org/10.17162/au.v13i4.1493

2 Methodology

2.1 Research Model

The 'Relational Scanning Model' was used in the research. Relational scanning model is used for the purpose of "understanding the change of variables, if any, with each other and how this change happens" (Karasar, 2011).

2.2 Research Group

In this research, 130 woman (39.27%) and 201 men (60.73%) studying at the Faculty of Sports Sciences of Karamanoğlu Mehmetbey University participated voluntarily. The mean age of the participants (females: 21.02±2.37, males: 21.76±4.28) and the mean of body mass index (BMI) (females: 20.86±2.35, males: 22.87±2.62) were found.

Table 1. Demographic information of the participants.

	Group	N	%
BMI Classification	Under weight	24	7.3
	Normal weight	249	75.3
	Over weight	58	17.5
Type of education	Regular education	203	61.3
	Evening education	128	38.7
Smoking	Yes	135	40.8
	No	196	59.2
Alcohol consumption	Yes	76	23.0
	No	255	77.0

BMI, Body mass index.

When Table 1 was examined, it was seen that although the participants were in the thin, normal and overweight class, there were no students in the obese class. It can be thought that the reason for this is because the participants are students of the Faculty of Sports Sciences. Regular education means; education from 8 am to 5 pm, while secondary education means; education that starts at 5 pm and continues until 11 pm.

2.3 Data Collection Tools

Personal information questionnaire, International Physical Activity Questionnaire Short Form (IPAQ-SF) and Chalder Fatigue Scale were used in the research. The data in the research were obtained by the 'Google form' method in a cross-sectional period of time in December 2022. Only students who volunteered and received education in sports sciences were included in the study, at this point they were asked whether they voluntarily participated in the study via the google form. The data indicating voluntary disagreement were not taken into consideration (n:2).

Personal Information Form

There are questions about the participants' gender, age, height, weight, class, department, smoking and alcohol use in the questionnaire determined by the researcher.

Body Mass Index

The body mass index of the participants was calculated using the formula (BMI= weight (kg)/height^2(m^2)) of the self-reported height and weight values. According to the WHO; persons with BMI < 18.5 kg/m^2 are considered underweight, those with 18.5 ≤ BMI < 25 kg/ m^2 are considered normal, those with 25 kg/ m^2 ≤ BMI >30 kg/ m^2 are overweight, and those with 30 kg/ m^2 ≤ BMI are considered obese.

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International Physical Activity Questionnaire Short Form (IPAQ-SF)

The physical activity levels of the participants were calculated with the IPAQ-SF. It was designed in two different ways (short and long) to define the physical activity levels of adults and their sedentary lifestyle. The short form consists of seven questions; provides information on time spent walking, moderate-to-vigorous and vigorous activities. As a result of these calculations, the "Metabolic Equivalent (MET)-minute" score is reached. A MET-minute is defined by multiplying the minute of activity by the MET score. In the IPAQ, heavy physical activity: 8.0 METs, moderate physical activity: 4.0 MET, walking: 3.3 MET (Sağlam et al., 2010). The Turkish validity and reliability research of the scale was made in 2005 (Öztürk, 2005).

Chalder Fatigue Scale

The scale was developed by Trundie Chalder in 1993 conducted the Turkish validity and reliability study (Adın, 2019). The aim of the scale is to reveal the fatigue which was felt in the last 1 month through self-report. The scale consists of 11 items and two sub-dimensions; consists of physical fatigue (7 items) and mental fatigue (4 items). In this study; bi-modal scoring system (0-0-1-1) was used. High scores mean that the severity of fatigue is high (Cella & Chalder, 2010).

2.4 Analysis of Data

All data in the research were analyzed with the Jamovi (2.0.0) statistical program at 95% confidence interval and 0.05 significance level. Whether the data had a normal distribution or not was used by the 'Kolmogorov Smirnov' test and the data were normal distribution. In the descriptive statistics of the data, mean ($\bar{x}$), standard deviation (sd) and percentage (%) were used. The 'independent samples t test', 'pearson's correlation test', 'multinomial logistic regression test' test and 'scatter diagram' were used in the analysis of the data.

