

# Mental toughness and performance strategies of martial artists in practice and competition

Atefeh Beheshti<sup>1</sup>   • Hassan Gharayagh Zandi<sup>1</sup> • Zahra Fathirezaie<sup>2</sup> • Fatemeh Heidari<sup>1</sup>

Received: 7<sup>th</sup> February, 2021

Accepted: 22<sup>th</sup> March, 2021

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DOI: 10.31382/eqol.210602



## Abstract

This study's objective was to analyze the relationship between mental toughness and martial artists' performance strategies. Two hundred athletes (male: 105, female: 95) with an age range of 18-36 years (mean:25.12, s=4.96) who competed at university to the national standard of martial arts participated in this study. Participants answered mental toughness questionnaires and performance strategies inventory. The Pearson correlation results showed a positive and significant relationship between mental toughness and automaticity, goal-setting, imagery, self-talk, and emotional control, and a negative and significant relationship between mental toughness and attentional control in practice. Furthermore, there is a positive and significant relationship between mental toughness and activation, relaxation, self-talk, imagery, goal-setting, and emotional control in the competition. The multiple linear regression analysis results showed that goal-setting and imagery in practice and competition, self-talk in practice, and relaxation in the competition could predict mental toughness. In analyzing the subscales of mental toughness, it was concluded that tough emotions could be loaded on

eight subscales of performance strategies. In the Independent-Sample T-Test, the significant differences related to gender were that men reported higher levels of self-talk ( $t=3.24$ ,  $p<0.001$ ), automaticity ( $t=2.76$ ,  $p<0.006$ ), goal-setting ( $t=2.63$ ,  $p<0.009$ ), imagery ( $t=2.18$ ,  $p<0.03$ ) and relaxation ( $t=2.17$ ,  $p<0.03$ ) than women.


**Keywords** mental toughness • performance • psychological skills • martial art • sport psychology.

## Introduction

Martial arts are forms of self-defence that originated in the Far East. This sport has historically emphasized concepts such as self-control, body control, and order. In the teachings of martial arts, continuous evaluation of thoughts and actions is critical, and it is believed that these evaluations cause self-awareness and personality development (Lakes & Hoyt, 2004) (Romanenko et al., 2018). Regarding martial arts, Fuller (1988) stated, "From a psychotherapeutic perspective, martial arts may be seen as potential human purification systems that provide attractive, practical models for teaching the mechanism of psychological intervention."

Psychological Skills (PS) are a set of trainable psychological abilities that help athletes improve performance, rise pleasure, or achieve self-satisfaction in sports and more physical activity (Kristjánsdóttir, Erlingsdóttir, Sveinsson, 2018; Barker, Slater, Pugh, Mellalieu, McCarthy, Jones, 2020). Common psychological skills include goal-

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 beheshti.atefeh@ut.ac.ir

<sup>1</sup> University of Tehran, Faculty of Physical Education and Sport Sciences, Tehran, Iran

<sup>2</sup> University of Tabriz, Faculty of Physical Education and Sport Sciences, Tabriz, Iran

setting, imagery, self-talk, emotional control, relaxation, automaticity, activation, and attention control (Röthlin, Horvath, Trösch, Holtforth, & Birrer, 2020; Feddersen, Keis, & Elbe, 2020; Thomas & Over, 1994) have concluded that emotional control is an integral aspect of golf's sport in constructing a tool for his report in measuring the psychological skills. Weinberg's (2018) study has also shown that negative emotions cause dysfunction in sports. On the other hand, Sadeghi et al. (2010) found that imagery, self-talk, goal-setting, and relaxation were the most needed psychological strategies in practice and competition conditions. Several studies have shown that imagery, self-talk, and relaxation in practice and competition, improve athletes' performance (Gould, Dieffenbach, 2002; Frey, Laguna, & Ravizza, 2003). Studies of wrestlers and Rugby players found that successful people in sports used positive imagery and self-talk compared to their peers (Gould, Eklund, & Jackson, 1993; Neil, Mellalieu, & Hanton, 2006). In addition to the above studies' results, Gould & Maynard (2009) found that successful Olympic performance with self-confidence, concentration, emotional control, automaticity, self-talk, imagery, goal-setting, and optimism has been associated. The psychological skills mentioned are also seen in the concept of mental toughness.

