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An Examination of the Attention and Psychological Skill Levels of Combat Athletes

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Abstract

The problem statement of the research is to examine whether there is any difference between the selected martial arts branches and attention levels and psychological skill levels. Also, there is a significant difference between gender and psychological skill and attention. The aim of this research is to examine the relationship between the psychological skills and attention levels of athletes involved in four different branches of combat sports (Boxing, Kickboxing, Muay Thai, and Taekwondo). A total of 85 athletes participated in the study, consisting of 52 males and 33 females. As data collection tools, a personal information form, the d2 Test of attention, and scale for evaluating athletes' psychological skills were used. To compare the data, the Independent Samples T-Test was applied for binary groups, and the One-Way ANOVA test was applied for groups of three or more. To determine which groups showed significant differences as a result of the One-Way ANOVA test, Tukey's Post Hoc test was used. At the end of the study, the richness and differences of Muay Thai among combat sports have been brought to the literature.
Keywords: Combat sports, Muay Thai, Attention, Psychological skill

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INTRODUCTION

Nowadays, sports have transformed from traditional to modern and have become highly professionalized. This professionalism has been achieved primarily through athletes internalizing their respective disciplines and progressing with the guidance of science. When we delve into the root of the matter, it is evident that what individuals experience in their inner world significantly affects the quality of sports. This inner world possesses a universe so vast that it cannot be confined. However, it gives rise to a general concept that we can express as psychological skills, which fundamentally include concepts like pressure, stress, and fear.

Psychological skills are factors that enable the manifestation of talents, increase motivation, and ensure the athlete's success. These factors include goal setting, imagery, self-talk, motivational speech, altering the direction of thoughts, autogenic training, progressive relaxation techniques, and elements such as fear and stress, all of which exist through their visualization in the mind. The convergence of all these factors, coming together to create motivation, forms psychological skills (Erhan et al., 2015). Although athletes strive to improve their physical factors such as strength, balance, and agility to achieve excellence in performance, they must do so within a framework of intense concentration. In fact, we can assume that psychological skills and attention are the true subjects in the development of such excellent performance. Regardless of the sport, attention is of paramount importance. For an individual to achieve the desired performance, focus is essential. Perfect focus can only be achieved with equally perfect attention.

Attention is a function of the nervous system that allows us to focus only on the stimuli relevant to our current needs and goals amidst numerous other stimuli (Yayci, 2007). It refers to the selective and active element in our perceptions (Korkmaz, 2000). Attention, being a part of daily life, is a cognitive process that humans must use in every aspect of their lives. Any task performed without proper attention will inevitably be incomplete and flawed. For athletes to perfectly and completely perform the skills they aim for, they must intensify their focus and aim to perform at the highest level of attention (Güllü, 2012). For instance, if an archer experiencing attention deficit cannot focus adequately on the target, they may struggle to achieve the necessary concentration. No matter how fit they are in terms of muscle strength, weight, or height, if they cannot integrate this physically and cognitively, the likelihood of failure is high (Tiryaki, 2000). Generally, during training, athletes and coaches prioritize physical skills while neglecting or failing to equally develop psychological skills, leading to significant performance losses for the athlete. As a result, there is a direct decline in sports success. Additionally, athletes and coaches should improve their psychological skills and attention levels, conduct regular tests, and ensure continuous practice.

Combat sports are a field that continues to be prevalent and popular today. This can be attributed to numerous reasons. Combat sports are highly complex, encompassing a variety of skills, including balance, strength, speed, agility, reflexes, focus, strategy, and tactics, among others.

Moreover, the intense and multifaceted training in combat sports results in high levels of calorie expenditure (Kimmel & Rogler, 2018). In addition to improving physical endurance, strategic thinking, and technical skills, combat sports offer several advantages that positively affect mental health. They primarily involve the learning process of discipline and self-control. Athletes enhance their problem-solving skills when facing crises and challenges during training and competitions, while also improving their ability to cope with stress and maintain emotional balance. This improvement helps them better withstand the stresses and pressures of daily life (Weiser et al., 1995). Combat sports also boost self-esteem and confidence. Dealing with challenges encountered during training increases athletes' confidence in their abilities. Observing their achievements and development has a positive impact on mental health. Furthermore, combat sports strengthen social bonds. Team training or group activities and competitions in gyms support social relationships, expanding emotional support networks. Although combat sports may seem individual, they are, in fact, a team effort with a significant psychological component (Theeboom, 2009). Combat sports positively affect both physical and mental health. Gains such as discipline, self-control, self-esteem, and social bonds help athletes lead healthier and more balanced lives. Therefore, combat sports play an important role as a lifestyle choice that strengthens both the body and the mind (Emru-Tadesee, 2017).

