Uluslararası Avrasya Sosyal Bilimler Dergisi / *The International Journal of Eurasia Social Sciences*
Cilt/Volume: 16, Sayı/No: 59, Yıl/Year: 2025, ss. / pp.: 478-489
E-ISSN: 2146-1961
URL: https://rrpubs.com/index.php/ijoess

The effect of pre-competition anxiety levels on acute pain thresholds of senior female wrestlers

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Araştırma Makalesi/*Research Article*		**DOI:** 10.70736/ijoess.602
Gönderi Tarihi/ *Received:*	Kabul Tarih/ *Accepted:*	Online Yayın Tarihi/ *Published*:
16.07.2024	01.02.2025	15.03.2025

Abstract

It is important to analyze the possible effects of athletes' anxiety on their pain thresholds before a national competition such as the Turkish Grand Women's Wrestling Championship. The hypothesis of this study is to investigate the effect of anxiety on pain tolerance by determining pre-competition anxiety and pain levels in a sport with intense physical and psychological pressure such as wrestling. The study was conducted on 30 volunteer female wrestlers who were either graduates or students of sports sciences faculties participating in the championship. Participants were selected from different weight classes and different experience levels. Body composition data of the participants were determined using bioelectrical impedance with Tanita 418 BC device. Anxiety Rating Scale (ARS) was given to the participants to measure their anxiety about the competition. In the analysis of the data, percentage (%), frequency, mean and simple linear regression analysis were used to determine the effect of the independent variable on the dependent variable. The age of the participants was reported as 20.32±2.21 years. The mean anxiety score of the participants was 34.35±5.62. According to the results of the study, total anxiety score had no effect on the participants' occiput right and left occipital pain thresholds ($p>0.05$). As a result of the study, it is thought that other factors that may affect the pain threshold besides anxiety were not included in the model and may be due to individual differences. In addition, in sports with high physical and mental endurance such as taekwondo and wrestling, managing athletes' anxiety levels can be seen as a critical strategy to increase success. The importance of anxiety management and stress reduction techniques to be developed by sports psychologists to manage athletes' pre-competition anxiety emerges. Creating personalized psychological support strategies by taking into account the individual differences of athletes can reduce the negative effects of anxiety on performance.

Keywords: Anxiety levels, female wrestlers, pain thresholds, pre-competition

Müsabaka öncesi kaygı düzeylerinin büyükler kadın güreşçilerin akut ağrı eşikleri üzerindeki etkisi

Öz

Türkiye Büyük Kadınlar Güreş Şampiyonası gibi ulusal bir müsabaka öncesinde sporcuların kaygılarının ağrı eşikleri üzerindeki olası etkilerini analiz etmek önemlidir. Çalışmamızın hipotezi, güreş gibi fiziksel ve psikolojik baskının yoğun olduğu bir sporda müsabaka öncesi kaygı ve ağrı düzeylerini belirleyerek kaygının ağrı toleransı üzerindeki etkisini araştırmaktır. Çalışma, şampiyonaya katılan spor bilimleri fakültesi mezunu ya da öğrencisi olan 30 gönüllü kadın güreşçi üzerinde yürütülmüştür. Katılımcılar farklı sıkletlerden ve farklı deneyim seviyelerinden seçilmiştir. Katılımcıların vücut kompozisyonu verileri Tanita 418 BC cihazı ile biyoelektrik empedans kullanılarak belirlenmiştir. Katılımcılara müsabaka ile ilgili kaygılarını ölçmek için Kaygı Derecelendirme Ölçeği (ARS) verilmiştir. Verilerin analizinde yüzde (%), frekans, ortalama ve bağımsız değişkenin bağımlı değişken üzerindeki etkisini belirlemek için basit doğrusal regresyon analizi kullanılmıştır. Katılımcıların yaşı 20,32±2,21 yıl olarak bildirilmiştir. Katılımcıların anksiyete puan ortalaması 34,35±5,62'dir. Çalışma sonuçlarına göre, toplam anksiyete puanının katılımcıların oksiput sağ ve sol oksipital ağrı eşikleri üzerinde etkisi yoktur ($p>0,05$). Çalışma sonucunda anksiyete dışında ağrı eşiğini etkileyebilecek diğer faktörlerin modele dahil edilmemiş olması ve bireysel farklılıklardan kaynaklanabileceği düşünülmektedir. Ayrıca taekwondo ve güreş gibi fiziksel ve zihinsel dayanıklılığın yüksek olduğu sporlarda sporcuların kaygı düzeylerini yönetmeleri başarıyı artırmak için kritik bir strateji olarak görülebilir. Sporcuların müsabaka öncesi kaygılarını yönetmek için spor psikologları tarafından geliştirilecek kaygı yönetimi ve stres azaltma tekniklerinin önemi ortaya çıkmaktadır. Sporcuların bireysel farklılıklarını dikkate alarak kişiye özel psikolojik destek stratejileri oluşturmak, kaygının performans üzerindeki olumsuz etkilerini azaltabilir.

