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The Relationship Between Musculoskeletal Disorders, Anxiety and Body Awareness in Elite Athletes

Atakan GÜRGAN[1A], Berna KARAMANCIOĞLU[1B],

Beyzanur DİKMEN HOŞBAŞ[1C], Deniz DEMİRCİ[1D]

[1]*Department of Physiotherapy and Rehabilitation, Üsküdar University, Istanbul, Turkiye.*

Address Correspondence to Ad Soyad: Deniz Demirci e-mail: deniz.demirci@uskudar.edu.tr

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A: Orcid ID: 0000-0003-1096-309X B: Orcid ID: 0000-0003-2561-4618
C: Orcid ID: 0000-0003-2494-480X D: Orcid ID: 0000-0003-4672-2378

Abstract

The aim of this study was to determine the most common musculoskeletal disorders in athletes and to investigate the relationship between musculoskeletal complaints and sport-related anxiety and body awareness. This study, which was designed using the relational screening method as a quantitative research, was conducted using the online survey method (via Google Forms). The study included 80 athletes aged 18-35 years, who were actively involved in elite level sport. The Nordic Musculoskeletal Questionnaire was used to assess musculoskeletal disorders, the Sports Anxiety Scale-2 (SAS-2) to assess anxiety, and the Body Awareness Questionnaire (BAQ) to assess body awareness. There was a significant difference in somatic anxiety levels between the athletes who experienced musculoskeletal pain and those who did not ($p<0.05$). The somatic anxiety levels of athletes with musculoskeletal disorders were found to be higher than those without musculoskeletal disorders. A weak correlation at significant level was found between the somatic anxiety levels of the athletes and the number of complaint areas reported in the last 12 months ($p<0.01$). With the body awareness status of the athletes; while a positive significant weak level relationship was found with somatic anxiety level ($p<0.05$), a negative relationship was found with concentration disorganisation at a high level of significance ($p<0.05$). It was observed that athletes with musculoskeletal disorders had higher levels of somatic anxiety and that the number of regions in which the athlete experienced complaints was related to the level of somatic anxiety; there was no relationship between body awareness levels and musculoskeletal complaints. A multidisciplinary study with a psychological perspective is important for the clinical care and support of elite athletes in different sports.

Keywords: Anxiety, Athlete, Body Awareness, Musculoskeletal System.

Özet

Elit Sporcularda Kas İskelet Sistemi Bozuklukları, Anksiyete ve Vücut Farkındalığı Arasındaki İlişki

Bu çalışmanın amacı, sporcularda en sık görülen kas-iskelet sistemi rahatsızlıklarını belirlemek ve kas-iskelet sistemi şikayetleri ile sporla ilgili kaygı ve beden farkındalığı arasındaki ilişkiyi araştırmaktır**.** Nicel bir araştırma olarak ilişkisel tarama yöntemi kullanılarak tasarlanan bu çalışma, çevrimiçi anket yöntemi (Google Forms aracılığıyla) ile gerçekleştirilmiştir. Çalışmaya aktif olarak elit düzeyde spor yapan 18-35 yaş arası 80 sporcu dahil edilmiştir. Kas-iskelet sistemi rahatsızlıklarını değerlendirmek için İskandinav Kas İskelet Sistemi Anketi, anksiyete değerlendirmesi için Spor Kaygı Ölçeği-2 ve vücut farkındalığını değerlendirmek için Vücut Farkındalığı Anketi kullanılmıştır. Kas-iskelet sistemi ağrısı yaşayan ve yaşamayan sporcular karşılaştırıldığında somatik kaygı düzeyleri arasında anlamlı fark bulunmuştur ($p<0.05$). Kas-iskelet sistemi rahatsızlığı olan sporcuların somatik kaygı düzeyleri, kas-iskelet sistemi rahatsızlığı olmayanlara göre daha yüksek bulunmuştur. Sporcuların somatik anksiyete düzeyleri ile son 12 ay içinde rapor edilen şikayet alanlarının sayısı arasında anlamlı düzeyde zayıf bir ilişki bulunmuştur ($p<0.05$). Sporcuların beden farkındalığı durumu ile; somatik kaygı düzeyi arasında pozitif yönde anlamlı zayıf düzeyde bir ilişki bulunurken ($p<0.05$), konsantrasyon dağınıklığı ile negatif yönde yüksek anlamlılık düzeyinde bir ilişki bulunmuştur($p<0.05$). Kas-iskelet sistemi rahatsızlıkları olan sporcuların somatik kaygı düzeylerinin daha yüksek olduğu ve sporcunun şikayet yaşadığı bölge sayısının somatik kaygı düzeyi ile ilişkili olduğu; beden farkındalığı düzeyleri ile kas-iskelet sistemi şikayetleri arasında bir ilişki olmadığı görülmüştür. Psikolojik bakış açısına sahip multidisipliner bir çalışma, farklı spor dallarındaki elit sporcuların klinik bakımı ve desteği için önemlidir.