Mental toughness (MT) is commonly defined as a psychological resource that allows a person to maintain or improve performance in challenging situations (Yankov, Davenport, & Sherman, 2019; Bird, Simons, & Jackman, 2020). According to recent definitions, MT has a multifaceted structure that allows the continuous pursuit of functional excellence regardless of type (internal, external), direction (positive, negative), degree (mild, severe), and experienced demands Provide (McGeown, St Clair-Thompson, & Clough, 2016; Manley, Jarukasemthawee, & Pisitsungkagarn, 2019). Given the role of MT in reinforcing adaptive responses to stress, positive and negative situations and events are often considered as an essential factor in athletic success (Coulter, Mallett, 2016; Gerber, Kalak, Lemola, Clough, Perry, Pühse, Elliot, Holsboer-Trachsler, 2013). In interviews with hundreds of athletes (Loehr, 1982) concluded that 50% of athletic success is a psychological factor called mental toughness. He found that MT allows a person to show their skills and talents despite much pressure. MT, like other personality traits, is somewhat influenced by a person's genetics. However, due to the significant importance of environmental factors, researchers investigate the factors affecting mental

toughness. For example, a qualitative MT study in cricket reported the essential role of environmental influences such as motivational climate, parenting, influence, upbringing, and exposure to tough competitive environments (Bull, Shambrook, James, & Brooks, 2005; Vaughan, Carter, Cockroft, 2018). Several studies have found changes in MT during human development. They have considered the changes to be influenced by different people (coach, peers), experiences (important events), and personal factors (curiosity) (Mahoney, Ntoumanis, Mallett, & Gucciardi, 2014; Thelwell, Such, Weston, Such, & Greenlees, 2010; Stamp et al., 2015). Gordon & Gucciardi (2007) found that mentally tough athletes are more successful than others. A study by Sheard (2012) showed that MT could be manipulated using psychological skills training. According to the results of Connaughton et al. (2010), Retrospective research on elite athletes has shown that psychological skills training plays an essential role in promoting MT in athletes. In confirmation of the previous study, Mellalieu & Hanton (2006) suggested that the proper use of some psychological skills leads to an increase in mental toughness, thus establishing a positive relationship between mental toughness and the use of psychological strategies. Likewise, Mack (2019) showed that the rated players as the best performers had higher MT scores. The findings confirm the vital relationship between MT and the use of psychological skills and performance. Consequently, he Recommends that psychological skills as an effective way in the development of MT. Thus, goal setting, self-talk, and imaging are basic performance strategies that prepare athletes to deal with competitive anxiety. According to Crust & Azadi (2010a), there is a significant positive correlation between MT and psychological skills such as goal-setting and imagery. Evidence from the study Nicholls et al. (2008) also shows that MT has a positive and significant relationship with imagery, cost of effort, and logical analysis and has a negative and significant relationship with avoidance, distraction, and resignation.

Based on the above literature, this study was conducted to expand the knowledge available in sports psychology literature to improve martial artists' performance. We expect to provide a comprehensive assessment of martial artist's psychological skills and strategies to assist coaches and sports psychologists in better preparation and implementation of mental training. This evaluation is practical for better planning and ranking of athletes. Therefore, the present study investigates the relationship between

mental toughness and martial artists' performance strategies, including activation, automaticity, emotional control, goal-setting, imagery, relaxation, self-talk, attentional control, and negative thinking in practice and competition.

## Method

Participants were 200 club/ university athletes from 4 universities in Tehran in 2019 (male: 105, female: 95) aged between 18 to 36 years (mean: 25.12,  $s=4.96$ ) who participated in this study. Athletes had a martial activity experience between 5 and 15 years (mean: 8.80,  $s=3.88$ ). The research sample included karate ( $n=25$ ), taekwondo ( $n=61$ ), kickboxing ( $n=36$ ), vovinam ( $n=3$ ), Muay Thai ( $n=17$ ), kung fu ( $n=15$ ), o- sport ( $n=40$ ), judo ( $n=3$ ). All participants were informed about the purpose of the study and the basis for participating in it. Athletes were also assured that their answers and information would be kept confidential. Finally, informed consent was obtained from them to participate in the research.