Although psychological skills are compatible with sports, psychological skills and attention are equally important. An excellent athlete must first have solid psychological skills, and this is actually possible with attention and concentration. No matter how careful the athlete is, if his psychological skills are low, he will either fail or have difficulty fully achieving the desired success. For this reason, psychological skills and attention and sports appear as an inseparable whole. This triangular structure is an indispensable key for athletes to achieve great success.

When reviewing the professional literature, it is evident that increasing the athlete's attention is a necessity for superior performance. To improve attention, one must focus on a goal, and attention exercises together with sports raise concentration and performance to a higher level (Gallahue, 1982).

The main aim of our study is to examine four different martial arts disciplines under the umbrella of combat sports in terms of attention and psychological ability levels. In addition, we wanted to investigate whether there are differences in limb usage, attention and psychological ability between these martial arts disciplines. It is thought that this study will help to show which branch will be more advantageous for improving the attention of athletes interested in combat sports within certain combat branches. These four similar fighting arms have a rare structure that has not been previously examined with attention or psychological skills surveys and has not been encountered or researched in the literature.

The Purpose and Importance of the Research

The purpose of our research is to study the attention and psychological skills of boxing, kickboxing, Muay Thai and Taekwondo athletes who are interested in combat sports. The four research branches were not chosen randomly. Each branch has its own techniques, and all have similar and different characteristics from other branches. These differences broaden the hypothesis of our research and allow us to look at the research from different perspectives. For example, while boxing only uses punches, Taekwondo uses both punches and kicks. While kickboxing uses punches, kicks and knees, Muay Thai is richer than other branches by including elbow strikes in addition to all of these techniques. The purpose is to study the relationship between attention and psychological skills, since the limb uses or techniques are similar between these branches and different from each other. In terms of importance, since research on combat sports is limited, it is thought that our study will contribute to this field. Since there are few studies addressing the cognitive and mental aspects of sports, it is very important to increase such studies.

Problem Statement of the Research

• Is there a significant difference in the attention and psychological skill levels of combat athletes according to the sport branch variable?

• Is there a significant difference in the attention and psychological skill levels of combat athletes according to the gender variable?

METHOD

Research Model

In this study, which aims to investigate the relationship between athletes' attention levels and psychological skills based on certain socio-demographic characteristics, a relational screening model from descriptive methods has been employed. Screening models are research approaches designed to reflect a situation that exists in the present or in the past. The subjects or objects of the study are described within the existing conditions as they are. The relational screening model is used to examine the relationships between multiple variables (Karasar, 2014). During the research process, no modifications or developments were made to the data collection tools; instead, the focus was on identifying and documenting the current state.

Research Groups

Our research group consists of 85 athletes involved in combat sports in Tekirdağ, selected randomly using a non-selective method. Of these athletes, 33 are female and 52 are male. The distribution across sports disciplines is as follows: 25 are involved in Boxing, 17 in Kickboxing, 22 in Muay Thai, and 21 in Taekwondo.

Data Collection Tools

In the study, a personal information form, the D2 Test of Attention, and a scale for evaluating athletes' psychological skills were used as the data collection tools.

The Personal Information Form consists of questions related to the participants' gender and the combat sports disciplines they are involved in.

Scale for Evaluating Athletes' Psychological Skills, developed by Smith et al., (1995) and translated into Turkish by Erhan et al., (2015) after validity and reliability studies, consists of 28 items. It uses a 4-point Likert scale and includes 7 sub-dimensions.

These dimensions and the items they are related to are as follows;

• Ability to Cope with Difficulties: 5,17,21,24 (4 items).
• Being Open to Learning: 3,10,15,27 (4 items).
• Concentration: 4,11,16,25 (4 items).
• Confidence and Success Motivation: 2,9,14,26 (4 items).
• Goal Setting and Mental Preparation: 1,8,13,20 (4 items).
• Being Able to Perform Well Under Pressure: 6,18,22,28 (4 items).
• Freedom from Anxiety: 7,12,19,23 (4 items).

The scoring is scored between 0 and 3 according to the expressions 'Almost never', 'Sometimes', 'Frequently' and 'Almost always'. Questions numbered 3, 7, 10, 12, 19 and 23 of the scale are negative and should be numbered in reverse. Scoring for sub-dimensions varies between 0 and 12 and an increase in the score obtained from the scale indicates that the athlete has good psychological skills.

Ability to Cope with Difficulty: This subscale measures whether an athlete is positive, enthusiastic, calm, controlled, and able to quickly recover from mistakes even when the going gets tough. 'I maintain emotional control no matter how things go for me'.

Openness to Learning: Measures whether an athlete is open to learning and accepts constructive criticism without taking it personally or getting upset. 'When a coach or manager tells me how to fix a mistake I've made, I tend to take it personally and get upset'.