Anahtar Kelimeler: *Anksiyete düzeyleri, kadın güreşçiler, ağrı eşikleri, müsabaka öncesi*

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INTRODUCTION

Athletic performance is influenced by a complex interplay of physiological, biomechanical, and psychological factors. Achieving optimal performance at an elite level requires not only the development of the musculoskeletal system but also a well-maintained psychological state (Konter, 2003; Ataç, 2019; Sarıakçalı et al., 2022; Küçük et al., 2024). Among these factors, psychological variables play a critical role in shaping an athlete's performance, either by enhancing or impairing their ability to compete effectively. These psychological influences can stem from an athlete's personality traits or external stimuli encountered during competition. One of the most extensively studied psychological factors affecting athletic performance is anxiety (Akandere, 1997; Samur, 2018; Ceylan et al., 2024).

Pre-competition anxiety is a common phenomenon experienced by athletes across various sports disciplines. It manifests through physiological, cognitive, emotional, and behavioral responses, often leading to changes in performance. Athletes experiencing heightened anxiety may suffer from increased muscle tension, excessive nervousness, and a decline in self-confidence, which can negatively affect their ability to execute technical and tactical skills effectively (Erbaş, 2000; Ataç, 2019). Excessive anxiety can also induce fear of failure, disrupt focus, and ultimately impair decision-making during competition. Previous studies have demonstrated that athletes frequently report symptoms such as stomach pain, intrusive negative thoughts, and heightened nervousness before major competitions, indicating a strong relationship between stress, anxiety, and performance (Kalkavan & Çakır, 2016).

Fear, as a component of anxiety, has been identified as a crucial psychological determinant, particularly in individual and high-contact sports such as wrestling. Fear can influence an athlete's pain perception, endurance capacity, and overall ability to withstand the physical demands of competition (Nahman-Averbuch et al., 2016; Michaelides & Zis, 2019). Pain is an unavoidable aspect of an athlete's career, and its perception is not solely determined by physiological factors but also shaped by psychological elements such as self-confidence, emotional resilience, and coping mechanisms. Negative emotions—including stress, frustration, and self-doubt—have been shown to exacerbate pain sensitivity and lower pain thresholds in athletes (Ataç, 2019). Therefore, understanding the relationship between psychological states, particularly anxiety, and pain perception is crucial in high-intensity sports where physical and mental endurance are equally demanded.

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Pre-competition stress can be categorized into two primary components: cognitive anxiety and somatic anxiety. Cognitive anxiety refers to negative thoughts, worry, and self-doubt regarding performance outcomes, whereas somatic anxiety manifests as physiological symptoms such as increased heart rate, sweating, and muscle tension. Both components can influence an athlete's pain perception and their ability to endure physically demanding conditions. For instance, research suggests that heightened anxiety before a competition is correlated with increased pain sensitivity, leading to potential decrements in performance (Sen Cermikli, 2021). Conversely, some studies indicate that experienced athletes may develop psychological resilience that enables them to regulate anxiety and manage pain more effectively, thereby sustaining high performance levels under pressure (Raglin, 1992; Gould et al., 2002; Mosewich et al., 2013; Sarkar & Fletcher, 2014).