Anahtar Kelimeler: Anksiyete, Elit Sporcu, Vücut Farkındalığı, Kas-İskelet Sistemi.

INTRODUCTION

The International Olympic Committee defines musculoskeletal disorders in its Handbook on Sports Injuries as "new or recurrent musculoskeletal complaints occurring during competition or training that require medical attention, regardless of the possibility of absence from competition or training (1). According to the literature, elite athletes can range from Olympic gold medallists and world record holders to regional and university level athletes (2). Muscle injuries, sprains, tendonitis and strains are among the most common health problems in athletes. Elite athletes can suffer from various musculoskeletal disorders due to high levels of physical activity. These disorders can occur in athletes due to overuse, particularly repetitive movements. Examples of these disorders include pain, fatigue, cramps and injuries (3).

Pain in the musculoskeletal system is often associated with sports injuries and is frequently observed in elite athletes (4). Although pain is often associated with sports injuries, which are common among elite athletes, pain can also be present in the absence of an injury, or can be present even after the healing of an injury (5) . Pain is a personal experience influenced to varying degrees by biological, psychological and social factors (6). The longer the duration of pain, the greater the potential for psychological, social and environmental/contextual factors to influence pain-related problems. These factors can cause problems such as functional limitations as well as pain. (7).

Psychological factors play an important role in athletes' responses to musculoskeletal disorders. Psychological assessment is necessary to understand the athlete's process of understanding their pain, when pain exceeds the expected recovery time or when psychosocial symptoms occur. Such an assessment includes questioning the athlete's cognitive and behavioural responses to pain, assessments of pain and its consequences, psychosocial stress levels and psychological symptoms (anxiety, depression, anxiety, etc.). There are bidirectional relationships between pain and anxiety, anxiety, depression, stress and anger. The

assessment of social and environmental factors related to the pain problem also constitutes an essential component of psychosocial factors (5, 8).

Among the various factors that researchers have addressed in the search for higher levels of performance in sport, athletes' body awareness has been a topic of particular interest in recent years (9). Body awareness represents an athlete's interpretation, evaluation, beliefs and memories within a natural, phenomenological attitude of proprioception and interoception that involves conscious awareness of the body. Body awareness includes attentive focus on the body and awareness of internal body sensations (10). Increased awareness of the interconnection between body, mind, emotions and context can lead to a better understanding of the messages emanating from painful muscles. This awareness, combined with a focus on personal experiences, has a significant impact on outcomes for individuals with chronic musculoskeletal pain. With increased body awareness, people learn to recognise and use body signals other than pain and to identify their physical and mental state (11). Awareness of the relationship between physical and mental states in different contexts can lead to a better understanding of this bodily information and thus to increased confidence in one's body and self (12, 13).

There is a paucity of studies in the literature examining the relationship between musculoskeletal complaints in athletes and psychosocial factors. There are no studies analysing the relationship between musculoskeletal disorders and anxiety and body awareness in elite athletes. The aim of our study was to determine the most common musculoskeletal disorders in athletes and to investigate the relationship between musculoskeletal complaints and sport-related anxiety and body awareness. We hypothesise that there is a significant relationship between musculoskeletal complaints, anxiety and body awareness in elite athletes.