2.5 Ethical Aspect of Research

Ethic committee judgment was obtained for this research from the "Karamanoğlu Mehmetbey University Social and Human Sciences Scientific Research and Publication Ethics Committee" (Date: 29.11.2022, Decision number: 254-258). During the research process, we acted in accordance with the ethical rules of human research of the Helsinki Declaration.

3 Results

The Table 2 is examined that, the mean total MET males among the participants is higher than that of females ($t=3.45$, $p<0.001$). Total fatigue mean of female was higher than male ($t=0.37$, $p<0.1$). The mean physical fatigue of female was higher than male ($t=3.91$, $p<0.001$). There is no significant difference in mental fatigue scores according to gender.

Table 2. T test results according to gender of the participants.

	Gender	N	Mean	Sd	t	Cohen's d	p
Total MET	Female	130	2750.3	2314.8	3.45	0.39	0.000***
	Male	201	3740.6	2689.1			
Total fatigue	Female	130	3.78	3.09	3.29	0.37	0.001**
	Male	201	2.65	3.04			
Physical fatigue	Female	130	2.82	2.24	3.91	0.44	0.000***
	Male	201	1.85	2.20			
Mental fatigue	Female	130	0.96	1.28	1.16	0.13	0.25
	Male	201	0.81	1.12			

**p<0,01; ***p<0,001; MET; Metabolic equivalent; sd, Standart deviation.

The Table 3 is examined that the total MET scores of the participants increase, their total fatigue ($r=-0.11$) and mental fatigue ($r=-0.11$) decrease ($p<0.05$). There was no correlation between the physical fatigue and total MET scores of the participants ($p>0.05$).

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Table 3. Pearson's correlation test results of the participants.

		Total fatigue	Physical fatigue	Mental fatigue
Total MET	R	-0.11	-0.01	-0.11
	P	0.04*	0.08	0.04*

*p<0,05; MET; Metabolic equivalent.

The Figure 1 shows that as total MET scores increase, physical fatigue and mental fatigue scores decrease.

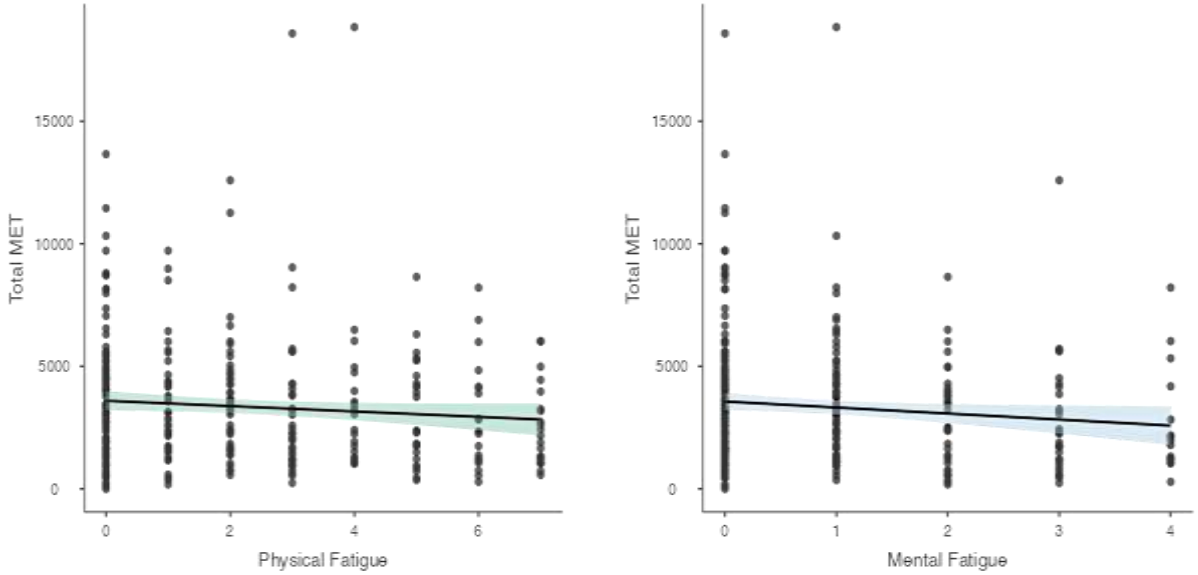

Figure 1. The relationship between participants' total MET scores and fatigue scores.

