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Investigating the Difference in Exercise Self-Efficacy According to the Grade of Muscle Injury

Kas Yaralanmasının Evresine Göre Egzersiz Öz Yeterliliğindeki Farkın Araştırılması

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ABSTRACT

Aim: Muscle injuries are common sports-related injuries that cause the most training loss. Self-efficacy refers to a person's personal belief that he/she can do the behavior necessary to reach his goal. This study aimed to examine the difference in exercise self-efficacy according to the grade of muscle injury in recreational and professional athletes.
Material and Methods: Ninety-three patients who applied to the sports medicine outpatient clinic and were diagnosed with muscle injury and doing sports were included in the study. Gender, age, weight, height, sports branch and exercise duration per week, injury grade, and Tegner activity level of the patients diagnosed with muscle injury were recorded. The patients were asked to fill in the sports fitness index and athlete self-efficacy scale.
Results: A significant difference was found in the sports fitness index score according to the grade of muscle injury (p=0.002), while there was no significant difference in the Tegner activity level (p=0.228) and athlete self-efficacy scale (p=0.791). A negative correlation was found between age and duration of exercise (r=-0.234, p=0.024), and age and Tegner activity level (r=-0.425, p<0.001). A positive correlation was found between exercise duration and Tegner activity level (r=0.308, p=0.003), and exercise duration and professional thought efficacy (r=0.251, p=0.015). Again, a positive correlation was found between the Tegner activity level and sports discipline efficacy (r=0.225, p=0.030) and professional thought efficacy (r=0.226, p=0.029) dimensions of the athlete self-efficacy scale.
Conclusion: No significant difference in exercise self-efficacy depending on the grade of muscle injury in recreational and professional athletes.
Keywords: Muscle injury; Tegner activity level; sports fitness index; exercise self-efficacy.

ÖZ

Amaç: Kas yaralanmaları en fazla antrenman kaybına yol açan ve sporla ilişkili olarak sık görülen yaralanmalardır. Öz yeterlilik, kişinin hedefine ulaşması için gerekli olan davranışı yapabileceğine olan kişisel inancını ifade eder. Bu çalışmanın amacı, rekreasyonel ve profesyonel sporcularda kas yaralanmasının evresine göre egzersiz öz yeterliliğindeki farkı araştırmaktır.
Gereç ve Yöntemler: Bu çalışmaya spor hekimliği polikliniğine başvurup kas yaralanması tanısı almış olan ve spor yapan 96 hasta dahil edilmiştir. Kas yaralanması tanısı almış olan hastaların cinsiyet, yaş, kilo, boy, spor branşı ve haftalık egzersiz süresi, yaralanma evresi ve Tegner aktivite düzeyi kaydedilmiştir. Hastalardan spora uygunluk göstergesi ve sporcu öz yeterlilik ölçeğini doldurmaları istenmiştir.
Bulgular: Kas yaralanmasının derecesine göre spora uygunluk göstergesi skorunda anlamlı bir farklılık bulunurken (p=0,002), Tegner aktivite düzeyi (p=0,228) ve sporcu öz yeterlilik ölçeğinde (p=0,791) anlamlı farklılık saptanmadı. Yaş ile egzersiz süresi (r=-0,234; p=0,024) ve yaş ile Tegner aktivite düzeyi (r=-0,425; p<0,001) arasında negatif korelasyon bulundu. Egzersiz süresi ile Tegner aktivite düzeyi (r=0,308; p=0,003) ve egzersiz süresi ile mesleki düşünce yeterliliği (r=0,251; p=0,015) arasında pozitif korelasyon bulundu. Tegner aktivite düzeyi ile sporcu öz yeterlik ölçeğinin spor disiplini yeterliliği (r=0,225; p=0,030) ve mesleki düşünce yeterliliği (r=0,226; p=0,029) boyutları arasında da pozitif korelasyon bulunmuştur.
Sonuç: Rekreasyonel ve profesyonel sporcularda kas yaralanmasının derecesine bağlı olarak egzersiz öz-yeterliliğinde anlamlı bir fark yoktur.
Anahtar kelimeler: Kas yaralanması; Tegner aktivite düzeyi; spora uygunluk göstergesi; egzersiz öz yeterliliği.