METHOD

This study, which was planned as a quantitative research using the relational screening method, was carried out using the online survey method (via Google Forms) between 11.07.2022-10.10.2022 dates. 80 licensed active athletes aged between 18 and 35, volunteered to take part in the study were included. Who had known diagnosed systemic disease, had suffered an injury that would prevent them from participating in sport in the previous 6 months, and were excluded.

Data Collection Tools

At the beginning of the study, demographic information of all participating athletes was recorded in the socio-demographic information form. The Nordic Musculoskeletal Questionnaire was used to determine musculoskeletal disorders, Sports Anxiety Scale-2 (SAS-2) was used to evaluate anxiety levels, and Body Awareness Questionnaire (BAQ) was used to determine body awareness levels.

Socio- Demographic Information Form: Information such as the age, gender, age of starting sports and the number of hours of training per day of elite athletes can be obtained.

The Nordic Musculoskeletal Questionnaire: It is a self-administered or interviewer-administered questionnaire that provides reliable information in the first two parts by asking yes/no about the presence of pain, soreness, discomfort in nine parts of the body (neck, shoulders, back, elbows, wrists, hips, ankles, feet and ankles) in the last 12 months and 7 days, (neck, shoulders, back, elbows, wrists, hips, knees, ankles, feet and ankles) in the last 12 months and 7 days and in the last part by asking yes/no if the pain or discomfort experienced in the last 12 months has prevented him/her from doing his/her job in which of the nine different areas mentioned. Kahraman et al. reported that the Turkish version of the questionnaire has favourable psychometric properties, including good test-retest reliability, internal consistency and construct validity. (14).

Sports Anxiety Scale-2 (SAS-2): It is a 15-item scale with 3 sub-dimensions: somatic anxiety, anxiety and concentration distraction. Items 2, 6, 10, 12 and 14 of the scale measure somatic anxiety level, items 3, 5, 8, 9 and 11 measure anxiety level and items 1, 4, 7, 13 and 15 measure concentration distraction. The scale is scored on a 4-point Likert scale and consists of "Not at all (1), a little (2), a lot (3) and very much (4)" (15). Karadağ and Aşçı adapted the scale into Turkish and conducted validity and reliability studies.(16).

Body Awareness Questionnaire (BAQ): It is an 18-item questionnaire that asks about bodily reactions, the individual's assessment of bodily processes, the disease process and the sleep-wake cycle. A high score on the questionnaire indicates a high level of body awareness. The Body Awareness Questionnaire is frequently used by health researchers because it comprehensively assesses emotional, physical and social aspects, does not require training for its use, is easy to understand, can be applied quickly and has a holistic approach. Karaca and Bayar conducted a validity and reliability study of the questionnaire, and found the Turkish version to be reliable and valid (17).

Ethical approval and institutional permission

The approval of this study, which was conducted in accordance with the ethical rules of the Declaration of Helsinki, was approved by the Üsküdar University Non-Interventional Research Ethics Committee with the decision dated 27.05.2022 and numbered 613513342/May 2022-39 Athletes who volunteered for the study were given detailed information about the study before completing the questionnaires and their consent was obtaine.

Statistical Analysis

The IBM SPSS 24.0 package was used for statistical analyses. The normality of the data was analysed using Kolmogorov Smirnov tests. It was found that the data were no distributed. Descriptive data were expressed as percentages, frequencies, means, standard deviations, medians and lower and upper quartile. The Mann-Whitney U test was used for two group comparisons that did not show a parametric distribution. Spearman correlation analysis was used for analysis of relationships. Statistical significance was taken as $p<0.05$.