Concentration: This subscale measures whether an athlete is easily distracted and can concentrate on the task even in unexpected adverse situations both in training and during matches. 'I can focus my attention and forget about distractions while playing sports'.

Confidence and Motivation for Success: Measures whether an athlete is confident and positively motivated during training and matches. 'I make the most of my talent and skills'.

Goal Setting and Mental Preparation: Measures whether an athlete sets and works towards specific performance goals. 'I set my own performance goals for every practice'.

Performing Well Under Pressure: Measures whether an athlete performs better under pressure. 'The more pressure there is during a game, the more I enjoy it'.

Releasing Worries: Measures whether an athlete puts pressure on himself by worrying about making mistakes or performing poorly (Smith & Christensen, 1995). 'I worry a lot about what others think of my performance'.

D2 Test of Attention is suitable for individuals aged 9 to 60 and can be administered either individually or in groups. It measures selective attention with a time-dependent approach. Key aspects assessed by the test include adherence to rules, the speed of task completion, and performance quality. The test consists of two pages: the front page features a personal information form with questions identifying the individual, their dominant hand, and a sample test application. It also includes a table showing the total score obtained. The back page contains 14 rows, each with 47 figures, totaling 658 figures. The test uses the letters 'd' and 'p,' with some letters having one, two, three, or four dots either above or below them. These letters and dot configurations appear in 16 different variations. The main task for the test taker is to identify the 'd' letters with exactly two dots. These can be detected in three different ways within the test. The test taker has 20 seconds to complete each row, and the total test duration is approximately eight minutes. At the end of the test, there are two separate scoring keys used to calculate the scores obtained from the d2 Test of Attention. The test is scored as follows (Zillmer & Brickenkamp, 1998):

Total Number of Marked Rows (TN): This is a quantitative measure of performance on all processed items, both relevant and irrelevant. It represents the parameter for attentional continuity and is the sum of correctly marked items.

Number of Unmarked/Omitted Steps (E1): This measures the error rate of missed or unmarked 'd' letters. It reflects selective attention, with a higher E1 indicating lower selective attention (Brickenkamp & Rump, 1966).

Number of Incorrectly Marked Letters (E2): This refers to the 'd' or 'p' letters that were incorrectly marked.

Total Errors (E): This includes both the unmarked (E1) and incorrectly marked letters (E2).

Concentration Performance (CP): This represents the concentration performance and is the only measure reflecting performance throughout the test. It is an excellent index of the coordination between accuracy and speed. CP is calculated by subtracting the number of incorrectly marked figures (E2) from the number of correctly marked relevant items.

Test Performance (TN-E): This score is obtained by subtracting the total number of errors from the total number of marked items. It represents the speed of marking and data processing. TN-E provides a Total Performance score, showing a normal distribution, high reliability, and measurement of the relationship between accuracy and speed. However, TN-E weighs the quantitative aspect of performance more heavily than the qualitative aspect. In unusual situations, where both quantitative and qualitative scores (total score and error percentage) are excessively high, TN-E may overestimate total performance. Excessive predictions can be avoided by considering error scores or, alternatively, by examining the recent concentration performance score.

Error Rate (% E): These variable measures the qualitative aspect of performance, representing the error rate among all processed items. As the error rate decreases, the accuracy,

quality of the task, and attentiveness of the subject increase. It is calculated by dividing the total number of marked rows by the total number of errors (TN / E).

Fluctuation Rate (FR): This is the difference between the row with the maximum number of processed items and the row with the minimum number. It is one of the less reliable measurements of the test. Extremely high FR scores may indicate inconsistency in work speed and could be related to decreased motivation.

Ethical Approval

The research was accepted and approved by the Social and Human Sciences Research and Publication Ethics Committee of Tekirdağ Namık Kemal University on 27 July 2023 at 16:00, during meeting number T2023-1577 (Document Date and Number: 28.07.2023-327095).

Collection of Data

Data was collected in January 2024 by visiting gyms where combat athletes were registered. The process involved first administering the d2 Attention Test while their minds were fresh, then administering the Personal Information Form, and finally administering the Psychological Skills Assessment Scale, all conducted face-to-face before training sessions.

Analysis of Data

The data was transferred to an electronic format using IBM SPSS v21.0 software and statistical analyses were conducted. Before analyzing the data, a normality test was performed, and independent sample t-test and one-way analysis of variance were applied to data showing normality. A significance level of $p<0.05$ was considered in the analysis. For comparing scale data, Independent Samples T Tests were used for binary groups, and One-Way ANOVA was applied for groups of three or more. To determine which groups showed significant differences after the One-Way ANOVA, Tukey's Post Hoc test was performed.

