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# Fit or nothing! University students' exercise addiction, eating disorders and mediator effect of sports supplement use

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**ABSTRACT**

Researches have revealed that most of the university age male individuals are not satisfied with their body image and prefer a more muscular body. This has revealed the accepted phenomena in mental illness classifications such as exercise dependence and eating disorder. In line with this information, the main purpose of the research is to examine the mediating effect of the use of sports supplements on the relationship between exercise addiction and eating disorder. 372 male university students participated in the research. Validity and reliability analyze were applied to the obtained data within the scope of the measurement model. The steps expressed by Baron and Kenny (1986) were followed in order to determine the mediation effect. As a result of the analysis, it has been empirically proved that the use of sports supplements mediates the relationship between exercise addiction and eating disorder. The results of the research have contributed significantly to the ongoing discussions as one of the leading researches in the literature. In addition, it provided clues to the researchers and practitioners who obtained the results in the detection and treatment of such important mental disorders.

**Keywords:** Exercise addiction, sports supplement use, eating disorder.

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## INTRODUCTION

Defining the concept of addiction from past to present is quite complicated. The addiction behaviors, which are primarily limited to drugs and alcohol, have extended to the phenomenon of exercise in the present period. Adams et al. (2009) stated that addictions such as internet and gambling, which occur within the scope of chemicals, are similar phenomena with exercise addiction. Regarding the issue, Griffiths and Jones (2002) stated that, as with some other behavior, there may be potentially serious negative consequences for exercise. While the general prediction in the literature reveals the psychological and physical benefits of exercise, Szabo and Griffiths (2007) mentioned that doing unlimited exercise is an addiction and that individuals in this situation do not regard it as an addiction (Yates, 1991). Glasser (1976) used the term positive addiction based on the beneficial aspects of exercise, unlike addictions such as drugs and alcohol.

Sachs and Buffone (1984) has been examined exercise addiction in two categories including who exercise with the dependency and who are committed to exercise as a result of intellectual analysis including social relationships gained from exercise, health benefits, status, prestige or monetary benefits and intellectual benefits. People who exercise for external factors do not think it as an important but indispensable part of their life. On the other hand, for exercise addicted one's exercise constitutes a very important part of their lives. Especially when such individuals stay away from exercise, they may show disturbing withdrawal symptoms in addiction situations (Sachs and Buffone, 1984). Regarding the subject, Szabo (1995) stated that the best way to distinguish these two types of exercising individuals from each other is to examine the relations of individuals with different structures for their actions and motives for exercise. Szabo (1995) evaluated exercise dependence in two main categories as normal and at risk. Veale (1987) stated that primary level normal exercise addiction is very

common. People who are especially at risk can be expressed as those who continue to exercise at all risks, physically, financially and medically. However, most people who are addicted to exercise can function adequately in their daily lives by adjusting their lifestyle to their exercise habits, and therefore it is not easily understood that they are addicted to exercise. On the subject, Terry et al. (2004) stated that there are serious differences between the two types of exercise addiction and individuals at risk should be saved from this addiction. Especially, determining the relationships between different structures on this subject will bring current perspectives to the ongoing discussions about exercise addiction behavior (Hausenblas and Downs, 2002). In the literature, psychosocial perspectives have been adopted to investigate the phenomenon of exercise addiction and have been examined in relation to exercise addiction of structures such as compulsory personality (Davis et al., 1997), narcissism (Spano, 2001) perfectionism (Hagan and Hausenblas, 2003). In addition, the relationship between exercise addiction, which is considered risky, and eating disorder has been revealed in studies (Bamber et al., 2003; Hausenblas and Downs, 2002; Powers and Thompson, 2007).

Dietary restriction is considered a central feature in eating disorders (Brownell, 1991). Although it is accepted that media emphasis especially on the well-being of the weakness contributes to the prevalence of the diet, it can be stated that its behavioral factors contribute to these common social pressures. Exercise addiction behavior has also been found to be significantly seen in individuals with eating disorders (Davis et al., 1997).