MET, Metabolic equivalent.

Table 4 shows that the model between MET classification and total, physical and mental fatigue scores is statistically significant (R2=0.72, p<0.001). When the independent variables were examined, it was found that low MET may increase the likelihood of a decreased in total fatigue scores compared to high MET by 1.1 times (p<0.001), 1.9 times (p<0.001) in mental fatigue scores and 0.03 times (p<0.001) in physical fatigue scores compared to high MET. It was found that low MET may increase the likelihood of decreased total fatigue scores by 1.1 times (p<0.01), mental fatigue scores by 2.0 times (p<0.001) and physical fatigue scores by 0.03 times (p<0.001) compared to high MET.

Table 4. Results of Multinomial logistic regression analysis of participants.

Group	Predictor	Estimate	S.E.	Z	C.R.	O.R.	p
Low MET-High MET	İntercept	-65.2996	0.4	-187.91	2.21-8.64	4.4	<0.001***
	Total fatigue	0.10362	0.0	18.62	1.10-1.21	1.1	<0.001***
	Mental fatigue	0.66016	0.1	11.56	1.73-2.16	1.9	<0.001***
	Physical fatigue	-3.39774	0.1	-32.90	0.03-0.04	0.03	<0.001***
Medium MET-Low MET	İntercept	-61.45190	0.4	-176.83	1.04-4.05	2.1	<0.001***
	Total fatigue	0.10105	0.0	18.10	1.09-1.12	1.1	<0.001***
	Mental fatigue	0.70419	0.1	12.22	1.81-2.26	2.0	<0.001***
	Physical fatigue	-3.37267	0.1	-32.67	0.03-0.04	0.03	<0.001***

Model, N:331; R2=0.72 (Negelkerkes); Model=x2(6)=319.39; AIC: 471.95; p<0.001.
***p<0.001; SE, Standart Error; CR, Confidence Range; OR, Odds Ratio; MET, Metabolic equivalent.

DOI: https://doi.org/10.17162/au.v13i4.1493

4 Discussion

In this study, it was aimed to reveal the possibility that physical activity levels of sport sciences faculty students who are involved in sports predict self-reported physical and mental fatigue scores. Our results confirmed the possibility that students' physical activity level may predict self-reported fatigue scores.

Female participants in this study had significantly higher total and physical fatigue scores than male participants. In addition, the total MET scores of male participants were significantly higher than those of female participants. Barriers to women's physical activity due to the pressure on women's physical appearance, perceptions of safety and responsibilities outside of work are included in gender issues (Yurtçiçek, 2014). The fact that the female participants in this study were university students and had sports courses may suggest that they had similar physical activity levels with males. However, as in this study, previous studies have concluded that male students studying at the faculty of sport sciences have higher MET levels compared to female students (Güler et al., 2021; Güler & Yanar, 2022). Because there is no data on physical activity barriers due to gender differences in this study, there is no clear inference that can be made about the possible causes. In addition to this result, due to physiological and anatomical differences, the fatigue felt in the same physical activity may be different in males and females (Tornero-Aguilera et al., 2022). It is a predictable result that female's self-reported perception of fatigue is higher than male's (LaSorda et al., 2020). However, the fact that female are not included in experimental studies as much as male in the literature due to their physiological characteristics (Habay et al., 2023) is not sufficient to support the certainty of this finding.