FINDINGS

Table 1. Socio-Demographic Information

		Mean±SD	N (%)
Age		24.89±4.16	
Height		177.73±8.88	
Weight		69.48±11.36	
Gender	Woman		19 (23.8%)
	Man		61 (76.3%)
Educational Status	Primary School		0 (0.0%)
	Middle School		7 (8.8%)
	High School		32 (40.0%)
	University		38 (47.5%)
	Postgraduate		3 (3.8%)
Sports Branch	Football		46 (57.5%)
	Volleyball		6 (7.5%)
	Basketball		4 (5.0%)
	Swiming		9 (11.3%)
	Other (Boxing. Taekwondo. Rowing)		15 (18.8%)
How many hours a day do you train?	2		41 (51.3%)
	3		33 (41.3%)
	4		4 (5.0%)
	5		2 (2.5%)
How many days a week do you train?	1		2 (2.5%)
	2		2 (2.5%)
	3		5 (6.3%)
	4		4 (5.0%)
	5		29 (36.3%)
	6		33 (41.3%)
	7		5 (6.3%)

A total of 80 athletes, 19 females (mean age=23.95±4.30) and 61 males (mean age=25.18±4.10) participated in the study. The athletes' age, height, weight, educational status, sports, daily and weekly training times are shown in **Table 1.**

Table 2. Frequency of musculoskeletal disorders according to body parts of athletes

Body Area	The presence of pain, sorenes, discomfort and numbness in the last 7 days	The presence of pain, soreness, discomfort and numbness in the last 12 months	Impact on functionality
	n (%)	n (%)	n (%)
Neck	11 (13.8)	29 (36.3)	10 (12.5)
Shoulder	13 (16.3)	27 (33.8)	10 (12.5)
Elbow	5 (6.3)	10 (12.5)	4 (5)
Hand and Wrist	9 (11.3)	27 (33.8)	8 (10)
Back	12 (15)	29 (36.3)	6 (7.5)
Waist	12 (15)	29 (36.3)	12 (15)
Hip	10 (12.5)	23 (28.8)	12 (15)
Knee	12 (15)	32 (40)	22 (27.5)
Foot/Ankle	19 (23.8)	43 (53.8)	27 (33.8)

The frequency of musculoskeletal complaints observed in the 'last 7 days' and in the 'last 12 months' in the parts of the body of the athletes and the frequency of these complaints affecting their functionality are shown in **Table 2.**

Table 3. The relationship between the number of regions where the athletes reported that they experienced discomfort and the BAQ and SAS-2 parameters

		Body Awareness Questionnaire	SAS-2 Somatic Anxiety	SAS-2 Anxiety	SAS-2 Concentration Distraction	SAS-2 Total
Number of areas where discomfort was reported in	r	0.049	**0.250***	-0.010	0.054	0.114
	p	0.668	**0.025**	0.927	0.635	0.315

r: Spearmann correlation coefficient *: Significance

When analysing musculoskeletal disorders in the last 12 months by sport, footballers were most likely to have musculoskeletal disorders in the foot/ankle region (65.21% of footballers), volleyballers were most likely to have musculoskeletal disorders in the shoulder region (83.33% of volleyballers), basketballers were most likely to have musculoskeletal disorders in the shoulder region (100% of basketballers) and swimmers were most likely to have musculoskeletal disorders in the back region (66.6% of swimmers).

In the past 12 months, 82.6% of football players reported complaints in at least one body region, all volleyball players reported complaints in at least two body regions, all basketball players reported complaints in at least three body regions and 88% of swimmers reported complaints in at least one body region.

A significant weak correlation was found between the somatic anxiety levels of athletes and the number of complaint areas reported in the last 12 months and the somatic anxiety levels of athletes ($p<0.05$). **(Table 3).**

Table 4. Total BAQ and SAS-2 Scores

	Mean	±SD	Median	Minimum	Maximum
BAQ	85.95	16.13	85,5	57.00	126.00
SAS-2 Somatic Anxiety	8.41	2.07	8.00	5.00	13.00
SAS-2 Anxiety	10.24	2.98	10.00	5.00	17.00
SAS-2 Concentration Distraction	8.18	1.81	8.00	5.00	12.00
SAS-2 Total	26.83	5.23	27.00	16.00	37.00

Body Awareness Questionnaire and Sports Anxiety Scale-2 scores of the athletes are shown in **Table 4.**

Table 5. Comparison of the anxiety and body awareness levels of the athletes according to their complaints in the last 12 months