Researches on the subject point out that eating disorders occur during the ongoing process that exercise addiction begins before diet restriction (Davis et al., 1997). Today, such behavioral disorders have become normal behaviors that are adopted as a way of reaching the body in form and highly socially accepted behaviors (Davis and Cowles, 1991). There are studies in the literature that show that male students studying in the university tend to dissatisfy their body image and work towards weight gain (Drewnowski and Yee, 1987; Rosen and Gross, 1987).

In particular, the biggest concern of male university students is gaining weight, size and strength (Gray, 1977). Particularly, the biggest concern of male university students is gaining weight, size and strength (Gray, 1977). Tucker (1982) found that almost 70% of college-age male individuals are dissatisfied with their body image and prefer the more muscular ideal. Individuals who exercise anaerobic, such as fitness to build a muscular body, use more supplements to improve the effects of exercise (Kim, 2016). The use of supplements has reached dizzying levels among individuals interested in fitness in the world (Sundgot-Borgen, 2003). This encourages young men who are concerned about their body image to use sports supplements to gain muscle.

In the light of all this information, the main purpose of the study is to investigate the mediating effect of sports supplements use on the relationship between exercise addiction and eating disorder in the context of male university students who are interested in fitness. In line with the steps expressed by Baron and Kenny (1986), four research hypotheses were created as follows.

$H_1$: There is a positive relationship between exercise addiction and eating disorder.
$H_2$: There is a positive relationship between exercise addiction and the use of sports supplements.
$H_3$: There is a positive relationship between the use of sports supplements and eating disorders.
$H_4$: Using sports supplements has a mediating effect on the relationship between exercise addiction and eating disorder.

## METHODOLOGY

### Data collection and sampling

Within the scope of the research, a total of 372 male university students who stated that they are interested in fitness were reached. The data were collected by the researchers by a questionnaire in sports science faculty of Eskişehir Technical University. Participants were given detailed information about the research and no questionnaire was distributed to those who stated that they were not interested in fitness. A total of 397 questionnaires were collected and 25 questionnaires were excluded due to incomplete and undisciplined coding. A large part of the participants reached within the scope of the research consisted of individuals between the ages of 18 to 25 (64.6%). In addition, most of the participants stated that they train at least 3 to 5 times a week. The data of the research have similar characteristics with the sample groups of the previous studies (Argan et al., 2019; Mayville et al., 2002) which provide clues about the universe representation of the research sample.

### Measuring instrument

To identify participants' eating disorder behavior, the six statements of "the Dichotomous Thinking in Eating Disorders Scale (DTEDS)" measurement tool developed by Bryne (2007) were adapted for the purposes of the research. In order to identify participants' exercise addiction behaviors statements of Terrey et al. (2004) "Exercise Addiction Inventory (EAI)" measurement instrument was used. Finally, to determine the behavior of participants about using sports supplements the sub-dimension named "using substance" of the "the Muscle Appearance Satisfaction Scale (MASS)" developed by Mayville et al. (2002) was revised and used for research purposes. All constructed structures were evaluated with

the five-point Likert scale (5-Strongly Agree; 1-Disagree with Definite Link). In addition, the second part of the questionnaire included questions to determine the demographic characteristics of the participants (age, number of weekly trainings, etc.).

### Data analysis

Skewness and Kurtosis values were determined in order to meet the normal distribution assumptions of the data collected within the scope of the research. Within the scope of the research, basic methodological principles of structural equality modeling (SEM) were used to determine the relationships between eating disorders, training addiction and sports supplement using behavior of fitness athletes. Byrne (2013) defined SEM as a very useful method that allows researchers to test the assumed relationships between all variables system simultaneously. In this context, after scanning and preparing the data to detect any irregularities within the scope of the research, a two-stage approach was adapted: (1) examining a measurement model to verify the factor structure of the assumed model using confirmatory factor analysis (CFA); and (2) testing whether it is a structural model to examine causal relationships between hidden variables (Anderson and Gerbing, 1988). In order to determine the mediation effect within the scope of the structural model, the steps expressed by Baron and Kenny (1986) were followed.