Table 1. D2 attention test normality analysis with psychological skills

	Skewness	Kurtosis
Psychological Skill	-,134	,308
D2 Attention	-,293	-,270

Table 1 shows the results of the skewness and kurtosis normality tests of the Psychological Skills Scale and the D2 Attention Test Scale. Based on these results, it was determined that the data were normally distributed (+1.5, -1.5) (Tabachnick et al., 2013).

FINDINGS

Table 2. Comparison of d2 attention and psychological skills scale by gender variable

		Gender	n	X	ss	t	p
D2 Attention	TN	Female	33	454,52	77,85	,246	,806
		Male	52	449,65	103,5		
	E1	Female	33	36,03	19,26	-2,818	**,006***
		Male	52	59,52	47,58		
	E2	Female	33	15,24	27,85	,361	,719
		Male	52	13,51	16,22		
	E	Female	33	51,27	36,08	-2,281	**,025***
		Male	52	73,03	51,77		
	TN-E	Female	33	403,21	73,66	1,454	,150
		Male	52	376,61	87,14		
	CP	Female	33	142,66	38,19	2,476	**,015***
		Male	52	118,36	47,43		
	FR	Female	33	17,39	6,86	-,903	,369
		Male	52	18,92	8,03		
	% E	Female	33	16,48	17,48	1,832	,074
		Male	52	10,30	9,85		
Psychological Skill	Ability to Cope with Challenges	Female	33	2,66	,72	-1,200	,233
		Male	52	2,85	,66		
	Openness to Learning	Female	33	3,50	,52	2,092	**,040***
		Male	52	3,23	,69		
	Concentration	Female	33	2,71	,49	-,704	,483
		Male	52	2,80	,59		
	Confidence and Success Motivation	Female	33	2,71	,49	-,704	,483
		Male	52	2,80	,59		
	Goal Setting and Mental Preparation	Female	33	2,72	,60	-1,089	,279
		Male	52	2,87	,64		
	Performing Well Under Pressure	Female	33	2,28	,77	-2,363	**,020***
		Male	52	2,69	,76		
	Overcoming Worries	Female	33	2,64	,59	-,002	,998
		Male	52	2,64	,61		
	Total	Female	33	2,75	,34	-1,018	,312
		Male	52	2,84	,43		

*($p<0.05$)

Table 2 shows that there were no significant differences in the d2 Test of Attention scores based on gender for TN (t=,246), E2 (t=,361), TN-E (t=1,454), and FR (t=-,903) ($p>0.05$). However, significant differences were found in several areas. Specifically, for E1 (Number of Missed Items), female athletes (M=36.03) had significantly fewer missed items compared to male athletes (M=59.52) ($p<0.05$). Similarly, in terms of E (Error), female athletes (M=51.27) showed a significantly lower error rate compared to male athletes (M=73.03) ($p<0.05$). For CP (Concentration Performance), female athletes (M=142.66) demonstrated significantly better performance compared to male athletes (M=118.36) ($p<0.05$). Additionally, the %E (Error Rate) was significantly lower for female athletes (M=16.48) compared to male athletes (M=10.30) ($p<0.05$). Regarding psychological skill subdimensions, no significant differences were observed

for Ability to Cope with Challenges (t=-1,200), Concentration (t=-,704), Confidence and Success Motivation (t=-,704), Goal Setting and Mental Preparation (t=-1,089), Overcoming Worries (t=-,002), and Total (t=-1,018) (p>0.05). However, significant differences were noted in Openness to Learning, with female athletes (M=3.50) scoring higher than male athletes (M=3.23) (p<0.05). In contrast, for Performing Well Under Pressure, male athletes (M=2.63) showed significantly better performance compared to female athletes (M=2.28) (p<0.05).

Table 3. Comparison of d2 attention and psychological skill scale by sports discipline

		Discipline	**n**	**X**	**ss**	**p**	**Expressiveness**
D2 Attention	TN	(A) Boxing	25	453,72	114,38	,983	
		(B) Kickboxing	17	457,47	91,79		
		(C) Muay Thai	22	445,68	89,63		
		(D) Taekwondo	21	450,29	78,11		
	E1	(A) Boxing	25	42,12	35,41	**,038***	**B-A**
		(B) Kickboxing	17	76,71	50,82		
		(C) Muay Thai	22	42,41	42,58		
		(D) Taekwondo	21	47,33	38,33		
	E2	(A) Boxing	25	16,20	16,22	**,024***	**D-C**
		(B) Kickboxing	17	12,05	14,31		
		(C) Muay Thai	22	4,40	3,30		
		(D) Taekwondo	21	23,27	34,84		
	E	(A) Boxing	25	58,32	42,11	**,036***	**B-C**
		(B) Kickboxing	17	88,76	56,69		
		(C) Muay Thai	22	46,81	42,34		
		(D) Taekwondo	21	71,09	43,34		
	TN-E	(A) Boxing	25	395,40	96,53	,639	
		(B) Kickboxing	17	368,70	77,65		
		(C) Muay Thai	22	398,81	83,04		
		(D) Taekwondo	21	379,19	70,14		
	CP	(A) Boxing	25	136,12	43,76	**,029***	**C-B**
		(B) Kickboxing	17	105,11	49,82		
		(C) Muay Thai	22	144,36	42,16		
		(D) Taekwondo	21	118,90	40,08		
	FR	(A) Boxing	25	16,52	6,11	,349	
		(B) Kickboxing	17	19,11	7,71		
		(C) Muay Thai	22	17,77	7,78		
		(D) Taekwondo	21	20,42	8,77		
	% E	(A) Boxing	25	10,50	6,04	**,024***	**C-B**
		(B) Kickboxing	17	8,55	6,85		
		(C) Muay Thai	22	20,11	20,37		
		(D) Taekwondo	21	10,80	13,11		