Body Area		SAS-2 Somatic Anxiety	SAS-2 Anxiety	SAS-2 Concentration Distraction	SAS-2 Total	BAQ
Neck	Yes	9 (7-11)	10 (9-12)	8 (7-9)	27 (25-31)	86 (79-94)
	No	8 (7-10)	10 (9-12)	8 (7-10)	27 (25-30)	80 (72-101)
	P	0.061	0.781	0.359	0.557	0.462
Shoulder	Yes	9 (7-11)	11 (8-12)	8 (7-9)	28 (25-32)	86 (77-93)
	No	8 (6-10)	10 (9-12)	8 (7-10)	27 (23-30)	80 (72-98)
	P	**0.038***	0.408	0.717	0.129	0.640
Elbow	Yes	9.5(8-11)	10 (7-12)	8.5 (8-9)	27 (25-35)	88 (85-103)
	No	8 (7-10)	10 (9-12)	8 (7-10)	27 (24-30)	80 (72-95)
	P	0.117	0.587	0.362	0.531	0.162
Hand and Wrist	Yes	9.5 (8-11)	10 (9-12)	8 (8-9)	28 (25-32)	89 (77-98)
	No	8 (7-10)	10 (9-12)	8 (7-10)	26 (23-30)	80 (72-94)
	P	**0.002***	0.685	0.462	0.076	0.248
Back	Yes	9 (7-11)	10 (9-12)	8 (7-10)	27 (25-31)	88 (77-96)
	No	7.5 (6-10)	10 (8-12)	8.5 (7-10)	27 (22-30)	80 (72-95)
	P	**0.012***	0.815	0.627	0.268	0.173
Waist	Yes	9 (7-11)	10 (9-12)	8 (7-9)	27 (25-29)	80 (75-103)
	No	8 (7-10)	10 (9-12)	8 (7-10)	27 (23-31)	85 (72-94)
	P	0.146	0.554	0.815	0.685	0.243
Hip	Yes	9 (6-10)	10 (9-11)	9 (8-10)	27 (25-30)	77 (72-93)
	No	8 (7-10)	10 (9-12)	8 (7-9)	27 (23-21)	87 (75-97)
	P	0.953	0.566	0.319	0.970	0.156
Knee	Yes	9 (7-10.5)	10 (8.5-12)	8 (7-9.5)	27.5 (24-31.5)	83 (72-95.5)
	No	8 (7-10)	10 (9-12)	8 (7-9.5)	27 (23.5-30)	85.5 (75-95)
	P	0.277	0.827	0.972	0.598	0.458
Foot-Ankle	Yes	9 (7-10)	10 (9-12)	9 (7-10)	27 (24-30)	79 (73-93)
	No	8 (7-10)	10 (8-12)	8 (6-9)	27 (24-30)	88 (75-98)
	P	0.914	0.969	0.051	0.526	0.213

Data expressed as median (percntil 25- percentil 75), **P<0.05**

The relationship between athletes' musculoskeletal complaints in the last 12 months and their levels of anxiety and body awareness is shown in **Table 5.** There was a significant difference in somatic anxiety levels

between athletes who had experienced neck, hand-wrist and back pain in the past 12 months and those who had not ($p<0.05$). The somatic anxiety levels of athletes with musculoskeletal disorders were found to be higher than those without musculoskeletal disorders. There was no significant difference between athletes with and without musculoskeletal complaints in terms of anxiety, concentration problems, general anxiety and body awareness ($p>0.05$).

Table 6. Examination of the relationship between body awareness and anxiety

		SAS-2 Somatic Anxiety	SAS-2 Anxiety	SAS-2 Concentration Distraction	SAS-2 Total
Body Awareness Status	r	**0.266***	-0.203	**-0.399****	-0.134
	p	**0.017**	0.072	**0.001**	0.237

r: Spearmann correlation coefficient *: Significance, **P<0.05**

With the body awareness status of the athletes; while a positive significant weak level relationship was found with somatic anxiety level ($p<0.05$), a negative relationship was found with concentration disorganisation at a high level of significance ($p<0.05$). (Table 6).