## RESULTS

### Results of normality test

Kolmogorov-Smirnov and Shapiro-Wilk tests were applied to determine whether the distribution of points in the scales was normal and it was determined that the research data did not distribute normally as a result of the analyses. Tabachnick and Fidell (2013) stated that the assumption of normality in social sciences should be made by controlling the skewness and kurtosis distortion values. George and Mallery (2010) stated that reference values are in the range of +2.0 to -2.0. In this context, the skewness and kurtosis values of the research structures were examined and found to be below the reference values (Table 1).

**Table 1.** Normality test results of the research structures.

| Factor | Kurtosis | Skewness |
|---|---|---|
| Exercise addiction | -1.35 | -1.57 |
| Eating disorder | -1.12 | -1.47 |
| Sports supplement use | 1.55 | 1.76 |

### Confirmatory factor analysis (CFA)

To determine irregularities in the raw data obtained (e.g. outliers), research data were analyzed and prepared through the SPSS program to address missing data problems and meet the assumptions underlying multivariate norms (Kline, 2005). In this context, value assignments were made for the missing values in the research data by using the series mean method via the SPSS program (Jöreskog and Sörbom, 1999).

In the application of SEM, the measurement model should be tested in its first stage. So, CFA (Confirmatory Factor Analysis) was applied through the AMOS program to reveal the factor structures of the scales used in the research and to test the consistency of the data obtained with the model (Byrne, 2013).

As a result of the analyzes on the structure of exercise addiction, eating disorder, and sports supplement use, and a total of three factor models, it was found that there was sufficient harmony between the model and the data ($X^2$: 214.62, $X^2$/df: 2.49, GFI: .93, AGFI: .90, CFI: .94, TLI: .93, IFI: .94, RMSEA: .063). (Table 2)

In addition, for the convergent validity of the measurement model, the AVE values of all structures were calculated and found to be higher than 0.5 and it was observed that the factor loads of all expressions were higher than 0.7 for discriminant validity (Nunnally and Bernstein, 1994). Cronbach alpha and CR (composited reliability) values were calculated to determine the reliability levels of factor structures (Bacon et al., 1995). It has been determined to have satisfactory levels of reliability with values between 0.74 and 0.84.

### Correlation analysis

For the external validity of the measurement tool, the relationships between all dimensions were examined and it was revealed that the correlation coefficients were not statistically significant and not over 0.85 (Table 3). These results provided empirical evidence that the model created within the scope of the research model is valid and reliable.

After creation of a valid measurement model, the causal relationships between the tree constructs (exercise addiction, sports supplement use and eating disorder) were examined within the scope of the structural model (Figure 1). The basic model developed within the scope of the research has been found to have acceptable goodness of fit values without the need for any modification. ($X^2$: 291.66, $X^2$/df: 3.35, GFI: .90, AGFI: .87, CFI: .92, TLI: .91, IFI: .92, RMSEA: .078). For the purposes of the research, the mediating effect of sports supplement use on the relationship between fitness athletes' eating disorders and exercise addictions was examined. Four conditions must be met in order to talk about the mediation effect of Baron and Kenny (1986). First, there should be a statistically significant relationship

**Table 2.** Confirmatory factor analysis results and AVE values.

| | Factor loading |
|---|---|
| **Exercise addiction (AVE: .510; α: .81; CR: .80)** | |
| Exercise is one of the most important things in my life | .629 |
| My family thinks I care too much about exercises | .805 |
| Exercise is very important to feel good | .723 |
| There is an increase in time I exercise day by day | .645 |
| I feel frustrated and sad when I miss my workouts | .679 |
| I am thinking about training all my life | .786 |
| **Eating disorder (AVE: .501; α: .85; CR: .85)** | |
| I separate food into two parts as useful or not | .735 |
| Food is like black or white for me | .632 |
| After eating I feel good or bad | .724 |
| Going off my diet is a regret for me | .737 |
| Diet is an important part of my life | .769 |
| In fitness. diet is everything | .624 |
| **Use of sports supplement (AVE: .629; α: .74; CR: .73)** | |
| I spend money for my muscles | .759 |
| I use supplements if I gain muscles | .582 |
| I use supplements that help my muscles grow | .986 |

