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Investigating the Role of Age, Skill Level, and Gender on the Psychological Skills of Iranian Combat Sport: A Meta-Analytic Study

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ABSTRACT

Objective: Combat sports, due to their appeal, diversity, and cultural aspects, are considered among the most popular athletic disciplines. Success in these sports, in addition to physical abilities, requires specific psychological skills, including emotion regulation, concentration, self-confidence, and emotional intelligence. Despite numerous studies examining these skills, some contradictory results have been reported. Such inconsistencies may be attributed to individual differences in age, gender, and skill level of athletes. Therefore, the present study was conducted with the aim of synthesizing and examining the role of age, skill level, and gender in the psychological skills of Iranian combat sport athletes using the meta-analysis method.

Methods: In the present study, a total of 70 relevant studies were collected, among which 35 met the required criteria for inclusion in the analysis. The data were analyzed using CMA2 software, and the computations were performed based on Cohen's d index.

Results: The results indicated that the studies were heterogeneous (I^2 = 98%), and the psychological skills of combat sport athletes were similar in some components based on age, skill level, and gender, while differing in others. Positive psychological components such as emotional intelligence, mental toughness, concentration and attention, and self-confidence had a significant impact on athletes' success. Moreover, psychological skills such as refocusing, goal setting, and imagery, along with negative emotions including cognitive and somatic anxiety, played an important role in the athletic performance of combat sport athletes.

Conclusion: The findings emphasize that designing psychological training programs tailored to individual characteristics can contribute to enhancing the performance of combat sport athletes.

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Introduction

Psychology is considered one of the key dimensions in sports, as differences in athletes' psychological skill levels lead to variations in performance during training and competition (1). Previous studies have shown that athletes' psychological characteristics vary according to several factors, such as the type of sport (team vs. individual) (2), skill level (3), competitive experience (4), and age category and gender (5).

In this regard, studies conducted in various individual sports, such as archery (6) and athletics (7), have shown that athletes' psychological profiles differ according to their skill levels. The findings of Géczi et al. (2009) and Bebetsos (2015), which examined the role of age on psychological skills in individual sports, indicated that adult athletes, compared to adolescents and youth, demonstrated better imagery skills, higher trait anxiety, and greater stress coping abilities (6, 8). In contrast, Moghaddam et al. (2020) reported no significant differences in the psychological characteristics of elite swimmers based on age category (9). Bohloul et al. (2015) also demonstrated that gender, as an important interpersonal factor in both competitive and non-competitive sports, influences athletes' psychological skills (10). Additionally, Taylor et al. (2008) found that women exhibited more positive self-talk than men during competition, whereas no gender differences were observed during training (11). Nasiree et al. (2020) further showed significant gender differences in mental toughness, competitive anger, and aggression among male and female track and field athletes (12).

Nowadays, martial arts, as an individual sport, have attracted the attention and interest of adolescents and young adults due to their diversity and appeal. The inclusion of martial arts disciplines such as taekwondo, karate, and judo in the Olympic Games, along with the widespread distribution of medals, has also drawn the attention of various countries, including Iran. The nature of martial arts as contact sports creates conditions that require athletes to be highly diligent and competitive, enabling them to withstand the physical and psychological pressures present in training and competition, and to pursue their goals with a heightened sense of superiority over athletes in other contact sports. Given that martial artists experience considerable pressure during matches, the use of mental skills to regulate stress-inducing factors is essential, serving as an effective means for stress management, emotional enhancement, increased self-confidence, stability, and performance improvement. Accordingly, training athletes in mental skills helps them control anxiety (13), enhance self-confidence (14), and manage their emotions (15). In martial and combat sports, mental training is employed to calm athletes before competitions, strengthen self-mastery, and support them under challenging conditions, with stress reduction contributing to improved athletic performance (16).