Participants were given a booklet that included demographic questionnaires, mental toughness, and performance strategies.

Mental toughness in Sport Questionnaire (MTSQ-50). The Mental Toughness in Sport Questionnaire (Harmison, 2012), a 50-item questionnaire, was used to measure athletes' mental toughness. MTSQ measures five subscales of mental toughness, namely tough beliefs (e.g., "I believe 100% in my ability to respond successfully to challenging, competitive situations"), tough attitudes (e.g., "I stick to what I do best in my sport, even during times in a competition when I am not playing well"), tough skills (e.g., "After making a mistake during the competition, I quickly forget about the error and mentally let go"), tough values (e.g., "To play at my best, I must manage my worry and physical nervousness about my performance"), and tough emotions (e.g., "Due to my strong desire to perform well, I often feel an overpowering amount of pressure being placed upon me to succeed"). This questionnaire allows respondents to rate their responses on a 7-point Likert scale, 1 = strongly disagree to 7 = strongly agree. This questionnaire has validity in the culture used. Cronbach's reliability in the present study is 0.95.

Test of Performance Strategies-2 (TOPS-2P). Performance Strategies Test-2 (Thomas, Murphy, &

Hardy, 1999), a 64-item test, was used to assess athletes' psychological skills and strategies. For this study, 64 items related to the subscales of activation (e.g., "During practice I can get my intensity levels just right"), self-talk (e.g., "I say things to myself to help my practice performances"), imagery (e.g., "During practice I visualize successful past performances"), Automaticity (e.g., "During practice I am able to perform skills without consciously thinking"), Goal-setting (e.g., "I set realistic but challenging goals for myself"), Emotional control (e.g., "During practice my emotions keep me from performing my best"), relaxation (e.g., "During practice I use relaxation techniques to improve my performance"), and Attentional control (e.g., "My attention wanders while I am training") were used. The 64 items used in this study are rated on a 5-point Likert scale from 1 = never to 5 = always. This questionnaire has validity in the culture used, and its Cronbach's reliability is 0.79 in the present study.

After obtaining ethical approval, correspondence was first made with the team's coaches to involve the athletes in the research. In the next step, the study's purpose and how to complete the questionnaires were explained to the athletes. Before participating in the study, athletes completed informed written consent and ensured that the study results were confidential. Also, these athletes were informed that if they wished to withdraw, they could withdraw from the study at any time. Finally, after the training, the MTSQ-50 and TOPS-2P questionnaires were distributed. The athletes completed them separately. The researcher was present to answer the athlete's possible questions during the athletes' answers to the questionnaires. Participants took about 20 minutes to complete the questionnaires.

Before the initial analysis, the missing data values were examined, and it was found that there was no missing data. The data were examined for normality, and finally, it was found that the distribution of research data is normal. Descriptive statistics, including M and s, were calculated for all research variables. For this correlational study, Pearson correlation was used to evaluate the relationships between variables, and multiple linear regression analysis (enter method) was used to determine the predictive power of predictor variables. An independent t-test was used to examine the gender differences between the test variables. All statistical analyzes were performed by SPSS 22.0 software.

## Results

Descriptive data from answering the MTSQ-50 and TOPS-2P questionnaires can be seen in (Tables 1 and 2), respectively.

**Table 1.** Means and Standard Deviations of the MTSQ-50 Data

| Variable               | N=200        |  |
|------------------------|--------------|--|
|                        | Mean±SD      |  |
| Total mental toughness | 260.65±42.01 |  |
| Tough belief           | 54.06±9.58   |  |
| Tough attitude         | 53.93±10.10  |  |
| Tough skill            | 52.48±9.01   |  |
| Tough value            | 55.00±10.84  |  |
| Tough emotion          | 45.16±7.70   |  |