(p<0.05)

Table 3 (Continue). Comparison of d2 attention and psychological skill scale by sports discipline

	Discipline		n	X	ss	p	Expressiveness
Psychological Skill	Ability to Cope with Challenges	(A) Muay Thai	22	3,00	,56	,391	
		(B) Taekwondo	21	2,70	,66		
		(C) Boxing	25	2,69	,82		
		(D) Kickboxing	17	2,72	,66		
	Openness to Learning	(A) Muay Thai	22	3,43	,52	,512	
		(B) Taekwondo	21	3,26	,69		
		(C) Boxing	25	3,43	,61		
		(D) Kickboxing	17	3,17	,76		
	Concentration	(A) Muay Thai	22	2,89	,42	,400	
		(B) Taekwondo	21	2,60	,59		
		(C) Boxing	25	2,79	,59		
		(D) Kickboxing	17	2,79	,62		
	Confidence and Success Motivation	(A) Muay Thai	22	2,89	,42	,400	
		(B) Taekwondo	21	2,60	,59		
		(C) Boxing	25	2,79	,59		
		(D) Kickboxing	17	2,79	,62		
	Goal Setting and Mental Preparation	(A) Muay Thai	22	2,87	,63	,942	
		(B) Taekwondo	21	2,76	,42		
		(C) Boxing	25	2,84	,71		
		(D) Kickboxing	17	2,79	,75		
	Performing Well Under Pressure	(A) Muay Thai	22	2,37	,76	,700	
		(B) Taekwondo	21	2,54	,57		
		(C) Boxing	25	2,65	,97		
		(D) Kickboxing	17	2,55	,78		
	Overcoming Worries	(A) Muay Thai	22	2,38	,52	,109	
		(B) Taekwondo	21	2,70	,64		
		(C) Boxing	25	2,69	,72		
		(D) Kickboxing	17	2,83	,35		
	Total	(A) Muay Thai	22	2,83	,30	,844	
		(B) Taekwondo	21	2,74	,34		
		(C) Boxing	25	2,84	,49		
		(D) Kickboxing	17	2,81	,46		

When Table 3 is examined, no significant difference was found in the D2 Attention Test results by sports discipline for TN, TN-E, and FR dimensions ($p>0.05$). An analysis of E1 data revealed a significant difference in favor of Kickboxing (M=76.71) compared to Boxing (M=42.12) ($p<0.05$). For E2 data, a significant difference was found in favor of Taekwondo (M=23.27) compared to Muay Thai (M=4.40) ($p<0.05$). When examining E (Error) data, a significant difference was observed in favor of Kickboxing (M=88.76) compared to Muay Thai (M=46.81) ($p<0.05$). CP data showed a significant difference in favor of Muay Thai (M=144.36) compared to Kickboxing (M=105.11) ($p<0.05$). %E data revealed a significant difference in favor of Muay Thai (M=20.11) compared to Kickboxing (M=8.55) ($p<0.05$). No significant differences were found in the sub-dimensions of the Psychological Skills Test by sports discipline ($p>0.05$).

DISCUSSION AND CONCLUSION

The study aimed to examine the relationship between psychological skills and attention levels among combat sports athletes, specifically those in Tekirdağ. This study is considered one of the first in the field to explore these hypotheses, given the rarity of similar research in the context of the four combat sports disciplines involved. The scarcity of such studies highlights a gap in the field, emphasizing the study's contribution and its potential to address existing needs. The findings of this research, along with the recommendations provided, are expected to illuminate future research on the topic. Athletes were subjected to two types of tests under various conditions to ensure that their attention remained undistracted, aiming for the highest possible data reliability. This section discusses and interprets the results of the study.