The acute pain threshold holds significant importance in sports characterized by physical contact and a high risk of injury. Wrestling, as a combat sport, necessitates not only a high tolerance for pain but also rapid reaction times and exceptional physical endurance. The perception of pain and fear responses in wrestling is shaped by an athlete's psychological preparedness, competitive experience, and mental resilience (Çağlar et al., 2025). Pre-competition anxiety can substantially influence pain perception, potentially affecting overall performance and motivation. Given that maintaining optimal athletic performance requires a stable motivational state, high-level athletes must effectively regulate their psychological readiness (Gül & Urhan, 2024). Furthermore, psychological stressors have been shown to modulate sensory processing mechanisms, leading to variations in pain sensitivity. Depending on the athlete's coping strategies, such stressors may either heighten pain perception or diminish the ability to perceive pain, thereby influencing performance outcomes (Cintineo & Arent, 2019).

Given the high psychological and physical demands of wrestling, it is essential to investigate the association between pre-competition anxiety levels and acute pain thresholds in athletes. Previous research has suggested that anxiety plays a role in modulating pain perception in sports settings (Michaelides & Zis, 2019; Sarıakçalı et al., 2025). However, the specific relationship between anxiety and pain thresholds among female wrestlers remains an area that requires further exploration. Therefore, the present study aims to analyze the potential effects of pre-competition anxiety on pain tolerance in elite female wrestlers competing at a national level, particularly before a physically and mentally demanding event such as the Turkish Senior Women's Wrestling Championship. This study hypothesizes that heightened anxiety levels

before competition may negatively impact pain tolerance, thereby influencing overall athletic performance.

METHOD

Scope of the study and participants

This study was conducted prior to the Mahmut Atalay Senior Women's Wrestling Championship in Turkey. It was conducted on 30 volunteer female wrestlers participating in the championship. The participants were selected from different weight classes and different levels of experience.

Body composition analysis

The participants' body composition data was determined using bioelectrical impedance with the Tanita 418 BC device.

Algometer measurement

Mechanically induced pain, especially the pressure pain threshold, is a common model to trigger acute experimental pain (Chesterton, 2007). Algometry (Baseline) is a useful technique for determining the pressure pain threshold and is frequently used in both laboratory and clinical settings (Marques, 2008). The pressure pain threshold is defined as the minimum force applied to cause pain (Bablis, 2008). Measurement with a pressure algometer is primarily a manual procedure that requires the patient's awareness (Çetin, 2009). Algometer is an instrument that measures the pressure pain threshold and pain tolerance in quantitative sensory tests (Gökoğlu, 2001). The algometer (dolorimeter), an instrument for measuring mechanical pressure, is a device that has a circular rubber at the end of the spring-loaded cylinder, contains a pressure surface with a diameter of 1 cm^2 and displays the measured values in kg/cm^2. The algometer device to be used in the study consists of a metal bulb with a circular rubber disk 1 cm in diameter at the end which can measure pressure in kilograms (kg) and pounds (lb) and has a scale calibrated to 10 kg with 100-gram graduations (1 lb = 0.4536 kg). When the rubber disk on the metal plunger of the device is pressed vertically against the skin, the needle on the scale moves clockwise to measure the pain threshold.

Anxiety rating scale (ARS)

The participants were given an Anxiety Rating Scale (ARS) to measure their anxiety about the competition. This scale consists of 10 questions and is a standard measurement tool commonly used in sport psychology research (Malakçıoğlu, 2022). The validity of the scale was confirmed by Malakçıoğlu (2022) with a Pearson correlation ($r=0.167$, $p<0.01$). All test-retest reliabilities (r) were above 0.5 ($p<0.001$). The internal consistency coefficients of

Cronbach's alpha were calculated as 0.845 (CSQ), 0.770 (Physiological Tension=FG), 0.822 (Worry=E) and 0.838 (Feeling Insecure=GH). For this study, the Cronbach's alpha value of the scale was calculated as 0.796.

