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Relationship Between Decision-Making Styles and Mental Toughness: A Study of Chess Athletes

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Abstract: This study aimed to examine the relationship between decision-making styles and mental toughness among chess athletes. The study sample consisted of 192 currently licensed and active players. Research data were collected through the *General Decision-Making Style Inventory*, *Mental Toughness Scale*, and a demographic information form. Descriptive statistics, as well as correlation and regression analyses, were employed in the study. Correlation analyses revealed that there was a positive and moderate correlation between rational decision-making style and mental toughness, with a negative and weak correlation between avoidant style and mental toughness. Regression analysis demonstrated that the rational style positively predicted mental toughness, whereas the avoidant style negatively predicted mental toughness. In conclusion, chess athletes were found to have good level of mental toughness. Rational decision-making style was identified as a positive predictor of mental resilience, whereas an avoidant style was negatively associated with it.

Keywords: *Modes of decision-making, mental resilience, chess competitors*

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INTRODUCTION

Human beings engage in a number of physical, mental, and social processes in order to maintain their existence and vital activities on a daily basis, and in order for such processes to be healthy and optimal, they must conduct decision-making behaviors several times throughout the day. Decision-making often plays a key role that serves as a fundamental component of various crucial aspects in one's life (Geisler & Allwood, 2017). It involves the use of information derived from the individual's existing knowledge, along with the ability to apply the data to plan, choose, and finalize an action in accordance with their goals. In essence, decision-making could be described as the individual's ability to choose the most functional one from among multiple possible actions influenced by environmental factors to achieve a particular objective (Silva et al., 2020). Sporting activities, on the other hand, involve numerous actions where athletes have to make decisions in the presence of numerous factors, both individual and environmental. Therefore, the decision-making process stands out as an essential component of a dynamic process that requires athletes to produce alternative strategies owing to the nature of sporting events (Kelecek et al., 2013).

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Improving decision-making skills of athletes—both individually and within a team context—is known to contribute to making the right decisions and enhance athletic success. Decision-making and the processes that it entails are particularly crucial in sports like chess, where cognitive processes such as strategy formulation and decision-making are dominant factors (Westlund Stewart & Hall, 2017). Because in such sports branches that demand individual and especially intense mental processes, the athlete has to struggle alone with the decisions and their resulting outcomes. The complexity of this process stems from the interplay of various factors, including individual predispositions and personality traits (Szczepańska & Kaźmierczak, 2022).

Athletes who continuously strive to achieve some targeted performance regardless of their emotional states (positive or negative) or the nature of the activity they are performing (training or competition) can generally be characterized as mentally resilient athletes (Gucciardi et al., 2014). Mental toughness in sport, can be defined as the ability to use characteristics such as self-belief, motivation, and controlling pressure more effectively than the individuals with whom the athlete competes (Jones et al., 2007). Loehr, who first used the concept of mental toughness in his research, stated that mental toughness, which he defined as the ability to regulate the emotional state of the individual, is important for high performance (Loehr & McLaughlin, 1988). Following Loehr, Jones and colleagues (2002) comprehensively examined the concept of mental toughness in sportive performance and determined its conceptual framework and dimensions such as focus, motivation, self-belief, overcoming anxiety and pressure (Jones et al., 2002). Bull et al. (2005), in their research on English cricket athletes, focused on making the content of the concept of mental toughness more understandable and how it provides development on athletes, and stated that it has a fundamental importance on performance. It is also thought to be associated with the determination to persevere in the face of unexpected adversities, the ability to compensate for mistakes, and the athlete's motivational aptitude (Bull et al., 2005). Furthermore, it has been reported that in competitions and events where the physical capacity and skill levels of athletes are comparable, individual mental endeavors and competencies represent an essential factor in determining the winner (Karageorghis et al., 2020). Besides, mental toughness is considered to contain a number of psychological components that influence athletic performance (Butt et al., 2010; Mahoney et al., 2014). The literature also includes a substantial body of research demonstrating that mentally toughness athletes improve their athletic performance (Slimani et al., 2016; Cowden, 2016; Meggs et al., 2019).