**Table 2.** Means and Standard Deviations of TOPS Data

| Variable            | N=200      |             |
|---------------------|------------|-------------|
|                     | Practice   | Competition |
|                     | Mean±SD    | Mean±SD     |
| Activation          | 11.69±1.57 | 11.91±1.75  |
| Automaticity        | 12.40±2.49 | 12.23±2.38  |
| Emotional control   | 12.55±1.85 | 11.95±1.94  |
| Goal-setting        | 13.92±3.10 | 13.85±3.18  |
| Imagery             | 14.07±3.44 | 13.84±3.63  |
| Relaxation          | 12.20±2.45 | 12.73±3.14  |
| Self-talk           | 14.09±3.67 | 13.46±3.89  |
| Attentional control | 11.85±1.84 | -           |
| Negative thinking   | -          | 11.46±1.76  |

The Pearson correlation and multiple linear regression analysis results are shown in (Tables 3 and 4). The results indicate that the subscales of performance strategies (goal-setting, imagery, self-talk, and emotional control) in the practice and competition sections have the most positive and significant relationship with the total mental toughness score. Also, automaticity in the practice and activation and relaxation in the competition section has a positive and significant relationship with the total mental toughness score. This relationship is negative and significant in the attention control subscale of performance strategies. In analyzing the relationships between the subscales of mental toughness and the subscales of performance strategies through correlation and multiple linear regression, it was concluded that the subscale of tough emotion is associated with the use of performance strategies in practice and competition. Besides, a significant

relationship was found between tough emotions in 13 subscales of the 16 subscales of performance strategies, with the range of relationships ranging from -0.37 (attentional control) to 0.63 (self-talk). The multiple linear regression analysis results showed that some MTSQ-50 subscales significantly predict performance strategies in practice and competition. The  $R^2$ - values of the research variables are between 0% and 19% of the variance in performance strategies. According to (Cohen, J., Cohen, P., West, S.G. and Aiken, 1983), estimates of effect size, the variance related to goal-setting and imagery in practice and competition, self-talk in practice, and relaxation in the competition were moderate. Small residual  $R^2$ s should be used with caution when less than 10% of the variance is significant for relationships. Also, in the Independent-Sample T-Test, in subscales of performance strategies, the significant differences related to gender were that men reported higher levels of self-talk ( $t=3.24$ ,  $p<0.001$ ), automaticity ( $t=2.76$ ,  $p<0.006$ ), goal-setting ( $t=2.63$ ,  $p<0.009$ ), imagery ( $t=2.18$ ,  $p<0.03$ ) and relaxation ( $t=2.17$ ,  $p<0.03$ ) than women.

**Table 3.** Results of Pearson correlation analysis between the Use of Performance Strategies and Mental Toughness

|                     |     | Total mental toughness | Tough belief | Tough attitude | Tough skill  | Tough value  | Tough emotion |
|---------------------|-----|------------------------|--------------|----------------|--------------|--------------|---------------|
| Activation          | (P) | -0.07                  | -0.03        | 0.11           | 0.05         | -0.03        | -0.22         |
|                     | (C) | <b>0.24</b>            | <b>0.17</b>  | <b>0.21</b>    | <b>0.19</b>  | <b>-0.20</b> | <b>-0.31</b>  |
| Automaticity        | (P) | <b>0.19</b>            | 0.10         | 0.07           | <b>0.20</b>  | <b>0.20</b>  | <b>0.32</b>   |
|                     | (C) | 0.06                   | 0.01         | -0.19          | 0.11         | 0.06         | <b>0.14</b>   |
| Emotional control   | (P) | <b>0.26</b>            | <b>0.18</b>  | <b>0.15*</b>   | <b>0.26</b>  | <b>0.21</b>  | <b>0.41</b>   |
|                     | (C) | <b>0.15</b>            | 0.08         | 0.11           | 0.07         | 0.13         | <b>0.33</b>   |
| Goal-setting        | (P) | <b>0.44</b>            | <b>0.33</b>  | <b>0.28</b>    | <b>0.31</b>  | <b>0.42</b>  | <b>0.63</b>   |
|                     | (C) | <b>0.40</b>            | <b>0.31</b>  | <b>0.25</b>    | <b>0.26</b>  | <b>0.39</b>  | <b>0.55</b>   |
| Imagery             | (P) | <b>0.41</b>            | <b>0.33</b>  | <b>0.29</b>    | <b>0.30</b>  | <b>0.42</b>  | <b>0.50</b>   |
|                     | (C) | <b>0.44</b>            | <b>0.36</b>  | <b>0.28</b>    | <b>0.34</b>  | <b>0.46</b>  | <b>0.55</b>   |
| Relaxation          | (P) | -0.02                  | -0.13        | -0.08          | 0.02         | -0.02        | 0.12          |
|                     | (C) | <b>0.37</b>            | <b>0.26</b>  | <b>0.24</b>    | 0.37         | <b>0.36</b>  | <b>0.44</b>   |
| Self-talk           | (P) | <b>0.36</b>            | <b>0.25</b>  | <b>0.22</b>    | <b>0.31</b>  | <b>0.37</b>  | <b>0.48</b>   |
|                     | (C) | <b>0.30</b>            | <b>0.20</b>  | <b>0.17</b>    | <b>0.32</b>  | <b>0.31</b>  | <b>0.36</b>   |
| Attentional control | (P) | <b>-0.31</b>           | <b>-0.26</b> | <b>-0.22</b>   | <b>-0.21</b> | <b>-0.32</b> | <b>-0.37</b>  |
| Negative thinking   | (C) | -0.03                  | 0.01         | -0.06          | -0.01        | -0.02        | -0.04         |

