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The effect of Mental Toughness on the relationship between irrational performance beliefs and trait anxiety levels of Turkish athletes: a mediation analysis

El efecto de la fortaleza mental en la relación entre las creencias irracionales sobre el rendimiento y los niveles de ansiedad de rasgo de los deportistas turcos: un análisis de mediación

O efeito da resiliência mental na relação entre crenças irracionais sobre desempenho e níveis de ansiedade em atletas turcos: uma análise de mediação

Zebehulla Ahmad Ali [1]
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ABSTRACT

PURPOSE: The aim of this study is to examine the mediating effect of mental toughness in the relationship between irrational performance beliefs and trait anxiety in individual and team athletes. **METHODOLOGY:** A total of 452 licensed athletes, including 150 females (X_age= 20.07 ± 2.20), 302 males (X_age = 20.35 ±3.64), 18 years old and above, who do individual and team sports in the province of Istanbul, participated in the study. "Irrational Performance Beliefs Inventory-2 (APIE-2)", "Sports Anxiety Scale 2 (SAS-2)", "Scale of Mental Toughness in Sports (SCI)" and "Personal Information Form" were applied to the participants. In the analysis of the data, correlation and regression analyses and mediation analysis were performed. **RESULTS:** The findings showed that mental toughness mediated significantly in the relationship between irrational performance beliefs and trait anxiety. In addition, a significant relationship was observed between irrational performance beliefs, disintegration and commitment sub-dimensions of mental toughness, and trait anxiety. As a result, all subdimensions of irrational beliefs that are intertwined with the emotions, minds and thoughts of the athletes are among the subdimensions of mental toughness, which is expressed as the ability to recover against the negative thoughts and pressures encountered during the performance process, to try to reach the determined goals and to stick to their goals despite the disintegration and difficult conditions. **CONCLUSION:** It is observed that the subdimensions of commitment and the athletes' trait anxiety play a role in determining the distraction subdimension and the general level.

KEYWORDS: mental training, physical training & conditioning, performance anxiety, psychology of athletes.

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RESUMEN

OBJETIVO: El objetivo de este estudio es examinar el efecto mediador de la fortaleza mental en la relación entre las creencias irracionales sobre el rendimiento y la ansiedad de rasgo en deportistas individuales y de equipo. **METODOLOGÍA:** En el estudio participaron un total de 452 deportistas con licencia, incluidas 150 mujeres (X_edad = 20,07 ± 2,20), 302 hombres (X_edad = 20,35 ± 3,64), de 18 años o más, que practican deportes individuales y de equipo en la provincia de Estambul. Se aplicaron a los participantes las escalas "Irrational Performance Beliefs Inventory-2 (APIE-2)", "Sports Anxiety Scale 2 (SAS-2)", "Scale of Mental Toughness in Sports (SCI)" y "Personal Information Form". Para el análisis de los datos, se llevaron a cabo análisis de correlación, regresión y mediación. **RESULTADOS:** Los hallazgos mostraron que la fortaleza mental mediaba significativamente en la relación entre las creencias irracionales sobre el rendimiento y la ansiedad de rasgo. Además, se observó una relación significativa entre las creencias irracionales sobre el rendimiento, las subdimensiones de desintegración y compromiso de la fortaleza mental y la ansiedad de rasgo. Como resultado, todas las subdimensiones de creencias irracionales que se entrelazan con las emociones, mentes y pensamientos de los atletas se encuentran entre las subdimensiones de la fortaleza mental, que se expresa como la capacidad de recuperarse frente a los pensamientos y presiones negativos experimentados durante el proceso de rendimiento, para tratar de alcanzar las metas determinadas y apegarse a sus objetivos a pesar de la desintegración y las condiciones difíciles. **CONCLUSIÓN:** Se ve que las subdimensiones de compromiso y la ansiedad rasgo de los atletas juegan un papel en la determinación de la subdimensión de distracción y el nivel general.

PALABRAS CLAVE: entrenamiento mental, entrenamiento y acondicionamiento físico, ansiedad por el rendimiento, psicología del atleta.