A review of studies on the psychological characteristics of Iranian martial artists indicates the existence of a relatively large number of articles across various martial arts disciplines, with considerable variability in the reported findings. Approximately 70 studies have examined the psychological characteristics of Iranian athletes in different martial arts, employing a variety of measurement instruments, including self-report questionnaires such as the South Australian Sports Institute Psychometric (SASI Psych), Ottawa Mental Skills Assessment Tool (OMSAT-3), Perceived Motivational Climate in Sport Questionnaire

(PMCSQ), Sport Motivation Scale (SMS), Competitive State Anxiety Inventory (CSAI), and Thought Questionnaire for Self-Talk (TQ-S), in relation to moderating variables such as skill level, age category, and gender. While these studies provide a broad range of information, the variability and, in some cases, contradictions in the findings concerning the psychological skills of martial arts athletes make it impossible to draw practical conclusions without a systematic and comprehensive review.

Research on different skill levels of martial artists has shown that elite athletes score significantly higher than non-elite athletes in eight psychological skills, including self-confidence, commitment, goal setting, relaxation, energization, imagery, mental practice, and competition planning; however, no differences were observed between them in four psychological skills: fear control, stress coping, concentration, and refocusing (17). Similarly, Jafari et al. (2007), using the South Australian Sports Institute Self-Report Questionnaire (SASI Psych), reported no significant differences in psychological skills among taekwondo athletes of different skill levels in the components of self-confidence, energy regulation, and goal setting (18). In contrast, Zarei and Salman (2018), using the Ottawa Mental Skills Assessment Tool (OMSAT-3), found significant differences among taekwondo athletes of varying skill levels in goal setting, self-confidence, and energization (19). Moreover, Noudehi et al. (2019) identified intelligence, arousal, and self-confidence as key factors contributing to the success of Iranian judo athletes (20).

Studies on the gender of martial artists have indicated that women's athletic success is associated with the components of challenge, control, and commitment, whereas challenge and confidence were significant predictors of athletic success in men (21). In line with this, a study examining the impact of gender on mental toughness among taekwondo, wushu, and kickboxing athletes found that men exhibited higher mental toughness than women (22). Additionally, research on individual sport athletes, including karate and judo practitioners, showed that the relationship between mental toughness and sources of self-confidence was stronger in women than in men (23). The findings of Amirian et al. (2018) on male and female athletes in individual sports (karate and taekwondo) also revealed that men were more competitive and had a higher desire to win, whereas women were more goal-oriented (24).

Since age is also an influential factor in the psychological skills of martial artists, previous studies have compared the psychological skills of elite athletes and examined the interaction of age with the type of sport (25). In this context, Sheikhi et al. (2011) reported that psychological factors such as anger, confusion, depression, fatigue, and tension were significantly lower in young taekwondo athletes compared to adolescent taekwondo athletes (26). Tojari (2012) also found no significant differences in psychological skills including motivation, concentration, self-confidence, regulation of mental energy, imagery, and goal setting among elite judo athletes across three age groups (adults, youth, and adolescents) (27). Additionally, Ghadiri et al. (2017) compared the psychological skills of male elite athletes in kickboxing and wushu across two age groups: youth and adults. Their findings indicated that adults in kickboxing outperformed the other three groups (youth and adults in wushu, and youth in kickboxing) in cognitive skills and concentration, while adults in wushu scored higher than the other three groups in psychophysiological skills and stress coping (25).

Given the variability of psychological components influencing success in martial arts, the contradictions regarding the importance of psychological factors within martial arts (even within a single discipline), and the diversity of psychological assessment tools used to measure these skills, as well as the lack of a comprehensive synthesis of research on psychological skills in Iranian martial arts, meta-analysis can be employed to achieve generalizable and practical results. Therefore, the present study aims to synthesize previous research on the psychological skills of martial arts athletes using a meta-analytic approach. This study sought to systematically and rigorously review existing research on the psychological skills of martial artists and present a structured summary of their findings. Furthermore, the study examined the effects of athletes' skill levels (beginner, intermediate, and elite), gender, and age on psychological skills in martial arts disciplines.