P: Practice, C: Competition. Bolded values are P<0.01.

**Table 4.** Results of The Multiple Linear Regression Analysis

| Dependent variable  |     | R <sup>2</sup> | ANOVA | Variables loading significantly and beta value |
|---------------------|-----|----------------|-------|--|
| Activation          | (P) | 0.00           | 1.09  | ( $\beta = -0.07$ )                            |
|                     | (C) | 0.05           | 12.66 | Total mental toughness ( $\beta = -0.24$ )     |
| Automaticity        | (P) | 0.03           | 7.99  | Tough emotion ( $\beta = 0.19$ )               |
|                     | (C) | 0.00           | 0.90  | ( $\beta = 0.06$ )                             |
| Emotional control   | (P) | 0.06           | 15.23 | Total mental toughness ( $\beta = 0.26$ )      |
|                     | (C) | 0.02           | 5.06  | Tough emotion ( $\beta = 0.15$ )               |
| Goal-setting        | (P) | 0.19           | 47.84 | Tough emotion ( $\beta = 0.44$ )               |
|                     | (C) | 0.15           | 38.12 | Tough emotion ( $\beta = 0.40$ )               |
| Imagery             | (P) | 0.16           | 41.10 | Tough emotion ( $\beta = 0.41$ )               |
|                     | (C) | 0.19           | 49.40 | Tough emotion ( $\beta = 0.44$ )               |
| Relaxation          | (P) | 0.00           | 0.16  | ( $\beta = -0.02$ )                            |
|                     | (C) | 0.13           | 32.21 | Tough emotion ( $\beta = 0.37$ )               |
| Self-talk           | (P) | 0.13           | 30.84 | Tough emotion ( $\beta = 0.36$ )               |
|                     | (C) | 0.08           | 20.45 | Tough emotion ( $\beta = 0.30$ )               |
| Attentional control | (P) | 0.09           | 20.97 | Tough skill ( $\beta = -0.31$ )                |
| Negative thinking   | (C) | 0.00           | 0.18  | ( $\beta = -0.03$ )                            |

P: Practice, C: Competition. Bolded values are P<0.01.

## Discussion

The present study aimed to investigate the relationship between mental toughness and martial artists' performance strategies. The study results show that mental toughness is significantly related to several performance strategies in practice and competition.

In terms of practice, the results showed a positive and significant correlation between the total score of mental toughness and goal-setting, imagery, self-talk, emotional control, and automaticity. However, a significant inverse relationship was found between the total score of mental toughness and attention control. The findings of this study are consistent with the (Kristjánsdóttir, Jóhannsdóttir, Pic, & Saavedra, 2019) findings entitled psychological skills, mental toughness, and anxiety in handball players. Also, it is consistent with research findings (Gould, D., & Maynard, 2009) that emphasize the importance of imagery, goal-setting, self-talk, and automaticity in improving an athlete's performance.