In the comparison of the scores from the d2 attention and psychological skill scales based on the gender variable, the d2 attention test data showed no significant differences in the total number of marked lines (TN), the number of incorrectly marked letters (E2), test performance (TN-E), fluctuation rate (FR), and error rate (% E). According to the research results, the absence of a significant difference in the total number of marked lines (TN) by gender suggests that there is no distinctive difference in the marking and data processing speeds of the athletes. However, the analysis of unmarked/omitted steps (E1) data revealed that male participants had higher error scores and left more blank figures compared to female participants.

The Total Error (E) value represents the sum of E1 and E2. The absence of a significant difference in E2, which indicates the number of incorrectly marked figures, suggests that the Total Error (E) score, which shows a significant difference favoring males, aligns with the findings of the E1 score. In this context, it is observed that male athletes left more figures unmarked compared to female athletes, resulting in a significant difference in the Total Error values favoring males.

In the study conducted by Çağlar and Koruç (2006), no statistically significant difference was found between genders in terms of d2 attention test scores. This result shows that girls and boys have similar attention performances. At the same time, it can be evaluated that the effect of gender on the results of the attention test is limited. A study conducted by Eynur et al., (2017) revealed that female athletes exhibited statistically superior performance compared to male athletes in terms of adaptation, attention consistency, time focus, attention control, hand-eye-brain coordination and concentration skills. These findings show that female athletes' attention and coordination abilities are more developed than male athletes. Özdemir and Tokol (2008) suggests in his study that women differ from men not only in terms of hormonal and brain structure but also in their detailed thinking, abilities, and particularly attention. When examining the findings related to gender, women’s lower d2 attention test error (E) scores compared to men indicate that they align with this characterization. However, it is not possible to claim that gender alone affects attention solely based on studies in the sports field. Similarly, Zillmer and Kennedy

(1999) found a significant difference only in the number of errors among students aged 18-32, with the difference favoring female athletes. Men had a higher number of errors in the d2 attention test compared to women.
The Concentration Performance (CP) data were found to be higher among female athletes. The higher level of concentration performance in female athletes suggests that they exhibit more significant differences in terms of performance speed and accuracy (Toker, 1990). Some studies on attention have noted that women's ability to focus is better than that of men (Bektaş, 2019). A review of the literature shows similar findings to the research results.

In the study examining the psychological skill levels of combat athletes according to gender, significant differences were found only in the sub-dimensions of openness to learning and performing well under pressure. No significant differences were observed in the other sub-dimensions. While other studies have reported significant differences in gender and psychological skill sub-dimensions, similar results were not found in our study. The lack of similar findings may be attributed to variations arising from similarities within combat athletes and across different sports disciplines.

In Şahinler's (2021) study, which involved a total of 428 athletes (218 women and 210 men) and assessed psychological skills, similar results were found in the sub-dimension of openness to learning, with women scoring higher. This aligns with our findings, as similar studies in the literature show comparable results regarding the impact of gender on psychological skill sub-dimensions. For instance, Rudman et al., (2013) describe men as having leadership qualities, being angry, assertive, career-oriented, analytical, persuasive, independent, ambitious, hardworking, sufficient, competitive, and capable of working well under pressure. In contrast, women are characterized by more emotional, affectionate, considerate, compassionate, polite, and naive traits. These stereotypes are not definitive but rather examples found in the literature. Therefore, it is important to avoid biases suggesting that women have lower psychological skills and instead create environments that enhance their self-confidence. Additionally, the results for performing well under pressure, where men scored higher, could indicate that their psychological skill levels contribute to their better performance under stress.

The comparison of participants' scores on the d2 attention and psychological skills scales according to their sports disciplines reveals the core findings of the study and the aspects most emphasized. Analysis of the d2 Test of Attention results shows that there are no significant differences among sports disciplines in terms of the total number of marked rows (TN), test performance (TN-E), and fluctuation ratio (FR) scores. The lack of significant differences in TN scores indicates that the number of marked items is similar across groups and that the groups have comparable attention continuity. The similarity in TN-E findings suggests that the marking and data processing speeds across disciplines are close to each other, indicating that the disciplines have similar qualitative scores. The absence of significant differences in FR scores reflects the uniformity in fluctuation rates among disciplines. This means that the difference

between the row with the maximum number of items processed and the row with the minimum number of items processed is similar across sports disciplines.

The findings regarding the number of unmarked/omitted steps (E1) indicate a significant difference, with kickboxers skipping more correct figures compared to boxers. This suggests that kickboxers have lower selective attention. In boxing, athletes need to choose the most suitable defensive actions based on their opponent's movements, requiring sudden reflexes and maximum focus (Çolakoğlu et al., 1993). Therefore, boxers must identify punches from opponents and distinguish deceptive blows. Additionally, because they focus intensely on their opponent's punches, their selective attention is continuously developed. In boxing, one of the most crucial tactics is not just punching but avoiding punches. The athlete gains an advantage by defending against incoming punches without getting hit, resulting in less effort and damage, which implies that their selective attention may be well-developed.