Materials and Methods

martial artists based on skill level, age, and gender. To this end, a comprehensive search and retrieval of descriptive and quasi-experimental studies in Persian and English concerning the psychological skills of Iranian martial artists across age, gender, and skill level was conducted. A detailed and systematic search protocol was developed using the logical operators OR and AND. In this protocol, keywords such as "psychological skills," "psychological characteristics," "martial arts," and specific disciplines including "karate, taekwondo, judo, kung-fu, wushu, kickboxing, jiu-jitsu, and aikido" were combined using OR, while AND was used to limit the search to studies involving Iranian athletes. The search was conducted in reputable databases including Google Scholar, ScienceDirect, PubMed, SID, Magiran, and Irandoc. To further refine the search, filters were applied to include articles published between 2001 and 2021 (corresponding to 1380–1400 in the Iranian calendar) in Persian and English. Seventy studies were initially selected prior to screening. The articles were then categorized based on participants' age into three groups: adolescents (under 18 years), youth (18–35 years), and adults (over 35 years), and classified according to skill level into beginner, intermediate, and elite. Following screening based on p-values and t-values, and after removing duplicates and review articles, 35 studies were selected for further analysis.

The selected studies were categorized according to psychological variables, including self-confidence, self-efficacy, perfectionism, resilience, somatic anxiety, concentration and attention, self-regulation, goal setting, refocusing, imagery, and competition planning. Inclusion criteria comprised studies related to the psychological skills of martial artists, conducted on Iranian populations, published in Persian or English, non-duplicated, methodologically sound, and providing sufficient data for effect size calculation. Exclusion criteria included case studies and review articles, studies with differing titles, research lacking sufficient quality for evaluation, and studies published in journals without scientific credibility (Figure 1).

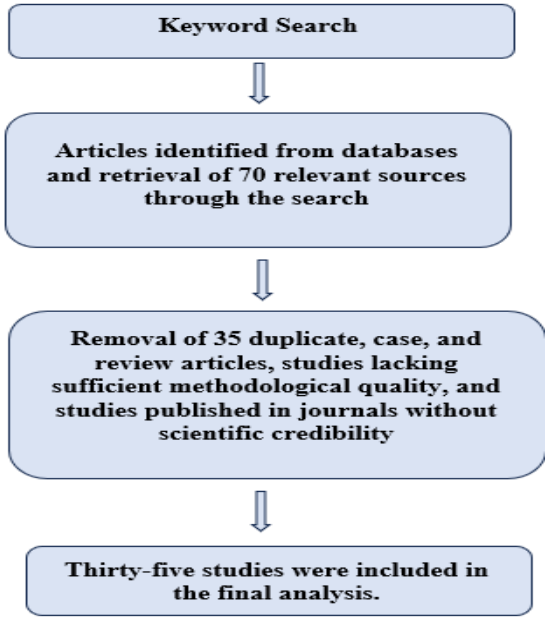

Figure 1. Diagram of the Screening Process for Articles Selected in the Present Study

Subsequently, general information (author name, year of publication, study population), research variables (age, gender, and athletes' skill level), sample size, and statistical data were extracted, coded, and entered into CMA2 software.

This study was conducted with the aim of examining the psychological components of Iranian martial artists through the analysis of 35 studies, and assessing the effects of gender, age, and skill level on these components. The results are presented in the form of tables and descriptive as well as inferential statistics, providing a more detailed examination of these components.

Psychological components extracted from the studies

Table 1 presents the frequency distribution of the psychological components extracted from the articles. These components were obtained from 70 psychological variables after data refinement and manual coding.

Results

Table 1. Frequency Distribution of Psychological Components Extracted from the Articles.

Components	Number of Studies	Frequency	Percentage
Emotional Intelligence (CH)	6	6	**8.57%**
Self-confidence (AH)	11	11	**15.71%**
Intrinsic Motivation (AA)	5	5	**7.14%**
Extrinsic Motivation (AC)	4	4	**5.71%**
Concentration and Attention (K)	13	13	**18.57%**
Emotion Regulation (C)	6	6	**8.57%**
Competitive Anxiety (BE)	3	3	**4.28%**
Imagery (M)	10	10	**14.28%**
Other Components	12	12	**17.14%**

Table 1 indicates that the most frequently investigated psychological components across the reviewed studies were concentration and attention, self-confidence, and imagery, which demonstrated the highest frequencies among the extracted factors.