According to the explicit monitoring theory, competitive conditions increase self-awareness and anxiety (Baumeister, 1984). In other words, the processing under pressure changes from an automatic state to a controlled state. The control of attention and baseball pressure confirms the low correlation between mental toughness and automaticity, and attention control (Gray, 2004). In general, considering the training conditions in which the pressure is less than the competitive conditions, it can be said that there is a degree of automation in the training conditions that confirms the results of this assumption.

A positive and significant correlation was obtained in the competition section between the total score of mental toughness and activation, emotional control, goal-setting, imagery, relaxation, and self-talk. This section's results align with Nicholls et al. (2008) research, which shows a significant relationship between mental toughness and relaxation and imagery. It can be said that changing the stimulus from rest to work and adjusting the stimulation level, managing energy levels, and reducing stress in the competition phase and between competitions is very important. The findings of this study confirm this (Tenenbaum G, 2020).

Considering the findings in the two parts of practice and competition and comparing them, it was concluded that the subscales of emotional control,

goal-setting, imagery, and self-talk are the only subscales of performance strategies that are positively and significantly related to mental toughness. According to linear regression results, out of the four common subscales of practice and competition, only three goal-setting, imagery, and self-talk variables can predict mental toughness. Previous studies have emphasized the importance of goal-setting, imagery, and self-talk (Tenenbaum G, 2020). According to (Crust & Azadi, 2010b), a positive and significant relationship between mental toughness and the use of psychological skills such as goal-setting and imagery is mentioned, which indicates that athletes with high mental toughness are looking for alternative ways to improve their performance. Evidence from (Nicholls et al., 2008) also shows that mental toughness is positively and significantly related to imagery, self-talk, and goal-setting.

In the analysis of MTSQ-50 subscales, it was found that the subscales of tough emotions are a subscale of mental toughness that is directly loaded to 8 subscales of performance strategies. According to this study, the more the athlete masters automaticity, emotional control, goal-setting, imagery, relaxation, and self-talk, the tougher and this mental toughness arises from the athlete's tough psychological and physiological emotions in training and competitive conditions. This finding is consistent with Gucciardi et al.'s (2008) findings and emphasizes the importance of emotions.

Due to gender differences in the subscales of performance strategies, men had higher scores than women in self-talk, automaticity, goal-setting, imagery, and relaxation. This study shows that the amount or manner of men using psychological skills is different from women. As in physical training, different exercises are performed in men and women, so the exercises should be done uniquely in the more effective use of women's psychological skills (Kristjánsdóttir, Erlingsdóttir, Sveinsson, & Saavedra, 2018). The results obtained in this part of the study align with the Harwood & Cumming (2004) results.

The current study has its limitations. First, the TOPS questionnaire was used to assess the psychological skills of athletes. The TOPS questionnaire's purpose is to measure a person's use of psychological skills and determine whether athletes have a proper understanding of these skills. Or, can they use these skills more effectively? There is no definite answer. The second limitation is caution in interpreting evidence from research that uses

multiple correlations. Another limitation is that it should be noted that mental toughness is not measured solely by the athlete's use of psychological skills and is a variable that goes beyond a set of performance strategies. Horsburgh et al. (2009) show that mental toughness has a genetic dimension and the acquired dimension. Nicholls et al.'s (2008) study also point to the lack of mental toughness variability from one situation to another and its behavior as personality traits. Therefore, mental toughness should not be considered a one-dimensional variable. The last limitation is that the current study's psychological variables can be related to athletes' personality traits. This possibility has not been investigated in this study.

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How to cite this article:

- APA: Beheshti, A., Gharayagh Zandi, H., Fathirezaie, Z., & Heidari, F. (2021). Mental toughness and performance strategies of martial artists in practice and competition. *Exercise and Quality of Life*, 13(1), 13-21. doi:10.31382/eqol.210602
- MLA: Beheshti, Atefeh, et al. "Mental toughness and performance strategies of martial artists in practice and competition." *Exercise and Quality of Life* 13.1 (2021): 13-21.
- Chicago: Beheshti, Atefeh, Hassan Gharayagh Zandi, Zahra Fathirezaie, and Fatemeh Heidari. "Mental toughness and performance strategies of martial artists in practice and competition." *Exercise and Quality of Life* 13, no. 1 (2021): 13-21.