Chess is an activity that requires the athlete to actively self-control cognitive skills such as reasoning, decision-making, extensive know-how, willpower and motivation (Blanch & Llaveria, 2021). It is

an intellectually complex and strategically challenging sport in which the player is the agent of decision-making processes, deciding when to execute the next move and responding to challenges that will influence the overall gameplay (Franklin et al., 2020). According to Szczepańska and Kaźmierczak (2022), chess is a specialized discipline that promotes both the game itself and the player's analytical thinking skills. In competitive chess, the athlete decides on the game plan to achieve the desired outcome through their chosen moves. Each game in chess involves a comprehensive decision-making process reflected in the tactical structure of any chess game and its player (Szczepańska & Kaźmierczak, 2022). Analyzing a chess game, therefore, enables evaluation of players' decision-making process in great detail, which offers valuable insights into the game and their perspectives. In that regard, chess provides a fertile research field for the study of basic cognitive processes and mental capacities, including decision-making (Villafaina et al., 2019; Campitelli & Gobet, 2004). During chess competitions, decisions are not made randomly; instead they are based on the player's information capacity and their analysis of cause-and-effect relationships between opponents' moves performed during the game. Naturally, the quality of decisions is directly proportional to an athlete's personality traits and mental skills like risk-taking propensity, motivation, and mood control, which are the underlying factors in their behavioral and tactical choices on the chessboard (Szczepańska & Kaźmierczak, 2022).

Making the right decision can directly or indirectly impact competitive outcomes as it is crucial for athletes' scoring opportunities and overall success (Gantois et al., 2020). Mental toughness in athletes is a vital asset that contributes to sporting achievement (Farnsworth et al., 2021), and previous work in the literature suggests a positive correlation between mental toughness (MT) and high performance in athletes (Wheatley et al., 2023). Crust, Swann and Allen-Collinson (2016), in their research on elite mountaineer athletes, evaluated that mental toughness is beneficial to the performance of mountaineering athletes, but at the same time, they stated that it has a dangerous aspect in obsessively progressing to the goal during peak climbing. Gürer et al. (2019), in their research with nature athletes, stated that there was a low but positive relationship between the mental toughness levels of athletes and their decision-making skills. Koç and Pakyardım (2024), in their study on wrestling referees, determined a positive relationship between mental toughness and decision-making processes. They also found that mental toughness increased as the refereeing experience increased.

When the related literature was analysed, there was no study that included the concepts of decision making and mental endurance together in chess athletes. Considering the way decisions are made in chess sport and the importance of mental toughness level on the results, it is thought that the

findings of this study may provide important contributions to chess athletes in their training and competitions. This study therefore sought to examine the relationship between decision-making styles and mental toughness of chess athletes—with the expectation that the findings will make meaningful contributions to the current literature on this topic.

METHOD

Research Group

For the research, ethics committee approval was obtained from Osmaniye Korkut Ata University's Scientific Research and Publication Ethics Board of Science, Scientific Research and Publication Ethics Board (2022 year and 13390 number). The sample comprised a total of 192 active licensed chess athletes, 57 females (29.7%) and 135 males (70.3%), who voluntarily agreed to participate in the study. Participants were grouped based on their years of experience in chess: 1-3 years (n=109, 56.8%), 4-6 years (n=46, 24%), and 7 or more years (n=37, 19.3%). The related questionnaire was determined by convenience sampling method among the individuals who are active sportsmen in Osmaniye province (mean age 14.55 ± 11.33 years).

Research model

This study employed a correlational research design to explore the relationship between decision-making styles and mental toughness in chess athletes. Correlational surveys, also known as relational screening models, are non-experimental research methods that aim to identify the presence or degree of covariance between two or more variables (Karasar, 2019).

Data Collection Tools

We used General Decision-Making Style Inventory and Mental Toughness Scale to collect data.

General Decision-Making Style Inventory (GDMS)

Developed by Scott and Bruce (1995) and adapted into Turkish by Taşdelen (2002), the scale consists of five subdimensions that assess different decision-making styles: rational style, intuitive style, dependent style, avoidant style, and spontaneous style. The scale has twenty-four items. A Likert-type five-point scale was used.

Mental Toughness Scale (MTS)

Developed by Madrigal et al. (2013), this eleven item instrument encompasses one dimension designed to measure the level of mental toughness in sports. A Likert-type five-point scale was used. The scale was adapted into Turkish by Erdogan (2016).

Data Analysis

Missing values were first analyzed at the beginning of the study. Kurtosis and skewness values were examined for normality assumption. Descriptive statistics were performed, mean values of the scales were calculated, and Pearson correlation and multiple regression analysis methods were used within the scope of the relational research.

RESULTS

The ages of the participants were between 7 - 63 years old and heterogeneous, and consisted of 192 people. The average age of the participants is 14.55.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	192	7,00	63,00	14,5521	11,33116
Valid N (listwise)	192				

Assessed via its two components 'skewness' and 'kurtosis' (Tabachnick et al., 2013), normal distribution is known to be one of the basic assumptions of parametric tests (Uysal et al., 2022).