Table 2. The Impact of Gender on Various Psychological Components.

Psychological Component	Gender	Effect Size (Cohen's d)	Z-value	p-value
Emotional Intelligence (CH)	Female	0.503	3.110	0.002*
Competitive Anxiety (BE)	Female	0.325	2.329	0.020*
Self-Confidence (AH)	Male	0.995	50.547	0.0001*
Concentration and Attention (K)	Male	0.399	3.006	0.003*
Emotion Regulation (C)	Male	0.211	1.412	0.158

*$p < 0.05$

As shown in the table, women demonstrated better performance than men in the components of emotional intelligence and competitive anxiety, whereas men were superior in self-confidence and concentration/attention. Subsequently, the impact of age on the psychological components of martial artists in different age groups (adolescents, young adults, and adults) was examined (Table 3).

Table 3. The Effect of Age on Psychological Components of Martial Artists in Different Age Groups (Adolescent, Young, Adult)

Component	Age Group	Effect Size (Cohen's d)	Z-value	p-value
Emotional Intelligence (CH)	Adult	0.760	2.146	**0.032***
Self-Confidence (AH)	Young Adult	0.503	3.110	**0.002***
Concentration/Attention (K)	Adolescent	0.618	3.949	**0.0001***
Somatic Anxiety (AL)	Young Adult	0.423	2.174	**0.030***
Self-Regulation (AN)	Adolescent	0.749	2.043	**0.041***

*p < 0.05

Based on the above findings, adults performed better than younger groups in the components of emotional intelligence and self-regulation, whereas adolescents showed superiority in somatic anxiety and concentration/attention. In the present study, the effect of skill level (beginner, intermediate, advanced) on psychological components was also examined, with the results presented in Table 4.

Table 4. The Effect of Skill Level (Beginner, Intermediate, Advanced) on Psychological Components.

Component	Skill Level	Effect Size (Cohen's d)	Z-value	p-value
Self-Confidence (AH)	Advanced	0.995	50.547	**0.0001***
Concentration/Attention (K)	Advanced	0.618	3.949	**0.0001***
Imagery (M)	Advanced	0.736	9.849	**0.0001***
Intrinsic Motivation (AA)	Intermediate	0.540	2.989	**0.003***
Emotional Intelligence (CH)	Beginner	0.503	2.146	**0.032***

*p < 0.05

This table indicates that advanced martial artists outperformed beginners and intermediate athletes in most psychological components, including self-confidence, imagery, and concentration/attention.

Subsequently, the I-squared index was used to assess heterogeneity among the studies. The results indicated a very high level of heterogeneity ($I^2 = 98.5\%$) across the different studies. This heterogeneity is attributable to differences in methodologies, study populations, and measurement instruments (Table 5).

Table 5. Heterogeneity Among the Reviewed Studies

Model	Effect Size (Cohen's d)	I-squared	Q-value	p-value
Fixed Effects	0.707	98.5%	14623.44	**0.0001***
Random Effects	0.621	98.5%	—	**0.0001***

*p < 0.05

To assess publication bias among the studies, both the funnel plot and the fail-safe N test were employed. The results indicated no evidence of publication bias (P = 0.0001; Z = 112/70). Furthermore, the predictive interval analysis showed that, if similar studies are conducted in the future, the results are likely to be replicable with a 95% probability.

Discussion

The findings of the present study regarding the psychological skills of martial artists

based on skill level (intermediate and advanced) indicated that mental toughness, emotional intelligence, and self-compassion, as positive psychological characteristics; fear control, as a psychological skill; and competitive anxiety, as a negative emotion, had a substantial impact on the motor performance of intermediate martial artists.

In contrast, the results showed that for advanced martial artists, mental toughness, emotional intelligence, positive perfectionism, self-confidence, concentration/attention, working memory capacity, self-regulation, and sensation-seeking served as positive psychological characteristics. Moreover, imagery, stress response, fear control, competition planning, refocusing, and goal setting were identified as significant psychological skills, while negative perfectionism and burnout represented negative psychological characteristics, and cognitive as well as somatic anxiety were identified as negative emotions that substantially influenced motor performance.