Preliminary results were presented orally at the 1st International & 4th National Health Services Online Congress (June 10-12, 2022).

INTRODUCTION

Muscle strain is the most common injury pattern in sports (1). Muscle injuries are more common in sports involving explosive movements and direction changes, such as football, basketball, and athletics (2). Muscle injuries account for approximately one-third of all injuries in professional-level football. The football player undergoes 0.6 per season muscle injuries. Therefore, a football team of 25 players can expect around 15 muscle injuries per season (3). Most muscle injuries in football are non-contact and occur at the muscle-tendon junctions (4,5). Due to the increased incidence of hamstring and calf muscle injuries in recent years (5,6), studies are still being conducted on the management of muscle injuries (5,7-9). The high injury load creates economic costs and affects player availability and team performance (5,10,11).

Self-efficacy refers to the individual's personal belief that he/she can perform the behavior required to achieve the desired result (12-15). Individuals with low self-efficacy report more pain during exercise even if they do not have a psychological problem. This affects exercise-based rehabilitation after injury. High self-efficacy increases the sustainability of physical activity and compliance with treatment in case of a sports injury. The self-efficacy level is a predictor of injury-induced disability and is prognostic for the success of exercise-based rehabilitation (16).

This study hypothesized that exercise self-efficacy and grades of previous muscle injuries would bidirectionally affect each other. There are few publications in the literature on exercise self-efficacy in muscle injuries. In light of all this information, the main purpose of this study was to examine the difference in exercise self-efficacy according to the grade of muscle injury in recreational and professional athletes.

MATERIAL AND METHODS

Ninety-three male and female volunteers aged between 18 to 50 years who applied to Health Sciences University Gülhane Training and Research Hospital and were diagnosed with muscle injuries were included in the study. Volunteers who did not have chronic or systemic problems were included in the study. Volunteers who had an acute illness affecting body balance and movement independent from the muscle injury and had current pregnancies were excluded from the study.

Health Sciences University Gülhane Training and Research Hospital Clinical Research Ethics Committee approved the study on 09.02.2022 (Approval number: 2022/4). Informed consent was given to all patients and signed.

Age, gender, height, weight, sports branch, exercise duration per week, grade of the muscle injury, and Tegner activity level were assessed at the first admission. The patients were asked to fill in the sports fitness index and the athlete self-efficacy scale. O'Donoghue classification was used for evaluating muscle injuries (17).

For an effect size of 0.80, a power of 95%, and a Type-I error rate of 5%, the required number of participants was calculated as a minimum of 70.

Tegner Activity Level

It is used to evaluate the sports activity level of the patients. This scoring system varies between 0 and 10 according to activities in daily life and sports. Activity level is graded from 0 points for those who quit the activity due to injury or dysfunction, to 10 points for those who play professional sports at a national team level (18).

Sports Fitness Index

Turkish version of the sports fitness index developed by Wilkerson in 2016 was used (19,20). In the Turkish version of the scale, the best cut-off point was 70 points, with a sensitivity of 96.6% and a specificity of 75%. Each item has a 6-level response option (from 0 to 5) with descriptors for problem frequency or problem severity. The total score is calculated by multiplying the sum of values for 8 items by 2. The higher the score obtained from the scale, the higher the fitness level for sports (20).

Athlete Self-Efficacy Scale

It is a 5-point Likert-type scale consisting of 16 questions in total, which includes the sub-dimensions of sports discipline efficacy, psychological efficacy, professional thought efficacy, and personality efficacy. Each of the dimensions is evaluated with 4 questions. The lowest score that can be obtained from the scale is 16, and the highest score is 80 (21).

Statistical Analysis

Analyses were made in the IBM SPSS v.22 package program (IBM Corp., Armonk, NY, USA). Mean and standard deviation, minimum, maximum, frequency (n), and percentage (%) were used for descriptive values in statistical analysis. Kolmogorov-Smirnov test was used to evaluate conformity to normal distribution. Independent samples t-test and chi-square test were used for group comparison and the Pearson test was used for correlations. The p-value was accepted as significant at the 0.05 level.