Goodness of fit values of the measurement model ($X^2$: 214.62, $X^2$/df: 2.49, GFI: .93, AGFI: 90, CFI: .94, TLI: .93, IFI: .94, RMSEA: .063).

**Table 3.** Correlation matrix.

| | 1 | 2 | 3 |
|---|---|---|---|
| Exercise addiction | 1.000 | | |
| Eating disorder | .524** | 1.000 | |
| Sports supplement use | .303** | .299** | 1.000 |
| Mean | 3.83 | 3.44 | 2.52 |
| SD | .76 | .93 | 1.10 |

$p < 0.01$.

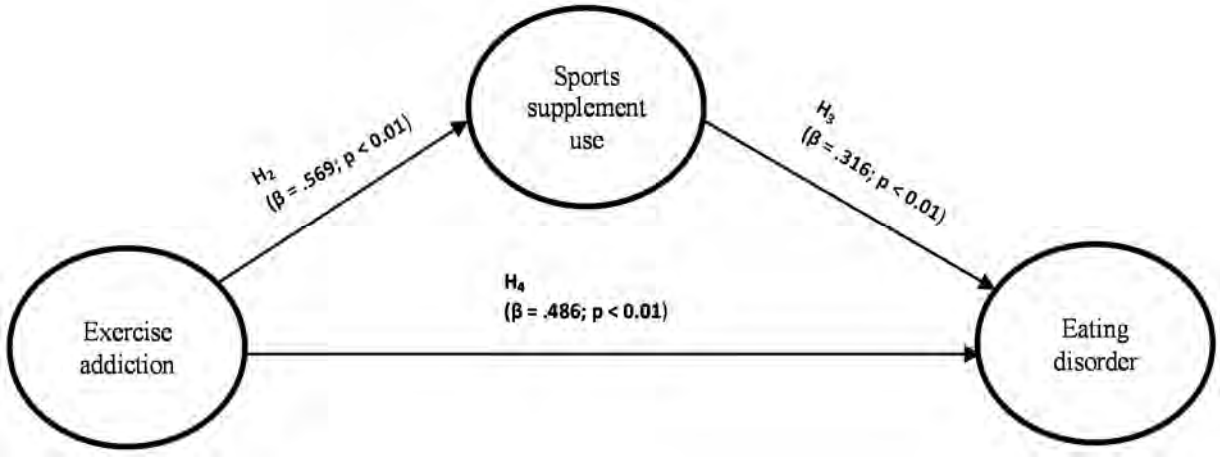


**Figure 1.** Research model.

between the dependent and the independent variable. A statistically significant relationship was found between the dependent variable (eating disorder) and the independent variable (exercise addiction) of this study (Standardized $R^2$= .725; p < 0.01). In this direction $H_1$ was accepted. The second condition, there should be a statistically significant relationship between the independent variable and the intermediary variable. In this study, a statistically significant relationship was found between the independent variable (eating disorder) and the mediator (sports supplement use) (Standardized $R^2$ = .216; p < 0.01). Accordingly, the $H_2$ was accepted. In the third step, there should be a statistically significant relationship between the mediating variable and the dependent variable (when used in conjunction with the independent variable in the model). In this study, a significant relationship was found between the mediator variable (sports supplement use) and the dependent variable (eating disorder) (Standardized $R^2$= .369; p < 0.01). So, $H_3$ was accepted. In the last step, the coefficient of the independent variable in the basic model with the dependent variable must be greater than the coefficient in the structural model. As can be seen in the basic model and intermediary model values created in Tables 4 and 5, the coefficient of the independent variable on the dependent variable decreased in the intermediary model (Standardized $R^2$ = .486; p < 0.01). As a result of the statistical analysis, all the assumptions suggested by Baron and Kenny (1986) were provided and it was revealed that the sports supplement use was partially mediated in the relationship between exercise addiction and eating disorder. Thus, $H_4$ was accepted.