The results of the meta-analysis revealed that the component of emotional intelligence (including emotion perception, emotion regulation, social skills, and optimism) had a strong positive impact on the performance of both advanced and intermediate martial artists. Emotions play a crucial role in human performance adaptation by enhancing sensory perception, stimulus recognition, response readiness, decision-making, memory, and interpersonal interactions. These influences can lead to improvements in health and performance in any endeavor, including sports. However, emotions can also be maladaptive (28).

Furthermore, athletes' capacity to perceive and regulate emotions, along with their efforts to optimize sport performance, constitutes a fundamental aspect of athletic success (29). Emotional intelligence is considered an inseparable factor influencing athletic performance among martial artists. In situations of attack and defense, if athletes fail to control their emotions, they may cause serious harm to themselves and their opponents. Therefore, to achieve victory, martial artists must possess a high level of emotional intelligence, enabling them to manage emotions effectively in competitive and stressful conditions while selecting the most appropriate tactics and techniques. This appears to explain why emotional intelligence experts such a significant influence on the performance of both intermediate and advanced martial artists.

The findings of this study indicate that the component of mental toughness had a strong positive impact on the performance of both advanced and intermediate martial artists. Mental toughness is regarded as an important psychological characteristic associated with successful outcomes in sport (30). Athletes who are mentally tough are capable of achieving and maintaining high performance across various situations (5).

Several studies have shown that young athletes with higher levels of mental toughness experience lower anxiety and exhibit more effective responses under stressful conditions (31, 32). Moreover, due to the intensity of combat, as well as the competitive and individual nature of martial arts, athletes in these disciplines require high levels of mental toughness to achieve success. In line with this, research has demonstrated that advanced and intermediate martial artists possess higher levels of mental toughness compared to beginners. Therefore, mental toughness can be considered one of the key determinants of success in martial artists.

The results of the meta-analysis also showed that competitive anxiety had a substantial impact on the performance of intermediate martial artists. Anxiety is

described as an unpleasant psychological state experienced by athletes at all levels of performance (33). Competitive anxiety, defined as a specific dispositional distress (34), affects athletic performance prior to competition (33). Research has further demonstrated that competitive anxiety is one of the primary factors underlying performance differences between training and competition, and it can lead to the defeat of intermediate martial artists during competitions.

The results of the meta-analysis further revealed that goal setting is an influential factor in the performance of advanced athletes. Goal setting is considered one of the most effective methods for enhancing motivation, self-confidence, and concentration in athletes. It enables them to prioritize what is most important for their sport and to structure their daily training accordingly (35). Since success in martial arts requires effort, consistent practice, and perseverance, appropriate and well-structured goal setting by both athletes and coaches creates the foundation for sustained training and helps prevent discouragement and fatigue.

The results of this study also indicated that burnout has a significant and negative impact on the performance of advanced athletes. Burnout has been described as a form of fatigue resulting from excessive use and training of the body, leading to physical, cognitive, and psychological exhaustion among athletes (36). Burnout can cause a lack of energy, discouragement, and loss of interest. A review study examining burnout among elite athletes, based on 72 articles, revealed a negative relationship between burnout and motivation, positive perfectionism, personal standards, and passion, while showing a positive relationship between burnout and negative perfectionism as well as concern over mistakes. Consequently, burnout in elite athletes is a variable linked to various psychological components, thereby negatively influencing their performance (37). Another study investigating the relationship between fear of failure, stress, and burnout in high-level athletes found that fear of failure was associated with burnout and stress, weakening athletes' performance (38). It seems that advanced athletes, due to more intensive training and competition schedules, are more vulnerable to burnout. Therefore, athletes should allocate sufficient time for physical and psychological rest and recovery in order to fully commit to training and planning for success.