Table 2. Skewness, kurtosis, and Cronbach's Alpha (α) values for the scales

Dimensions	Skewness	Kurtosis	(α)
Rational style	-.470	.003	.70
Intuitive style	-1.018	1.244	.78
Dependent style	-.381	-.303	.73
Avoidant style	.600	-.447	.83
Spontaneous style	.275	-.282	.70
Mental toughness	-.304	-.335	.82

In this study, skewness and kurtosis values were calculated to fall within the acceptable range specified in the literature (George & Mallery, 2010), which confirmed the normality assumption. Cronbach's Alpha (α) reliability coefficients for the GDMS subdimensions were as follows: .70 for *rational style*, .78 for *intuitive style*, .73 for *dependent style*, .83 for *avoidant style*, and .70 for *spontaneous style*, with an overall scale α of .83. The Mental Toughness Scale (MTS) demonstrated an α of .82. Overall, these findings indicated acceptable reliability for both scales (Kalaycı, 2018).

Table 3. Results of correlation analysis on research variables

	M	SD	1	2	3	4	5	6
1. Rational style	4.27	.508	-					
2. Intuitive style	3.79	.838	.188**	-				
3. Dependent style	3.37	.862	-.033	.173*	-			
4. Avoidant style	2.45	1.042	-.035	.249**	.390**	-		
5. Spontaneous style	2.76	.844	-.011	.334**	.350**	.539**	-	
6. Mental toughness	4.05	.579	.511**	.110	-.086	-.236**	-.069	-

***p<0.01*

Correlation analysis aims to determine the strength and direction of the relationship between variables (Karasar, 2019). The following guidelines are typically employed to interpret correlation coefficients: 0<r<0.3 indicates a weak relationship, 0.3<r<0.7 signifies a moderate relationship, and finally 0.7<r<+1 could be suggested to represent a strong relationship (Norusis, 2008). As shown in Table 2, the correlation analysis detected a positive and moderate association (r = .511) between rational decision-making style and mental toughness, implying that those basing their decisions on logic and careful analysis are also more likely to exhibit greater mental toughness in the face of challenges. In contrast, a negative and weak correlation (r = -.236) was observed between avoidant style and mental toughness, suggesting lower levels of mental toughness among individuals that avoid or delay making decisions.

Table 4. Results of regression analysis on research variables

Model	B	Std. Error	Beta (β)	t	p	VIF
(Constant)	1.746	.345	-	5.062	.000	-
Rational style	.559	.071	.490	7.903	.000***	1.047
Intuitive style	.044	.046	.064	.973	.332	1.188
Dependent style	.002	.045	.003	.049	.961	1.222
Avoidant style	-.149	.042	-.268	-3.589	.000***	1.519
Spontaneous style	.040	.052	.058	.777	.438	1.544
R=.563	R^2=.317	Adj. R^2= .298				
$F_{(5-186)}$= 17.227	p=.000	D-W=1.938				

**** p< .001; Dependent variable: Mental toughness, VIF: Variance inflation factor, D-W= Durbin Watson*

Based on the VIF values calculated in the study, it was determined that there was no multicollinearity problem between the research variables (Mertler & Vannatta Reinhart, 2017; O'Brien, 2007). Regression analysis was employed to predict one variable's score based on another (Tabachnick & Fidell, 2015). The regression model created within the scope of the study was statistically significant, $F_{(5-186)}$= 17.727; p<.001). The R^2 value of the model was .317 and the

adjusted R^2 value was .298. This finding shows that the independent variable—namely decision-making styles— explains approximately 30% of the variance in the dependent variable, or mental toughness. Analysis of the beta values, which indicate the relative influence of independent variables on the dependent variable, also revealed two significant effects: a significant and positive effect observed in the rational decision-making style dimension (β=.490) and a significant and negative effect emerging in the avoidant decision-making style (β=-.268).

DISCUSSION

The aim of this study was to examine the relationship between decision-making styles and mental toughness of chess athletes. Descriptive statistics revealed that chess athletes exhibited high levels of mental toughness. These results corroborate the previous research findings (Çimen, 2022; Yarayan et al., 2018; Gucciardi, 2010). The correlation analysis results indicated that there was a positive and moderate relationship between rational decision-making styles—a subdimension of the General Decision-Making Style Inventory (GDMS)—and mental toughness among chess athletes. In addition, there was a negative and low-level relationship between the avoidant decision-making style and mental toughness in chess athletes (Table 3). Accordingly, we can suggest that chess athletes who approach decisions with logic and careful analysis of alternative options tend to demonstrate greater mental toughness. This seems to align with the findings of Güvendi et al. (2020), who reported a weak, yet significant, relationship between mental toughness and avoidant decision-making style. Astuti et al. (2024) examined the effects of mental toughness on decision-making styles in basketball referees and found a strong positive relationship. They found a positive relationship between referees mental toughness and cautious decision-making levels and a negative relationship between mental toughness and panicking, avoiding and postponing decision-making styles. In a similar study conducted by Bavol'ar and Orosova (2015) with Slovak students, researchers found a positive association between intuitive decision-making and mental health, and a negative and significant correlation between avoidant style and mental health. Nehass and Zarhbouch (2023) further reported a significant positive relationship between students' decision-making skills and their academic achievement. Selvi (2018) emphasized that psychological resilience was correlated with all subdimensions of decision-making styles. In a similar vein, Tekkurşun Demir et al. (2018) stated that there was a positive and significant correlation between rational decision-making style and mental toughness level, but unlike our findings, they emphasized a positive correlation between intuitive decision-making and mental toughness, and a negative correlation with dependent style. Another study conducted by Dilmaç and Bozgeyikli (2009) with teacher candidates reported a significant positive relationship existing between rational decision-