RESUMO

OBJETIVO: O objetivo deste estudo é examinar o efeito mediador da resiliência mental na relação entre crenças irracionais sobre o desempenho e a ansiedade-traço em atletas individuais e de equipe. **METODOLOGIA:** O estudo envolveu um total de 452 atletas licenciados, incluindo 150 mulheres (idade média = 20,07 ± 2,20) e 302 homens (idade média = 20,35 ± 3,64), com 18 anos ou mais, que praticam esportes individuais e coletivos na província de Istambul. As escalas "Irrational Performance Beliefs Inventory-2 (APIE-2)", "Sports Anxiety Scale 2 (SAS-2)", "Scale of Mental Toughness in Sports (SCI)" e "Personal Information Form" foram aplicadas aos participantes. Para a análise dos dados, foram realizadas análises de correlação, regressão e mediação. **RESULTADOS:** Os resultados mostraram que a resiliência mental mediou significativamente a relação entre crenças irracionais sobre desempenho e ansiedade-traço. Além disso, observou-se uma relação significativa entre crenças irracionais sobre desempenho, as subdimensões de desintegração e comprometimento da resiliência mental e a ansiedade-traço. Consequentemente, todas as subdimensões de crenças irracionais que se entrelaçam com as emoções, a mente e os pensamentos dos atletas estão entre as subdimensões da resiliência mental, que se expressa como a capacidade de se recuperar de pensamentos e pressões negativas vivenciadas durante o processo de desempenho, de tentar alcançar os objetivos determinados e de se manter firme neles apesar da desintegração e das condições difíceis.

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CONCLUSÃO: Ao que tudo indica, as subdimensões de comprometimento e ansiedade-traço em atletas desempenham um papel na determinação da subdimensão de distração e do nível geral.

PALAVRAS-CHAVE: treinamento mental, treinamento e condicionamento físico, ansiedade de desempenho, psicologia do atleta.

1. Introduction

Achieving optimal performance in sports is shaped by the interaction of various physical and psychological factors (Sheard, 2010). In this context, Rational Emotive Behavior Therapy (REBT), which is known as one of the main perspectives of cognitive behavioral approach, recently it has become increasingly common in the field of sport and exercise psychology (Vertopoulos & Turner, 2017).

This approach, which was developed by Albert Ellis in 1955 (Ellis, 1962), argues that the beliefs an individual has about the events around him have profound effects on his or her cognitive, emotional and behavioral consequences (Ellis & Dryden, 2007). In addition, according to the perspective of the REBT, inflexible, rigid, and irrational beliefs lead to poor emotional self-regulation, self-defeating behaviors, and problems in achieving personal and important life goals and objectives (Browne et al., 2010). Accordingly, although athletes may show healthy behavioral responses based on logical and rational beliefs such as motivating and goal- encouraging, according to their positive experiences or according to their failure experiences, they may show unhealthy behavioral responses based on dogmatic irrational beliefs such as reducing motivation and limiting performance (Szentagotai & Jones, 2010).

Irrational beliefs that are often rigid and sharp, inconsistent with reality, irrational, emphasizing difficulties, and generalizing, often prevent individuals from achieving the goals for which they are striving (Dryden & Branch, 2008). They cause negative emotions such as anxiety, guilt, despair, shame and maladaptive behaviors (DiGiuseppe et al., 2014; Dryden, 2009; Szentagotai & Jones, 2010).

Within the framework of REBT, core beliefs are understood as broad and deeply rooted assumptions individuals hold about themselves, others, and the world. These beliefs function as an underlying cognitive foundation rather than direct causes of emotional problems. Emotional well-being or distress emerges primarily from the rational or irrational evaluative beliefs—such as rigid demands, catastrophizing, low frustration tolerance, and global self-evaluations—that develop from these core assumptions. Therefore, in REBT, psychological outcomes are shaped not by the mere presence of core beliefs, but by how flexibly or rigidly individuals interpret and evaluate experiences based on those beliefs (Dryden, 2009).

Psychological and emotional distress is “an emotional suffering characterized by symptoms of depression and anxiety” (Drapeau et al., 2012). Emotional distress negatively affects the social functions and daily life of the individual (Wheaton, 2007) and reaches higher levels in populations exposed to working under stress and pressure (Marchand et al., 2005).

Therefore, as the athlete population is constantly exposed to pressured environments, emotional factors such as irrational beliefs and anxiety are important structures that should be

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examined (Fletcher & Arnold, 2017; Nixdorf et al., 2013). Although anxiety can sometimes facilitate performance, high or maladaptive levels of anxiety are generally associated with negative performance outcomes in athletes (Craft et al., 2003; Urfa, 2022; Vast et al.,2010; Woodman & Hardy, 2003).