The analysis of the data indicated that mental imagery plays a critical role in enhancing the performance of elite martial artists. Sport imagery is defined as the ability to mentally simulate specific scenarios with the purpose of improving performance and coping strategies, thereby facilitating better athletic outcomes (39). Previous research has demonstrated that athletes with superior performance levels tend to possess a higher capacity for mental imagery (40), which may account for the considerable impact of this skill on the performance of advanced martial artists. Furthermore, the findings of this study revealed that attentional focus and concentration exert a significant positive influence on the performance of elite martial artists. This effect can be attributed to the one-on-one nature of combat in martial arts, where high-level competition demands rapid reactions and precise decision-making. In such contexts, maintaining an exceptional degree of concentration enables athletes to detect even the smallest cues from their opponents, capitalize on optimal opportunities to initiate attacks, and secure points effectively.

The analysis of this study further highlighted the impact of somatic and

cognitive anxiety on the performance of elite martial artists. In competitive sports, athletes frequently experience arousal alongside various physiological and emotional changes during competition, some of which may impair performance (41). It appears that elevated levels of somatic and cognitive anxiety in skilled martial artists may stem from facing stronger opponents, as well as the psychological burden of prior encounters with such competitors. Moreover, heightened anxiety may also be attributed to the pressure exerted by coaches and the elevated expectations associated with advanced levels of skill. Additionally, self-confidence was found to have a considerable positive effect on the performance of elite martial artists. One plausible explanation for the higher levels of sport confidence observed among elite compared to intermediate athletes is their greater exposure to competitions and achievement of medals in higher-level tournaments. Success in these competitive contexts fosters a deep-seated belief in their abilities, whereby confidence in one's skills translates into enhanced athletic performance and continued success. The results further indicated that refocusing (attentional recovery) exerts a considerable effect on the performance of elite martial artists. Following a lapse in concentration, athletes must be able to refocus in order to maintain goal-relevant cues within the center of attention (42). In a study examining the mental skills of Iranian athletes, it was found that responses to stress and the ability to refocus distinguished selected athletes from non-selected ones (43). One key reason refocusing is critical for elite martial artists lies in temporary setbacks—such as an opponent taking the lead during competition—which frequently occur in high-level tournaments (national, continental, or Olympic). In such situations, martial artists must be able to regain their concentration, maintain morale, and persist in the match.

Psychological Skills of Martial Artists by Age (Adolescents, Young Adults, Adults)

The findings of this study revealed that, for adolescent martial artists, self-regulation, emotional intelligence, concentration and attention, mental toughness, and self-compassion served as positive psychological characteristics; refocusing and stress reactivity as psychological skills; and trait anxiety as a negative emotional factor exerted significant effects on motor performance. Among young martial artists, concentration and confidence emerged as positive psychological characteristics, while imagery, refocusing, goal-setting, and competition planning were found to significantly influence performance as psychological skills. In contrast, for adult martial artists, mental toughness, concentration, and confidence constituted positive psychological traits; competition planning, refocusing, goal-setting, and imagery were identified as psychological skills; and somatic and cognitive anxiety were shown to negatively affect motor performance. The meta-analysis further demonstrated that mental toughness has a significant and positive impact on the performance of both adolescent and adult martial artists. Mental toughness is widely regarded as a critical prerequisite for sustained success in sports. A study conducted with adolescents revealed that mental toughness contributes to reducing stress and depression (44). It appears that the relative scarcity of research focusing on psychological constructs among young martial artists may account for these findings.

The results also highlighted the significant influence of self-compassion on the performance of adolescent martial artists. In this regard, Ferguson et al. (2014) demonstrated that self-compassion fosters

optimism, perseverance, and responsibility, while reducing rumination in challenging sporting situations. Similarly, in a study conducted on adolescent girls, positive emotions associated with self-compassion and body compassion were found to regulate emotions and enhance athletic performance (45). Moreover, Mosewich et al. (2011) examined the relationship between self-compassion and self-conscious emotions in adolescent girls, showing that self-compassion was negatively associated with shame, somatic anxiety, body consciousness, fear of failure, and fear of negative evaluation (46). These findings suggest that the psychological characteristics specific to this developmental stage may explain the pronounced role of self-compassion in adolescent martial artists. Given the competitive and stressful nature of martial arts, adolescents often experience heightened pressure and stress, which can be alleviated by fostering self-compassion and kindness toward oneself.