**Table 4.** Model values before intermediary variable included into the analysis.

| Analysis | Std. $R^2$ | S.E. | T-value | P-value | Result |
|---|---|---|---|---|---|
| $H_1$ Eating disorder <--- Exercise addiction | .725 | .090 | 9.63 | .000 | Significant |

p < 0.01.

**Table 5.** Model values after intermediary variable included into the analysis.

| Analysis | Std. $R^2$ | S.E. | T-value | P-value | Result |
|---|---|---|---|---|---|
| $H_2$ Sports supplement use <--- Exercise addiction | .569 | .091 | 5.63 | .000 | Significant |
| $H_3$ Eating disorder <--- Sports supplement use | .316 | .034 | 2.94 | .000 | Significant |
| $H_4$ Eating disorder <--- Exercise addiction | .486 | .068 | 5.81 | .000 | Significant |

p < 0.01.

## DISCUSSION AND CONCLUSION

This study was conducted to determine the relationships between male university students' exercise addictions, eating disorders and sports supplement uses, and to determine the mediating effect of sports supplement use on the relationship between eating disorder and exercise addiction. The acceptance of the hypotheses put forward in the context of the research provided empirical evidence to the developing literature on the subject. In addition, it provided clues to the researchers and practitioners who obtained the results in the detection and treatment of such important mental disorders.

Many studies in the literature (Davis et al., 1997; Lacombe et al., 1998) empirically proved the relationship between eating disorder and exercise addiction. The feeling of guilt when not exercised and the sense of excellence towards exercise express important academic indicators of exercise addiction (Hagan and Hausenblas, 2003; Wang et al., 2012). In particular, weight and shape concerns serve individuals' perception of perfectionist body (Hagan and Hausenblas, 2003). It is stated that individuals with such behavioral disorders should be treated socially and individually (Terry et al., 2012). Acceptance of the hypothesis created within the scope of the research on the subject provided empirical evidence in the context of the ongoing discussions in the literature in terms of male university students doing fitness. In this parallel, it is very important to act to prevent exercise addiction for male students at the university level in public sense.

The mass media spread idealistic representations in the context of different standards of attraction for men and women (muscular ideal for men, slim ideal for women). Sociocultural theory increases individuals' exposure to mass media, which includes idealistic representations of the body, and leads individuals to body-image evaluation. This situation focuses individuals on body-image investment. Body-image assessment and use of simple diet, exercise and weight control applications concentrates individuals to invest on their body-images. In order to have the ideal body, especially individuals with exercise addiction may face with health, social and financial risks. Sports supplements are among the items that can be considered as seductive in the basic assumption plane of sociocultural theory and there

is a continuous increase in the use of these substances (Sundgot-Borgen, 2003). The results found in the context of this research have been empirically proven to partially mediate the relationship between exercise addiction and eating disorder which take part in the American Psychiatric Association and World Health Organization mental illness classifications. This situation provided important clues regarding the identification of causes of the phenomena repeatedly proven in different studies and the level in which they are experienced.

## Limitations and future studies

All scientific research has various limitations, especially methodological constraints. In this case, it is important to develop suggestions for new research. This research was carried out by using quantitative research methodologies. More in-depth results can be obtained from new researches to be carried out by using qualitative research methodologies. The current research was carried out only in the context of male students. The inclusion of female students in new researches will reveal the gender differences in the context of the research subject. Within the scope of the research, Turkish students have been reached. So, new research to be carried out with data collected from different countries and cultures may indicate a cross-cultural difference. Finally, new models can be tested by adding different structures in parallel with the developing literature.

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