DISCUSSION AND CONCLUSION

As a consequence of this study, which was conducted to determine the musculoskeletal disorders in elite athletes in different sports and to examine the relationship between these disorders and the anxiety and body awareness levels of the athletes, it was found that the somatic anxiety levels of athletes with musculoskeletal disorders were higher and that the number of regions in which the athlete experienced discomfort was related to the level of somatic anxiety. It was found that the elite athletes who participated in the study experienced discomfort most frequently in the foot-ankle area in the football branch, most frequently in the shoulder area in the volleyball and basketball branches, and most frequently in the back area in the swimming branch.

Medical, psychological, and social factors have been shown to influence pain. When an athlete is injured, the sports medical team primarily focuses on treating the physical effects of the injury (18). However, it is important to address the negative psychological reactions that many injured athletes experience throughout the rehabilitation process. Therefore, it is crucial to consider psychosocial conditions in athlete health (19).

A study of male professional football players reported that the number of serious musculoskeletal injuries during their football careers was positively associated with symptoms of stress, anxiety, depression and sleep disturbance. In this study, professional male football players who have experienced one or more serious musculoskeletal injuries (joint or muscle) in their careers are more likely to be affected than professional male football players who have not experienced serious musculoskeletal injuries during their careers; They were found to be nearly two to four times more likely to report symptoms such as depression, stress, and anxiety (20). A pilot study among professional footballers showed that a higher number of serious musculoskeletal injuries and surgeries were significantly associated with stress, anxiety and depression (21). Another study found that injured Australian athletes had significantly higher symptoms of depression and generalised anxiety than uninjured athletes (22). These results are consistent with the anxiety-related results found in our study.

The findings of our study show that elite athletes in different sports branches with musculoskeletal disorders have higher somatic anxiety levels. The results of our study may contribute to the development of preventive measures. Investigating the relationships between the disorders experienced by athletes can guide the planning of possible treatment approaches, training programmes and taking the right precautions. Recently, it has been reported that while athletes and health professionals recognise that medical care and support as well as medical examinations throughout the sporting career are only directed towards physical health (mostly injuries), adequate support for psychosocial well-being is lacking and necessary (23, 24). In terms of support related to psychosocial factors, a study reported that increasing self-awareness about the

occurrence of symptoms such as depression, stress, and anxiety among athletes, access to internet-based interventions, and positive perspectives of all stakeholders (especially coaches) on this issue can be supportive (25).

It has been reported that depressive symptoms and pain symptoms are less common in people with high body awareness, and it has been highlighted that body awareness is an important parameter to consider in this sense (26). In a study that investigated body awareness levels in different sports, no significant difference was found between body awareness levels in different sports, and it was found that there was a moderate correlation with athletes' performance emotional state (27). The authors stated that body awareness levels were above average in all sports branches, and the body awareness levels of the athletes in our current study are in parallel with the literature. In the present study, it can be considered that the negative moderate relationship between body awareness levels and lack of concentration supports the findings in previous studies.

The clinical relevance of our study is that it highlights the importance of a multidisciplinary approach to the clinical care and support of elite athletes in different sports, particularly when an athlete is unable to train or compete for long periods as a result of recurrent serious joint or muscle injuries, which should also be monitored in the long term because of the potential impact on symptoms such as anxiety (28, 29). Given the recommendations for the use of supportive and preventive evidence-based interventions that address psychosocial factors, and the design and implementation of interventions to protect and improve the sustainable health of athletes (25, 28), our study may guide researchers in the design of these interventions.

To the best of our knowledge, scientific data on the effect of physical stressors such as musculoskeletal injuries on psychological symptoms such as anxiety in elite athletes is limited. Our study is an original study that will contribute to the literature in this regard. In addition, our study highlights the importance and need for a multidisciplinary study with a psychological perspective.

The study has some limitations. One of them is that the sample is limited in order to generalise the results. Another limitation is that the study population is mainly composed of football players. Another limitation is that the data obtained with the questionnaire method, which is a self-report method, may be subjective. There is a need for studies using more objective measures and larger sample sizes.

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