In this context, irrational performance beliefs are mostly associated with the concept of anxiety in literature (Chadha et al., 2019b: Elko & Ostrow, 1991; Turner & Barker, 2013; Turner & Moore, 2016; Turner et al., 2020; Vîslă et al., 2016)

According to Martens (1997), athletes with high levels of anxiety are more likely to perceive that they do not have the necessary and sufficient cognitive resources to cope with difficulties; as a result of this perceived inadequacy between demands and cognitive resources, they could experience higher levels of anxiety. In the literature, it has been suggested that having flexible and rational beliefs leads to behaviors that support emotion regulation and goal attainment (Caserta et al., 2010; Dryden, 2011). In addition, sports researchers have emphasized not only the roles of talent and physical ability, but also the effect of psychological states such as mental toughness on optimum performance in the sports environment in order to distinguish consistently successful athletes from others (Gould et al., 2002). Therefore, it is seen that REBT can provide a suitable theoretical framework for understanding some psychological processes that support the development of a performance mentality such as mental toughness (Hanli, 2014).

Relationship between irrational beliefs and performance is associated with mental toughness (Kalinin et al., 2019b). Despite the emergence of the concept of irrational performance beliefs belongs to the 1950's, comprising a very large and important research area in the psychology literature, its entry into the field of sports is very recent. There are recent studies revealing that irrational beliefs indirectly affect sportive performance negatively (Chadha et al., 2019a; Turner & Moore, 2016; Turner et al. 2020; Turner et al., 2019a; Turner, 2022; Urfa & Aşçı; 2018a). Although there are studies that reveal similar results in recent years, research in this area remains limited. Therefore, the relationship between irrational beliefs and anxiety and mental toughness was found worth examining.

Examining the interplay of irrational performance beliefs, anxiety, and mental toughness—topics rarely studied together—can significantly contribute to sports psychology. Mental toughness, recognized as a personality trait, may mediate the relationship between irrational beliefs and anxiety levels.

Exploring these relationships could enhance athletes' performance and enrich the field of sports and exercise psychology. Furthermore, such research is likely to yield valuable contributions to both practice and scholarship in this domain. This study aims to investigate the mediating role of mental toughness in the relationship between irrational performance beliefs and trait anxiety in sport. To achieve this objective, mediation analysis, along with correlation and regression analyses, were conducted.

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2. Methods

Research Design

This study is a quantitative research type and was conducted using a relational screening model. Within the scope of the study, the mediating role of mental toughness in the relationship between irrational performance beliefs and trait anxiety was examined by using the simple mediation analysis method.

Figure 1 shows two models related to the mediation effect. In the model on the left side of Figure 1 the total effect of the independent variable (X) on the dependent variable (Y) is expressed as c, while in the model on the right, the direct effect of X on Y is indicated by c'. In the simple mediation model on the right side of Figure 5.1, the independent variable (X) transmits its effect on the dependent variable (Y) through the mediator variable (M) (Hayes, 2018). In this model, the effect of X on M is expressed by path a, while the effect of M on Y is shown by path b (Gürbüz & Şahin, 2017).

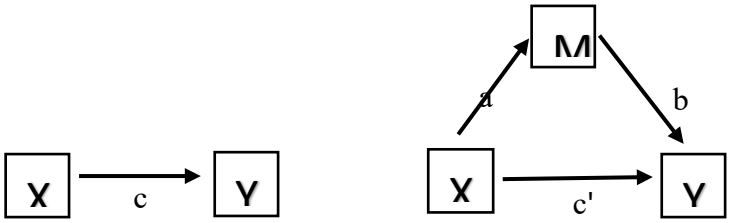

Figure 1. Mediator variable model. Source: the authors.

The aim of this research is investigated within this model which is shown in Figure 2.

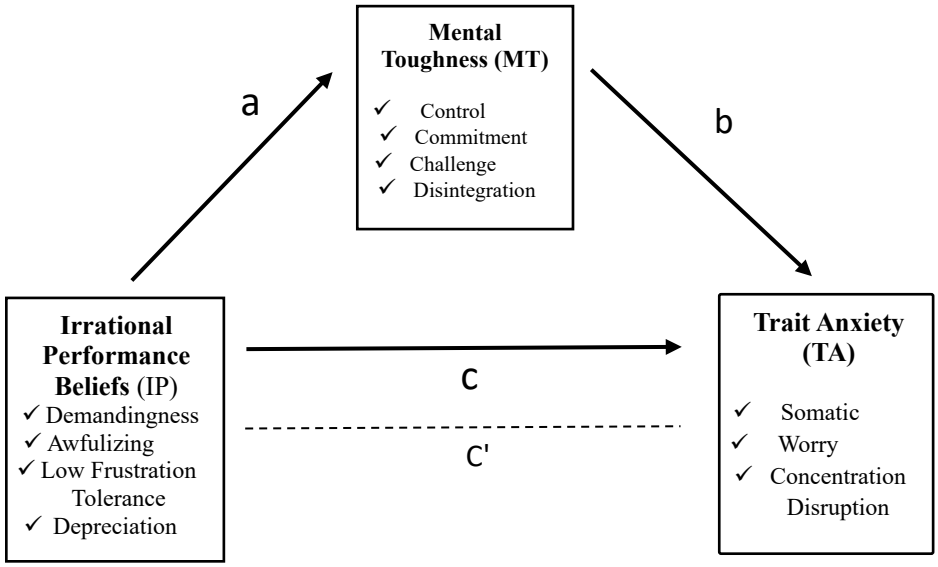

Figure 2. Mediation Model of Research. Source: the authors.