The findings related to the number of incorrectly marked letters (E2) indicate that Taekwondo athletes marked more incorrect figures compared to Muay Thai athletes, with a significant difference in favor of Taekwondo athletes. Additionally, the Total Error (E) score shows that kickboxers have a higher number of errors compared to Muay Thai practitioners. This suggests that kickboxers have lower performance (attention) levels and degrees of attention. In essence, while both disciplines are relatively similar, the perspective is not about the lower scores of kickboxers but rather the higher scores in a dynamic discipline like Muay Thai. Furthermore, a significant difference was found in Concentration Performance (CP) scores, with Muay Thai athletes scoring higher than kickboxers. This indicates that Muay Thai athletes exhibit better accuracy and coordination of speed throughout the test. CP scores are known to reflect performance across the entire test, and Muay Thai athletes achieve higher scores in this regard.

Muay Thai is a rich and intense sport with a high calorie burn rate, engaging almost every muscle group in the body. Compared to other sports, Muay Thai involves extensive use of limbs, including punches, kicks, knees, and elbows. This frequent use of various limbs requires athletes to quickly think and respond with appropriate defensive actions against incoming attacks. Therefore, the high performance observed in Muay Thai athletes in terms of Concentration Performance (CP) aligns well with the sport's dynamic and diverse movement requirements. The rich content of Muay Thai has also brought it to recognition at the Olympic level. In the coming years, this rich and cognitive difference will be at a level that will be able to reveal its difference in the Olympics (Muller & Capraro 2024)

The findings from the test examining athletes' psychological skill levels reveal that there are no significant differences between the sub-dimensions across different disciplines. The most immediate interpretation of this result could be the similarity between the disciplines. Athletes work in similar competitive environments, follow comparable training styles, and train in similar gyms. This similarity may have prevented significant differences in the psychological skill sub-

dimensions. Ultimately, each athlete is exposed to the same challenges and benefits associated with combat sports within a fighting environment. Regardless of the specific discipline, all combat sports involve experiencing similar emotions such as pre-match anxiety, stress, and pressure. The technical, tactical, and rule-based similarities between disciplines may also contribute to the lack of significant differences observed.

Sports activities significantly influence individuals not only in terms of physical health but also psychological well-being. Physical exercise is directly related to individuals' mental states, highlighting a noteworthy interaction between these two domains. In this context, research supports the positive effects of sporting activities on both physical and mental health (Çelik, 2023)

In our study, it was found that female athletes obtained more significant differences in the attention test compared to male athletes. In psychological skill data, significant differences were only found in the sub-dimension of performing better under pressure, where males showed superior performance. Additionally, among the compared combat sports, Muay Thai was clearly observed to have a more significant difference in attention compared to other sports. No significant differences were found in the psychological skill test.

Conclusion

When the results are examined; it is frequently stated in the literature that women are more prominent than men in terms of attention. Women's meticulousness and attention in daily life seem to be reflected in the test results. However, men's endurance also comes to the fore in psychological competence tests. It is seen that men have stronger psychological skills than women. When we examine the tables, the research results show that Muay Thai is among the four sports with the highest D2 attention level. In fact, it is quite possible for Muay Thai to achieve this success and reflect it in the data thanks to the abundant use of limbs and multi-directional kicks. Muay Thai has a very deep-rooted and ancient history among all martial arts. In this way, it has evolved and spread over time and is still quite popular thanks to its beneficial uses.

Recommendations

Firstly, given the limited number of studies on combat sports in the literature, it is advisable to increase the number of such studies. Research can be conducted under the general umbrella of combat sports and further specialized to focus on individual disciplines if possible. Expanding the sample size to include more athletes could also be beneficial. Using test-retest methods in the same environment and at the same time, where general arousal and attention levels are high and equal, could provide more consistent and meaningful results. Psychological skill-enhancing training programs for athletes can be developed. Additionally, efforts to increase research in sports facilities could be made. Universities, The Ministry of Youth and Sports (GSB), and the Ministry of National Education (MEB) can coordinate to provide athletes with more professional

support. While there is a strong focus on developing sports skills, it is equally important to enhance psychological skill levels. Organizing activities to boost and develop attention can be beneficial. More diverse tests and surveys for measuring attention should be applied.

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REFERENCES

Bektaş, F. (2019). Evaluation of D2 attention levels of orienteering national team athletes who are in education age. *Journal of Education and Training Studies*, *7*(6), 49-55. https://doi.org/10.11114/jets.v7i6.4204

Brickenkamp, R., & Rump, G. (1966). The Stability of the attention load test (Test D2) over longer periods of time. *Diagnostica*, *12*(1), 17-24.