making and intuitive decision-making subdimensions and subjective well-being. Aditya et al. (2024), stated that mental toughness has a vital role in athlete performance and during intense competitions. They emphasised that it is effective in pressure and stress management, as well as its importance on physical and mental health. Kara (2020) conducted a study on karate athletes and detected a positive correlation between careful decision-making and cognitive flexibility levels among karate athletes, and a negative correlation between avoidant decision-making, panic decision-making and procrastinatory decision-making and their cognitive flexibility.

Multiple regression analysis indicated that rational style, a subdimension of the GDMS, significantly and positively predicted mental toughness, whereas avoidant style, another subdimension of the GDMS, had a significant and negative impact (Table 4). The interplay between both variables (mental toughness and rational style) and broader psychological constructs has been a topic of interest for researchers across various fields. For instance, Özsarı et al. (2022), focusing on chess athletes, found that improved mental toughness was linked to better psychological well-being, suggesting a potential cascading effect, whereby the capacity for rational decision-making fosters mental toughness, which in turn contributes to a positive psychological state. In a similar vein, Stepanyan and Lalayan (2024), reported that cognitive processes that provide stress resilience during athletic performance in competitive environments have important effects on decision-making ability. They found that long-term stress resilience also strengthens mental health. Güler et al. (2022) reported that mental readiness—a concept involving aspects of mental toughness and cognitive preparedness—was a significant predictor of rational decision-making, further underscoring the interconnectedness of these variables.

Newland et al. (2013) argued that the performance of basketball athletes could be predicted by their mental toughness levels. Sheard (2009) concluded that mental toughness of elite rugby league players is positively correlated with successful sport performance. Similar reports were published by Powell and Myers (2017), Crum (2022), and Hsieh et al. (2023). Furthermore, Lin et al. (2017) reported that mentally strong individuals were able to maintain higher levels of control and confidence in stressful situations, which in turn might improve their psychological well-being. Gucciardi et al. (2009) investigated the impact of psychological skills training on mental toughness in soccer players and found that positive changes were detected in the mental toughness levels of soccer players who participated in training sessions on psychological skills. Gümüşdağ et al. (2025), stated that there are mental processes such as attention, knowledge and memory in the efficient decision-making ability of athletes. They mentioned that the decisions taken at high risk and pressure are important, and variables such as attention management skills and experience have a

function on decision making. In the same spirit, Dagnall et al. (2021) mention that mental toughness can be considered as a source of strength that safeguards athletes from stress. Finally, Connaughton et al. (2008) suggested that mental toughness levels of individuals can be improved through rigorous mental training. Considered collectively, all these studies underscore the importance of research into mental toughness or toughness in athletes performing across various domains.

CONCLUSION

Chess athletes demonstrated good levels of mental toughness. Rational decision-making style was positively associated with mental toughness, while avoidant style was negatively associated. Just as decision-making can be considered as a major factor in predicting performance of athletes in sporting activities (Gantois et al., 2019), it could be a key attribute determining athletic achievement in chess as well. Chess athletes who evaluate a number of alternative options and make highly rational decisions and those who do not avoid making decisions exhibit higher levels of mental resilience. Rational decision-making and tendency to avoid making decisions appear to be two major components influencing mental toughness in this population. Accordingly, chess athletes can enhance their mental readiness for competition by incorporating activities into their training sessions that would specifically aim to develop skills in evaluating options and making decisions without resorting to avoidance strategies.

Although our research findings are limited to chess athletes in Osmaniye province, they contain important results for researchers who will conduct future studies on the current subject. The fact that the data were obtained through cross-sectional questionnaires within the research design in our study limits the generalisability of the results found.

Coaches and athletes can include practices that emphasise decision-making and mental toughness in their training designs. It is thought that knowing the decision-making styles and mental toughness levels of athletes by measuring them may provide an advantage during their performance in the competition. It is thought that the findings we obtained as a result of the research can increase its contribution to the literature by expanding the sample group and applying it to athletes in different provinces and categories. By designing a qualitative study model, the development of athletes who have studied decision-making style and mental toughness over a certain period of time can be observed. In this way, long-term contribution data on performance can be obtained.

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