As the total MET scores of the participants in the study increased, their total fatigue and mental fatigue decreased significantly. It is known that people's perceptions of fatigue may be related to feelings of lack of energy, exhaustion, desire for rest and fatigue (Tanaka et al., 2014). It has also been stated that the causes of fatigue in individuals may be related to digestive and sleep problems and mental health (Baek et al., 2020). In this context, it can be said that it would not be useful to evaluate the concept of fatigue only physically or only mentally. However, it is expected to experience acute physical and mental fatigue immediately after a physical activity (Bestwick-Stevenson et al., 2022). However, according to the results of a review, the small number of studies supporting the relationship between physical inactivity and fatigue prevents a clear interpretation (Saunders et al., 2020). In addition, since the data collection scale used to reveal fatigue in this study measured fatigue in the last 1 month, it may be thought that this is the reason for the low levels of physical and mental fatigue.

The last and most important finding of the study was that an increase in participants' MET levels significantly predicted the likelihood of a decrease in participants' total, physical and mental fatigue scores. If perceived fatigue is not high, the next physical activity will be perceived negatively (Greenhouse-Tucknott et al., 2022). In contrast, individual exercise programs are recommended for the treatment of fatigue (Van Herck et al., 2023). According to the results of a study conducted in sedentary individuals, it was found that sitting for more than 8 hours a day may have negative effects on mental energy and mental fatigue (Boolani et al., 2021). In an experimental study, individuals with mental fatigue were given a cognitive task again after physical activity. While the mental fatigue of the control group gradually worsened during the given task, the subjective mental fatigue of the physical activity group remained stable (Jacquet et al., 2021). Although the acute effect of physical activity may cause fatigue, it may actually contribute to a reduction in physical and mental fatigue by increasing the person's fitness in the long term. In an experimental study, it was reported that exercise therapy applied to individuals with chronic fatigue syndrome had positive effects (Larun et al., 2019). Again, in a study conducted in adults in 2019, it was observed that as the total MET levels of individuals increased, their general fatigue scores decreased (Yıldız, 2019). These results support the conclusion of the study.

Limitations of the research

The first limitation of the study is that the physical activity and fatigue levels of the research group were determined through a questionnaire. Although the questionnaires used have international validity and reliability, the survey data collected are based on the personal statements of the respondents. Another limitation of the study is that personal or environmental causes that may be related to the participants' physical and mental fatigue are not known. In this context, questions that will reveal the causes of fatigue

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can be included in future studies. The research was conducted in a specific population in this context, the research results cannot be generalized to other groups.

5 Conclusion

As a result, it can be argued that increasing the physical activity levels of students in the faculty of sport sciences may reduce self-reported physical and mental fatigue scores. In this context, increasing the level of physical activity can contribute to a decrease in self-reported physical and mental fatigue by making sport sciences university more fit. In future studies, the level of physical and mental fatigue can be measured with different objective measurement tools in which physiological parameters are included. The study can also be performed in different populations, different ai groups, athletes and individuals with disabilities. Randomized controlled experimental studies are needed to make definitive judgments in this area.

Practical Implications

In this study, interesting results were obtained as a result of the measurement of physical activity level and self-reported fatigue with the help of a questionnaire. The fact that these detected results were taken over a cross-sectional period of time means that the research group has current results. It is important to conduct chronic and controlled studies in order to draw firm conclusions. It also brings to mind the conclusion that mental and physical fatigue are felt less when the participants in this study do physical activity voluntarily. In order to confirm this prediction, there is a need for future studies to be conducted in this area.

6 Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

7 Author Contributions

Conceptualization, Ö.A. and M.G.; methodology, Ö.A. and M.G.; software, M.G.; validation, Ö.A.; formal analysis, M.G.; investigation, N.Y. and Ö.A. and M.G.; resources, M.G.; data curation, M.G.; writing—original draft preparation, Ö.A. and M.G. and N.Y.; writing—review and editing, Ö.A. and M.G. and N.Y.; visualization, Ö.A.; supervision, Ö.A. and M.G.; project administration, Ö.A.; funding acquisition, Ö.A. and M.G. and N.Y.; All authors have read and agreed to the published version of the manuscript.

8 Funding

There is no funding support in the publication.

9 Acknowledgements

Thanks to all the volunteer participants who participated in the research.

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