Çağlar, E., & Koruç, Z. (2006). Reliability and validity of d2 attention test in athletes. *Journal of Sports Sciences*, *17*(2), 58-80.

Çelik, A. (2023). *An investigation of the dietary habits and attention levels of secondary school students who do and do not participate in sports* (Doctoral dissertation). Selçuk University, Institute of Health Sciences, Konya.

Emru-Tadesee, M. (2017). Martial arts and adolescents: Using theories to explain the positive effects of Asian martial arts on the well-being of adolescents. *Ido Movement for Culture. Journal of Martial Arts Anthropology*, *17*(2), 9-23. https://doi.org/10.14589/ido.17.2.2

Erhan, S. E., Bedir, D., Güler, M. Ş., & Ağduman, F. (2015). Turkish validity and reliability study of the psychological skills assessment scale of athletes. *Journal of Physical Education and Sports Sciences*, *17*(1), 59-71.

Eynur, B. R., Eynur, A., & Erzeybek, M. S. (2017). Studying attention levels of the university students from various Sport branches. In *SHS Web of Conferences* (Vol. 37, p. 01059). EDP Sciences. https://doi.org/10.1051/shsconf/20173701059

Gallahue, D. L. (1982). Assessing motor development in young children. *Studies in Educational Evaluation, 8*(3), 247-252. https://doi.org/10.1016/0191-491X(82)90028-1

Karasar, N. (2014). *Scientific research methods: Concepts, techniques and principles (27th ed.).* Nobel Publishing House, 109-111.

Kimmel, M., & Rogler, C. R. (2018). Affordances in interaction: The case of Aikido. *Ecological Psychology, 30*(3), 195-223. https://doi.org/10.1080/10407413.2018.1438198

Korkmaz, B. (2010). Autism: Clinical and neurobiological features, early diagnosis, treatment and some current developments. *Turkish Archives of Pediatrics*, *45*(12), 37-44.

Özdemir, E., & Tokol, T. (2008). Marketing strategies for women consumers. *Anadolu University Journal of Social Sciences*, *8*(2), 57-80.

Rudman, L. A., Mescher, K., & Moss-Racusin, C. A. (2013). Reactions to gender Egalitarian men: Perceived feminization due to stigma-by-association. *Group Processes & Intergroup Relations, 16*(5), 572-599. https://doi.org/10.1177/1368430212461160

Şahinler, Y. (2021). Investigation of psychological skill levels of athletes. *Iğdır University Journal of Sports Sciences*, *4*(1), 8-18.

Smith, R. E., & Christensen, D. S. (1995). Psychological skills as predictors of performance and survival in professional baseball. *Journal of Sport and Exercise Psychology*, *17*(4), 399-415. https://doi.org/10.1123/jsep.17.4.399

Smith, R. E., Schutz, R. W., Smoll, F. L., & Ptacek, J. T. (1995). Development and validation of a multidimensional measure of sport-specific psychological skills: The Athletic coping skills inventory 28. *Journal of Sport and Exercise Psychology, 17*(4), 379-398. https://doi.org/10.1123/jsep.17.4.379

Tabachnick, B.G., Fidell, L.S., & Ullman, J.B. (2013). *Use of multivariate statistics.* Pearson.

Theeboom, M., De Knop, P., & Vertonghen, J. (2009). Experiences of children in martial arts. *European Journal for Sport and Society*, *6*(1), 19-35. https://doi.org/10.1080/16138171.2009.11687825

Tiryaki, Ş. (2000). *Sports psychology: Concepts, theories and practice.* Eylül Bookstore and Publishing House.

Toker, M. Z. (1990). Adaptation study of the d2 attention test. *V. National Psychology Congress* (pp. 627-635). İzmir: Special Issue of the Psychology-Seminar Journal.

Weiser, M., Kutz, I., Kutz, S. J., & Weiser, D. (1995). Psychotherapeutic aspects of martial arts. *American Journal of Psychotherapy*, *49*(1), 118-127. https://doi.org/10.1176/appi.psychotherapy.1995.49.1.118

Yayci, L. (2007). *Testing The Effectiveness of a program based on developing selective and concentrated attention skills in fourth grade primary school students*. Doctoral dissertation, Marmara University, Türkiye.

Zillmer, E. A., & Kennedy, C. H. (1999). Preliminary United States norms for the d2 test of attention. *Archives of Clinical Neuropsychology, 14*(8), 727-728. https://doi.org/10.1093/arclin/14.8.727

Zillmer, R. B. E., & Brickenkamp, R. (1998). *D2 test of attention*. Hogrefe & Huber Publishers. https://doi.org/10.1037/t03299-000