Ethics committee approval

The research was conducted in accordance with ethical rules. All participants were informed in detail about the purpose and methods of the study and their written consent was obtained. The confidentiality and security of participants' personal data was maintained throughout the research process. Ethical approval for this study was granted by the non-interventional ethics committee of Hitit University on 07.02.2024 under application number 2024-0019 and ethical approval number 2024-01.

Analysis of data

In analysing the data, percentage (%), frequency, mean and a simple linear regression analysis were performed to determine the effect of the independent variable on the dependent variable using the SPSS 24 package.

FINDINGS

Of the female wrestlers who participated in the study, 93.5 were dominant right-handers and right-leg users (n=29) were 93.5% were dominant left-handers and left-leg users (n=2) were 6.5%. The age of the participants was reported as 20.32±2.21 years. The average height of the participants was 163.48±6.60 cm, fat percentage 17.52%, fat mass 10.50±3.37 kg and lean body mass was 49.89±4.83 kg. The athletic age of the participants was 7.00±2.16 years, the weekly training time was 5.58±0.99 days and the training time per day was 2.55±0.850 hours.

Table 1. Mean pain threshold and anxiety scores of the participants

Variables	Minimum	Maximum	x̄± Sd.
Occiput Right	2	5	3.58±0.87
Occiput Left	2	6	3.57±0.89
Lateral Epicondyle Right	2	5	3.50±0.74
Lateral Epicondyle Left	2	5	3.48±0.80
Trapezius Right	3	7	4.45±0.85
Trapezius Left	2	7	4.60±0.96
Total Anxiety Score	23.00	46.00	34.35±5.62

The average anxiety score of the participants was 34.35±5.62.

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Table 2. Effect of the total anxiety score on the pain threshold at the right occiput

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta	t	p
Occiput Right	Stable	3.782	1.006		3.758	0.001
	Total Anxiety Score	-0.006	0.029	-0.038	-0.206	0.838

F: 0.042 Model (p): 0.838 R^2 : 0.001 Adjusted R^2 : -0.033

The independent variable total anxiety score had no influence on the pain threshold of the right occiput of the participants (p>0.05).

Table 3. Effect of the total anxiety score on the pain threshold at the back of the left head

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta	t	p
Occiput Left	Stable	3.917	1.029		3.808	0.001
	Total Anxiety Score	-0.010	0.030	-0.064	-0.344	0.733

F: 0.118 Model (p): 0.733 R^2 : 0.004 Adjusted R^2 : -0.030

The total score of anxiety had no influence on the pain threshold of the left occiput of the participants (p>0.05).

Table 4. Effect of the total anxiety score on the pain threshold of the right lateral epicondyle

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta222	t	p
Lateral Epicondyle Right	Stable	3.959	0.846		4.678	0.001
	Total Anxiety Score	-0.013	0.024	-0.102	-0.553	0.584

F: 0.306 Model (p): 0.584 R^2 : 0.010 Adjusted R^2 : -0.024

The participants' anxiety levels had no influence on the pain threshold of the right lateral epicondyle (p>0.05).

Table 5. Effect of the total anxiety score on the pain threshold of the left lateral epicondyle

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta	t	p
Lateral Epicondyle Left	Stable	3.445	0.934		3.690	0.001
	Total Anxiety Score	0.001	0.027	0.006	0.034	0.973

F: 0.001 Model (p): 0.973 R^2 : 0.000 Adjusted R^2 : -0.036

Table 5, the total score of anxiety has no influence on the pain threshold of the left lateral epicondyle (p>0.05).