RESULTS

A total of 93 patients (23 female, and 70 male) were included in the study. Demographic data of the patients were shown in Table 1. Muscle injuries were divided into three grades. While 33 (35.5%) of the patients were classified as grade 1, 57 (61.3%) of them were grade 2. Only 3 (3.2%) patients with grade 3 muscle injury were present in the study. Since the small number of patients was not statistically significant, grade 3 patients were excluded when analyzing according to the injury grade. In addition, the results did not change when grade 2 and 3 muscle injuries were combined. The grade 3 muscle injury group was excluded from the statistical analysis due to the small number of participants. A significant difference was found in the sports fitness index score between grade 1 and grade 2 muscle injuries ($p=0.002$). No significant difference was found in the Tegner activity level and athlete self-efficacy scale according to the grade of muscle injury ($p=0.228$, and $p=0.791$, respectively).

There was a negative correlation between age and weekly exercise duration ($r=-0.234$, $p=0.024$), and between age and Tegner activity level ($r=-0.425$, $p<0.001$). There was a positive correlation between exercise duration and Tegner activity level ($r=0.308$, $p=0.003$), and exercise duration and professional thought efficacy dimension of the athlete self-efficacy scale ($r=0.251$, $p=0.015$). There was a positive correlation between the Tegner activity level and sports discipline efficacy ($r=0.225$, $p=0.030$) and professional thought efficacy ($r=0.226$, $p=0.029$) dimensions of the athlete self-efficacy scale.

There was no statistically significant difference between the male and female gender in terms of muscle injury grade, Tegner activity level, sports fitness index, and athlete self-efficacy scale (Table 2).

Patients were also divided into two groups according to Tegner activity level. The levels of 9 and 10 were accepted as high-intensity sports (n=44, 9.2±0.4) and 5 to 8 as moderate-intensity (n=46, 7.3±0.4). In terms of muscle injury, while 13 (29.5%) patients were classified as grade 1 and 31 (70.5%) were grade 2 in the high-intensity group, 20 (43.5%) patients were grade 1 and 26 (56.5%) were grade 2 in the moderate-intensity group. No significant difference was found between these two groups in terms of muscle injury grade (p=0.195), sports fitness index score (44.9±14.9 vs 42.2±13.1, p=0.546), and athlete self-efficacy scale score (67.7±9.9 vs 65.4±15.8, p=0.408).

DISCUSSION

In this study, there was no significant difference in exercise self-efficacy in recreational and professional athletes according to the grade of muscle injury. Similarly, there was no difference in the Tegner activity level and athlete self-efficacy scale according to the grade of muscle injury. There was a difference in the sports fitness index score according to the grade of muscle injury. There was no difference in the sports fitness index score, Tegner activity level, and athlete self-efficacy scale according to gender. Similarly, a negative correlation was found between age and weekly exercise duration, and age and Tegner activity level. However, no relationship was found between the grade of muscle injury and the athlete self-efficacy scale score.

Participation in high-intensity sports decreases with increasing age. This may be due to many different reasons; decreased muscle strength, joint stiffness, reduced flexibility, a decline in overall physical fitness, previous injuries, prolonged recovery period, additional health concerns, changing lifestyle/social factors, and fear of injury. As a result, instead of participating in intense sports, individuals modify their participation by reducing their exercise duration or intensity (22,23). Similar to the literature, this study revealed that with increased age, participation in high-intensity sports and duration of exercise decreases.