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Research Hypotheses

The present study aimed to examine the mediating role of mental toughness in the relationship between irrational performance beliefs and trait anxiety among individual and team sport athletes.

Based on the theoretical framework and previous empirical findings, the following hypotheses were proposed:

H1: Irrational performance beliefs are positively associated with trait anxiety among athletes.

H2: Irrational performance beliefs are negatively associated with mental toughness among athletes.

H3: Mental toughness is negatively associated with trait anxiety among athletes.

H4: Mental toughness mediates the relationship between irrational performance beliefs and trait anxiety among athletes.

Sample

The samples of the cross-sectional study were selected by using the convenient sampling method, one of the non-probability sampling methods. In this context, a total of 470 licensed individual and team athletes aged 18 years and older with at least 1 year of licensed sports experience volunteered to be involved in this research. The convenient sampling was accomplished in Istanbul (Turkey) from November 2022 through January 2023. Besides, the exclusion criterion in study participation was being passive or inactive athlete which is the athlete who does not participate in any competition or sport organization. One other criterion to remove participants before data imputation to analyze was answering questions randomly and dishonestly or finishing the scales much earlier than what is expected. 18 participants were excluded due to dishonesty and randomly answering questions.

3. Participants

A total of 452 participants remained in this study. 150 (33.2%) of the athletes were female (age = 20.07 ± 2.20) and 302 (66.8) were male (age = 20.35 ±3.64) (mean ± SD). 201 (44.5%) of the athletes are engaged in team sports, 251 (55.5%) are engaged in individual sports. When we look at the licensing period of the participants, it varied under three groups: 1-5 years, 6-10 years and 11 years. According to the grades, the lowest level in terms of sports level was determined as the regional amateur league and inter-university competitions, while the highest levels were formed by the athletes participating in the Turkish Super League, European, and World Championships. Although the participants do not show an equal distribution in branches, they consist of athletes from 31 different branches (athletics, badminton, basketball, cycling, boxing, gymnastics, field hockey, fitness, football, fencing, kick boxing, judo, handball, wrestling, rafting, karate, skiing, kung fu , rowing, table tennis, tennis, muaythai, orienteering, swimming, martial arts, taekwondo, triathlon, volleyball, wushu, canoeing).

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4. Materials

Personal Information Form, Irrational Performance Beliefs Inventory-2. (APIE-2), Sports Anxiety Scale 2 (SAS-2) and Sports Mental Toughness Scale (SCI) were used in this research. The details of these scales are as follows:

Personal Information Form: researcher prepared this form to determine the features of the athletes such as gender, age, sport type and sport experience.

Irrational Performance Belief Inventory-2 (iPBI-2): The first version of this inventory was developed by Turner et al., (2016); but after two years it is updated by Turner and Allen (2018). The validity and reliability of the Turkish version of the Irrational Performance Belief Inventory-2 (iPBI-2) were examined by Urfa and Aşçı (2018b). This inventory uses a 5-point Likert scale with 20 items. It has 4 sub-dimensions which are Demandingness, Awfulizing, Low Frustration Tolerance and Depreciation. Higher scores on each factor indicate higher levels of the target dimension. The internal consistency of all sub-dimensions is examined in Turkish form. The Cronbach Alpha internal consistency coefficient of the scale's reliability was found to be 0.76 for the Demandingness factor, 0.85 for the Low Frustration Tolerance factor, 0.79 for the Awfulizing factor, and 0.87 for the Depreciation factor. The validity for this scale and the fit values was acceptable ($\chi 2$ /df = 3.90, CFI = 0.91, NNFI = 0.90, RMSEA = 0.07) (Turner & Allen, 2018).

Scale of Mental toughness in Sports (CIS): This scale was developed by Seydaoğulları (2018). The scale consists of 22 items and is rated on a 5-point Likert scale. The scale consists of 4 factors: Control, Commitment, Challenge and Disintegration. The items of the dispersion dimension are scored conversely. According to the Cronbach Alpha internal consistency coefficient values of the reliability study of the scale, it was found that the Control sub-dimension was 0.82, 0.75 for the Commitment factor, 0.74 for the Challenge factor, and 0.86 for the Disintegration factor.