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Table 6. Effect of the total anxiety score on the pain threshold of the right trapezius muscle

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta	t	p
Trapezius Right	Stable	5.173	0.973		5.315	0.001
	Total Anxiety Score	-0.021	0.028	-0.139	-0.757	0.455

F: 0.573 Model (p): 0.455 R^2: 0.019 Adjusted R^2: -0.014

The total anxiety score of the participants had no effect on the right trapezius pain threshold (p>0.05).

Table 7. Effect of the total anxiety score on the pain threshold of the left trapezius muscle

Dependent Variable	Independent Variable	Non-Standardized Coefficients		Standardized Coefficients		
		B	SH	Beta	t	p
Trapezius Left	Stable	4.494	1.110		4.049	0.001
	Total Anxiety Score	0.003	0.032	0.017	0.094	0.926

F: 0.009 Model (p): 0.926 R^2: 0.017 Adjusted R^2: -0.034

According to Table 7, anxiety total score had no effect on the dependent variable trapezius left pain threshold (p>0.05).

DISCUSSION AND CONCLUSION

The results of this study may provide valuable insights into how athletes manage their pre-competition anxiety and increase their pain tolerance. They may also provide important strategies for coaches and sport psychologists to optimize the psychological and physical preparation of athletes. This study should make a valuable contribution to the sport science literature on the effects of pre-competition anxiety on wrestlers' perception of pain.

According to the results of the study, the total anxiety score had no effect on the participants' occiput right and left occipital pain thresholds (p>0.05) (Table 2-3). Çağlar et al., (2025) found that the pain threshold in thoracolumbar segments decreased in kickboxers before competition after rapid weight reduction. According to the results of the same study, psychological endurance was found to be at high levels. Sa and Silva (2017) found that pain intensity, frequency and duration were moderately associated with anxiety in adolescents with neck pain. Burston et al., (2019) They found that high anxiety levels were significantly associated with high pain sensitivity in people with knee osteoarthritis. The results of this study suggest that anxiety has no direct effect on the pain threshold at the back of the head. However, these results are not consistent with some studies in the literature Burston et al., 2019 and Sa and Silva (2017). To explain this situation, several possible factors should be considered. First, the presence of other important factors besides anxiety that influence the pain threshold at the

back of the head should be considered. If these factors are not included in the model, the effect of anxiety may be less pronounced. In addition, individual differences among participants and variations in study conditions may also contribute to the differentiation of these results. Fear, stress and sense of catastrophe, as well as anxiety, have been shown to be mediators in the causal pathway between pain and disability.

While examining the literature on this subject, it was found that the anxiety levels of 30 girls and 30 boys in the star category, 30 girls and 30 boys in the junior category and 20 girls and 20 boys in the senior category who participated in the 2007-2008 Turkish Taekwondo Championship increased before the competition and decreased at the end of the competition. It was found that the level of anxiety before and after the competition affected the success of the athlete. Pre-competition anxiety was lower in the first-place athletes than in the second- and third-place athletes. (Akandere & Bedir 2011). In this context, in sports that require a high level of physical and mental endurance, such as taekwondo, reducing athletes' anxiety levels can be seen as a crucial strategy for increasing their success. It is important for sport psychologists to develop anxiety management and stress reduction techniques for athletes by focusing on such studies (Cerit et al., 2013) Their study found a significant difference between the teams' anxiety levels and their performance. This was based on the results of a total of 45 basketball players who took part in the last four games of the 2nd Turkish Women's Basketball League (Civan et al., 2010). There was no significant difference in the pre-match state of anxiety variable depending on the person who aroused the sense of responsibility before the match, while there was a significant difference depending on the person who aroused the emotion. This suggests that the type of sport and the source of emotional arousal play an important role in influencing athletes' anxiety levels. These results emphasize the importance of specific psychological support strategies to meet the particular needs of athletes depending on their sport and the causes of their anxiety. In another study examining the anxiety levels of wrestling athletes before were after competition, it was found that there was a significant difference between pre-competition and post-competition anxiety levels, and it was concluded that pre-competition anxiety levels were higher than post-competition anxiety levels (Demirli, 2017).