This study did not find a difference between male and female gender for muscle injury grade, Tegner activity

Table 1. Demographics of the patients and differences between the groups

	Grade 1 (n=33)	Grade 2 (n=57)	p	All patients
Age (years), mean±SD	23.3±6.8	24.6±7.8	0.430	24.3±7.5 (18-50)
Weight (kg), mean±SD	72.1±13.4	73.4±13.4	0.663	72.8±13.1 (44-103)
Height (cm), mean±SD	176.3±7.9	177.1±7.6	0.664	176.7±7.6 (159-195)
Gender, n (%)				
Female	11 (33.3)	12 (21.1)	0.198	23 (24.7)
Male	22 (66.7)	45 (78.9)		70 (75.3)
Exercise duration/week (min), mean±SD	442.7±241.7	495.2±343.0	0.441	473.8±306.4 (90-1800)
Sports Fitness Index, mean±SD	48.9±13.4	39.7±13.1	**0.002**	43.0±14.0 (5-37)
Athlete Self-Efficacy Scale	65.3±14.4	66.0±12.9	0.791	65.9±13.2 (16-80)
Sports Discipline Efficacy	16.1±4.3	16.2±4.0	0.929	16.3±4.0 (4-20)
Psychological Efficacy	15.6±3.8	16.4±3.6	0.326	16.2±3.7 (4-20)
Professional Thought Efficacy	16.3±4.1	16.2±3.4	0.890	16.2±3.7 (4-20)
Personality Efficacy	17.0±3.8	17.0±3.3	0.990	17.1±3.5 (4-20)
Tegner Activity Level, mean±SD	8.0±1.4	8.3±1.0	0.228	8.1±1.1 (5-10)

SD: standard deviation

Table 2. The differences between genders

	Female (n=23)	Male (n=67)	p
Grade, n (%)			
1	11 (47.8)	22 (32.8)	0.198
2	12 (52.2)	45 (67.2)	
Exercise duration/week (min), mean±SD	384.7±247.6	503.1±319.5	0.108
Sports Fitness Index, mean±SD	40.6±14.6	43.8±13.8	0.347
Athlete Self-Efficacy Scale, mean±SD	66.0±12.1	65.9±13.7	0.957
Sports Discipline Efficacy	16.4±3.6	16.2±4.2	0.812
Psychological Efficacy	15.8±3.5	16.4±3.7	0.546
Professional Thought Efficacy	16.5±3.6	16.1±3.8	0.700
Personality Efficacy	17.2±3.1	17.0±3.6	0.777
Tegner Activity Level, mean±SD	8.3±1.1	8.1±1.2	0.446

SD: standard deviation

level, sports fitness index, and athlete self-efficacy scale score. However, according to the literature on muscle injuries, the prevalence and severity change between males and females. Generally, males tend to have a higher incidence of muscle injuries, particularly in certain sports that require explosive power and strength. This can be attributed to differences in hormonal profiles, muscle mass, and biomechanics between the genders (24). Having only 23 females out of the 93 participants may be the reason for this result. However, in terms of the incidence of muscle injury, males constituted the majority in our study, similar to the literature.

The Tegner activity level is a scale used to assess an individual's activity level and participation in sports and recreational activities (18). While there might be variations within genders, studies have indicated that males generally tend to have higher Tegner activity level scores compared to females. This difference could be influenced by factors such as cultural expectations, societal norms, and variations in sports participation rates between males and females (25).

The sports fitness index is a measure of an individual's overall fitness level concerning their sport or athletic activities. It takes various fitness components into account such as strength, endurance, speed, and agility (19). Differences between males and females can exist due to factors like hormonal profiles, body composition, and physiological characteristics (26). Generally, males tend to exhibit higher levels of absolute strength and power, while females may excel in areas such as flexibility and endurance (27).

Self-efficacy refers to an individual's belief in their ability to successfully perform a specific task or activity (21). Studies have shown that males and females may differ in their self-efficacy levels, with males often exhibiting higher levels of self-efficacy in certain domains. These differences may be influenced by factors such as societal expectations, stereotypes, and past experiences. It's important to note that while there are general trends and differences between genders in these factors, individual variations exist within each gender. Moreover, these differences are not absolute and may be influenced by various factors such as training, experience, genetics, and personal motivation (28,29). Our study found similar results for Tegner activity level, sports fitness index, and athlete self-efficacy scale according to gender. This might be due to the male-to-female ratio of the study participants or the patient population presenting to the outpatient clinic of the study.