The findings of this study further indicated that emotional intelligence and self-regulation exert substantial effects on the performance of adolescent martial artists. Self-regulation, a psychological construct encompassing emotion regulation, the ability to maintain positive interpersonal interactions, and the capacity to avoid inappropriate emotional reactions (47), appears particularly relevant for this age group. The strong influence of self-regulation on adolescents' performance likely stems from the intense emotional fluctuations and affective confusion characteristic of puberty. Accordingly, the ability to regulate emotions may enable adolescent martial artists to achieve superior outcomes in their discipline.

In addition, the results of this meta-analysis demonstrated that confidence significantly impacted the performance of young and adult martial artists. Confidence is widely recognized as one of the most critical determinants of athletic performance, with its absence closely linked to sporting failure (48). Supporting this, Dabbagh et al. (2020) reported a significant positive relationship between mental toughness and confidence (49). The unique nature of martial arts, along with the mental training embedded in their practice such as exercises designed to cultivate courage, boldness in attacking, and fearlessness in combat appears to be among the key factors explaining the heightened role of confidence in young and adult martial artists.

The data analysis of this study further revealed that goal setting significantly influenced the performance of young and adult martial artists. Goal setting enhances task-related performance through four distinct mechanisms. First, goal specification directs individuals' efforts toward goal-relevant actions while filtering out irrelevant activities. Second, goal setting provides individuals with energy, motivation, and persistence to pursue their objectives. Third, goals affect perseverance, as more challenging (yet attainable) goals lead to greater commitment and investment of effort. Fourth, the pursuit of goals facilitates task-related discovery and development (50). In line with this, Wikman et al. (2014) found that goal setting significantly reduced fear of failure among young athletes (51). It appears that the pronounced influence of goal setting on young and adult martial artists may be attributed to their stronger sense of purpose and greater adherence to goals compared to adolescents.

Psychological Skills of Martial Artists Based on Gender

The results of the present study in this section demonstrated that, among male martial artists, emotional intelligence, mental toughness, self-compassion, focus and attention, and confidence functioned as

positive psychological attributes; negative perfectionism, fear control, stress response, goal setting, imagery, and competition planning emerged as negative psychological characteristics; and somatic and cognitive anxiety were identified as negative emotional states significantly impacting motor performance.

Conversely, among female martial artists, emotional intelligence, mental toughness, focus and attention, confidence, resilience, happiness, and positive perfectionism were identified as positive psychological attributes; stress response and attentional recovery (refocusing) functioned as psychological skills; and somatic anxiety, cognitive anxiety, and trait anxiety were identified as negative emotional states that significantly influenced motor performance.

Based on the results obtained, mental toughness (encompassing confidence, persistence, and control) is a key factor influencing the performance of both male and female martial artists. According to Jones et al. (2002), mental toughness is defined as a combination of innate and developed psychological advantages, through which an athlete achieves awareness and control of thoughts and focus (control), uses long-term goals as a source of motivation, consistently exceeds limits, and maintains strong self-belief (confidence) (52). These components are considered the core elements of mental toughness. Mental toughness represents a set of psychological skills that play a critical role in optimal performance, continuous improvement, and athletic success (53). Furthermore, it contributes to stress regulation, enhanced motivation and confidence, effective competition management, and the ability to maintain and regain focus, enabling athletes to persevere through challenging situations (54). In combat sports, due to one-on-one competition, high stress and anxiety, the individual nature of the sport (athletes cannot rely on teammates during critical moments), and the rigor of training, both male and female athletes must possess high levels of mental toughness for success, and this psychological attribute appears to be independent of gender.