This study provides important data in the psychological and physical preparation processes of athletes by examining the effect of pre-competition anxiety levels on pain threshold. According to the results of the study, the total anxiety score of the participants had no effect on the right and left occipital pain threshold at the back of the head (occiput) ($p>0.05$). This differs from some studies in the literature such as Sa and Silva (2017) and Burston et al.

(2019). While anxiety has been found to be associated with pain sensitivity, especially in adolescents with headache and individuals with knee osteoarthritis, no such effect was found in this study. It is thought that this may be due to the fact that other factors that may affect pain threshold besides anxiety were not included in the model and individual differences. Leźnicka et al. (2016), combat sport athletes showed significantly higher pain tolerance in the Cold Press Test (CPT) and Pressure pain threshold (PPT) tests ($p<0.001$). Athletes were found to have a higher pain threshold in the PPT; however, no significant difference was found in the CPT. 91.43% of combat athletes could tolerate >10 kg/cm2 pressure compared to 57.46% of non-athletes. In another study, the odds of a high pain threshold were significantly higher in combat athletes (26%) than in non-athletes (1%) ($p < 0.001$). Combat athletes have higher pain tolerance due to their regular physical activity and intense training (Leźnicka et al., 2023).

In addition, studies conducted in different sports branches in the literature show that there is a relationship between athletes' achievement levels and their anxiety levels. Studies such as Akandere and Bedir (2011) suggest that reducing pre-competition anxiety levels can increase the success of athletes. In this context, in sports with high physical and mental endurance such as taekwondo and wrestling, managing athletes' anxiety levels can be seen as a critical strategy to increase success.

In line with the findings of this study, the importance of anxiety management and stress reduction techniques to be developed by sport psychologists to manage athletes' pre-competition anxiety emerges. Creating personalized psychological support strategies by taking into account the individual differences of athletes may reduce the negative effects of anxiety on performance. In addition, conducting studies that examine the effects of anxiety on pain threshold more comprehensively may increase the knowledge in this field.

Suggestions

Considering that the level of anxiety may differ according to the type of sport, it is recommended to develop strategies to reduce anxiety, especially in sports that require endurance and strength. Finally, regular follow-up of athletes' anxiety levels before and after the competition may be a useful indicator to understand the effect of anxiety level on success.

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Tasarım *Design*	Yöntem ve araştırma desenini tasarlamak *To design the method and research design.*	Esin Çağla ÇAĞLAR Müjde ATICI
Literatür Tarama *Literature Review*	Çalışma için gerekli literatürü taramak *Review the literature required for the study*	Esin Çağla ÇAĞLAR Müjde ATICI
Veri Toplama ve İşleme *Data Collecting and Processing*	Verileri toplamak, düzenlemek ve raporlaştırmak *Collecting, organizing and reporting data*	Esin Çağla ÇAĞLAR Müjde ATICI
Tartışma ve Yorum *Discussion and Commentary*	Elde edilen bulguların değerlendirilmesi *Evaluation of the obtained finding*	Esin Çağla ÇAĞLAR Müjde ATICI

Destek ve Teşekkür Beyanı/ *Statement of Support and Acknowledgment*

Bu çalışmanın yazım sürecinde katkı ve/veya destek alınmamıştır.

No contribution and/or support was received during the writing process of this study.

Çatışma Beyanı/ *Statement of Conflict*

Araştırmacıların araştırma ile ilgili diğer kişi ve kurumlarla herhangi bir kişisel ve finansal çıkar çatışması yoktur.

Researchers do not have any personal or financial conflicts of interest with other people and institutions related to the research.

Etik Kurul Beyanı/ *Statement of Ethics Committee*

Bu araştırma, Hitit Üniversitesi Etik Kurulunun 07.02.2024 tarihli ve 2024-01 sayılı kararı ile yürütülmüştür.

This research was conducted with the decision of Hitit University Ethics Committee dated 07.02.2024 and numbered 2024-01.

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