A higher sports fitness index score indicates better fitness and performance capabilities (20). On the other hand, the grade of muscle injury refers to the severity or extent of the injury, with higher grades indicating more severe injuries. In general, it is expected that individuals with more severe muscle injuries would have a lower Sports Fitness Index. This is because muscle injuries can significantly impact an individual's ability to engage in physical activity, reduce their overall fitness level, and limit their performance in sports. In other words, as the grade of muscle injury increases, the Sports Fitness Index tends to decrease. However, there is no study in the literature that supports this expectation. In the Turkish validity and reliability study of the sports fitness index, 70 points and above were found to be suitable for sports. In this study, the mean of the sports fitness index was found to be 43.0±14.0. Also, the sports fitness index of athletes with grade 1 injury was 48.9±13.4, and grade 2 was 39.7±13.1. In the study, the sports fitness index score decreased with the increase in the muscle injury grade. Despite being below the cut-off values of the sports fitness index score average, even those with lower scores can still be considered to have lower physical fitness compared to those with higher scores.

The cut-off value of the athlete self-efficacy scale is reported as 40 (21). This study found the mean of the participants' score as 65.9±13.2. Engaging in regular sports or exercise can already be a situation that individuals with exercise self-efficacy can achieve. Therefore it might not be possible to find a relationship with the grade of injury. In addition, the psychological rehabilitation of the injured athlete is of great importance in sports medicine. The most basic part of athlete rehabilitation is to explain each step and to determine the goals together with the athlete so that the psychology of the athlete is not affected (30). The result that there is no difference in exercise self-efficacy according to the stage of muscle injury showed that the grade of the muscle injury does not affect the exercise self-efficacy and might not so the sports rehabilitation's psychological phase or the performance.

Generally, individuals who engage in longer durations of exercise are more likely to have higher Tegner activity level scores. This is because longer exercise durations often indicate a greater commitment to physical activity and participation in sports, which can contribute to the higher activity levels and a wider range of sports involvement (31). Similarly, this study revealed that higher exercise duration is related to a higher Tegner activity level. Professional thought efficacy is a subgroup referring to self-efficacy related to professional thoughts or activities (21). Confidence in one's professional skills or decision-making abilities, and higher exercise durations can positively impact self-efficacy. Regular exercise has been associated with improved cognitive function, increased self-confidence, and enhanced overall well-being, which can translate into greater professional thought efficacy (32). In this study, it was revealed that the duration of exercise affects professional thought efficacy positively.

Sports discipline efficacy refers to an individual's belief in their ability to adhere to the rules, regulations, and behavioral expectations of a specific sport or athletic activity (21). In general, individuals with higher Tegner activity level, indicating a greater engagement in sports and physical activities, are more likely to have higher levels of sports discipline efficacy. This is because increased involvement in sports often requires a higher level of discipline, commitment, and adherence to the rules and standards of the sport (33). Professional thought efficacy refers to an individual's belief in their ability to successfully perform professional tasks or activities. While the Tegner activity level is primarily focused on sports and recreational activities, it can indirectly influence an individual's professional thought efficacy. Engaging in regular physical activity and sports participation can positively impact cognitive function, self-confidence, and overall well-being (32). These factors can contribute to

enhanced professional thought processes, decision-making abilities, and self-efficacy in professional domains. This study showed that if the Tegner activity level is high, the sports discipline efficacy and professional thought efficacy dimensions of the athlete self-efficacy scale will also be high.

Factors such as the intensity and type of exercise, personal motivation, and specific professional domains can influence the relationship. This can be named as a limitation of our study since these parameters were not evaluated.

CONCLUSION

Sports and exercise are factors that improve an individual's exercise self-efficacy. Increasing exercise duration increases Tegner activity level and professional thought efficacy. Increasing Tegner activity level, like dominos, increases the sports discipline efficacy and professional thought efficacy dimensions of the athlete self-efficacy scale. So that even when the athlete experiences muscle injury, exercise self-efficacy may not be affected.

Ethics Committee Approval: The study was approved by the Clinical Research Ethics Committee of Gülhane Training and Research Hospital (09.02.2022, 2022/4).

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