The present study also demonstrated that confidence significantly impacts the performance of male and female martial artists. Confidence is a personality trait arising from an individual's sense of self-worth and belief in their abilities. Individuals with high confidence are certain of their ability to influence outcomes. Consequently, martial artists require elevated confidence to engage in combat effectively and score points against opponents, particularly under high-pressure or critical conditions. The meta-analytic findings further indicated that cognitive and somatic anxiety negatively affect the performance of both male and female martial artists. Anxiety is a negative emotional state characterized by restlessness, worry, apprehension, and physiological arousal (1). In martial arts, particularly given the combative and individual nature of these sports, the detrimental impact of anxiety on performance may be especially pronounced. Additionally, the results revealed that emotional intelligence—including emotion perception, emotion regulation, social skills, and optimism—is a crucial factor influencing the performance of both male and female martial artists. Empirical evidence consistently demonstrates a significant positive relationship between emotional intelligence and athletic performance. Numerous studies have also highlighted the importance of emotional intelligence in critical domains such as leadership, stress management, and mental health (55).

The findings of this study indicated that negative perfectionism has a significantly detrimental effect on male martial artists'

performance, whereas positive perfectionism has a notable positive impact on female martial artists' performance. Perfectionism is characterized by excessively high personal standards and self-critical evaluation. It comprises two dimensions: positive and negative. Both groups set very high-performance standards; however, positive perfectionists are flexible, strive toward their goals, and derive satisfaction from their efforts. In contrast, negative perfectionists are inflexible, experience intense fear of failure, critically evaluate their own performance due to high standards, feel incompetent when failing, and are overwhelmed by negative emotions (56). Negative perfectionism is positively associated with cognitive, somatic, and competitive anxiety and negatively correlated with self-confidence. It also reduces feelings of empowerment and competition management skills and impairs focus and accuracy. In a meta-analysis of 52 studies on perfectionism in sports, Hill et al. (2018) demonstrated that perfectionistic concerns are clearly maladaptive and negatively affect athletic performance. Conversely, positive (adaptive) perfectionism contributes to athlete success through realistic goal-setting, self-acceptance, psychological flexibility, performance satisfaction, reduced cognitive and somatic anxiety, and enhanced self-esteem and confidence (57). Therefore, negative perfectionism appears to amplify negative emotions, consequently impairing martial artists' performance.

Meta-analytic findings also revealed that happiness constitutes a positive psychological trait and a contributing factor to female martial artists' performance. Physical activity enhances and maintains health, improves well-being, and promotes positive emotions. Participation in physical activity increases psychological well-being, mitigates depression and anxiety, and positively influences happiness (58). Given the psychological and emotional differences between males and females, happiness appears to be a key determinant of performance among female martial artists.

Furthermore, the results demonstrated that resilience significantly impacts female martial artists' performance. Resilience is defined as the process of adapting to adversity, trauma, tragedy, threat, or stress, representing an individual's capacity to cope with stress and recover from setbacks (59). Psychological resilience is a critical component that facilitates athletic performance by enabling adaptation to adversity and stressors and promoting effective responses to negative stimuli (60). Female athletes face numerous challenges, including sports inequality, body image concerns, increased psychological distress, and internalized emotions, making the development of resilience particularly important (61). In this context, Besharat et al. (2008) examined the relationship between resilience, perseverance, athletic success, psychological well-being, and psychological helplessness. Their results indicated significant positive associations between resilience and perseverance with athletic success and psychological well-being, suggesting that resilience and perseverance are predictors of both sports success and mental health (62). Therefore, martial artists, particularly in combat disciplines, require high levels of resilience to recover from being behind in a match, continue their attacks, and ultimately achieve victory.

Conclusion

The findings of this study indicate that psychological factors such as emotional intelligence, mental toughness, and self-confidence have a significant positive impact on martial artists' performance. Conversely, variables such as competitive anxiety and psychological burnout exert substantial

negative effects on performance quality. Therefore, it is recommended that coaches, in addition to enhancing technical skills, pay attention to psychological aspects that play a critical role in improving performance and achieving success. Furthermore, designing targeted training programs and psychological interventions to strengthen positive traits and mitigate negative influences can effectively enhance the athletic performance of martial artists.

Author Contributions

All authors contributed equally to the conceptualization of the article and writing of the original and subsequent drafts.

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Data Availability Statement

Data available on request from the authors.

Ethical considerations

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Conflict of interest

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