Sports Anxiety Scale 2 (SAS-2): It was developed by Smith, Smoll, Cumming and Grossbard in 1990. Later, in 2006, Smith, Smoll, Cumming, and Grossbard revised the Sports Anxiety Scale as 2, and its Turkish form was carried out by Akyol, Altıntaş, Sezer, and Aşçı (2016). This scale is a 4-point Likert type and has 15 items. Somatic anxiety, worry, and concentration disruption consisted of 3 sub-dimensions, each of which consisted of 5 items. The factor loads of the scale obtained in the study were between 0.63 to 0.84 for the anxiety subfactor, between 0.49 and 0.61 for the somatic anxiety subfactor, and between 0.51 and 0.70 for the concentration disorganization subfactor. The internal consistency values of the subfactor of this scale were 0.74 for somatic anxiety, 0.86 for anxiety, and 0.77 for concentration disruption.

Data Collection

Before starting the study, approval was obtained regarding the scientific and ethical suitability of the study by applying to the Ethics Committee of the Institute of Health Sciences of Marmara University. Before starting data collection, necessary permissions were obtained from the researchers who developed and adapted the scales. In the data collection process in order to deal with confounding factors (1) the distance between athletes in a team during completion of the scales was controlled, (2) the discipline of silence was applied in order to reduce the risk of

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distraction and remaining concentration to fill the scales, (3) the athletes were not left alone as a group or team in changing room while they were filling the scales, (4) all data were collected in their free time or at least one hour before or after training sessions, and (5) the scales were not applied just before an important event or game to control for confounding factors like state anxiety and stress.

Athletes read the "Participant Information and Consent Form" to ensure that their participation in the research was voluntary and based on informed consent. The data collection was face-to-face with the licensed athletes in Marmara University Faculty of Sports Sciences, and the athletes in individual and team regional and super league clubs in Istanbul. Due to the intensity of the training and preparation program of some athletes participating in the European/world championships or in the preparation camp, this consent form was applied online via "Google Forms".

Ethics protocol

A sign informed consent was obtained from all participants prior to data collection and after the study protocol was reviewed by Marmara University Institute of Health Sciences Ethical Committee and approved on 19/02/2022 according to document 98.

Analysis of Data

Data were collected from 452 licensed athletes. The data of this research was analyzed using SPSS-25 statistical software. In the analysis conducted within the scope of the research purposes, parametric analysis methods were preferred. In this context, correlation and regression analysis were used to examine the mediating role in this research.

5. Results

In the analysis conducted, descriptive statistics (minimum, maximum, mean, and standard deviation) for mental toughness, irrational performance beliefs, and trait anxiety were calculated. The normality of the data was then assessed using skewness and kurtosis values. All statistical results, including descriptive analyses, correlations, and regressions, are reported in this section (Ahmad Ali & Karagozoglu, 2026).

Descriptive findings of the research

The mean mental toughness score was 83.61 ± 6.54. Among its dimensions, the highest mean score was observed for Control (24.73 ± 3.01), while the lowest was for Challenge (18.89 ± 2.37). The mean score for irrational performance beliefs was 60.97 ± 14.12. The highest mean was found for Low Frustration Tolerance (17.93 ± 4.37), and the lowest for Depreciation (12.86 ± 3.82). The mean trait anxiety score was 25.25 ± 7.40, with Worry showing the highest mean (9.15 ± 3.46) and Concentration Disruption the lowest (7.56 ± 2.21).

Before examining the data on licensed athletes' mental toughness, irrational performance beliefs, and continuous anxiety levels, the distribution of the research data was checked. Normality checks are performed using the Shapiro-Wilk and Kolmogorov-Smirnov tests (Büyüköztürk, 2010). However, in social sciences, normality checks are commonly conducted by

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examining skewness and kurtosis values (Yalçıntaş, 2019). There are different references used to determine whether skewness and kurtosis values meet the normal distribution assumption. According to Büyüköztürk (2010), skewness and kurtosis values between -1 and +1; according to Tabachnick and Fidell (2013), between -1.5 and +1.5; and according to George and Mallery (2010), between -2 and +2 indicate a normal distribution.

Normality of the data was assessed using skewness and kurtosis values, and all variables fell within the acceptable range (±2). Thus, it is shown that the data of the study are suitable for normal distribution. Since the data we obtained in the study showed normal distribution, the analysis was continued using the parametric method.

Findings Regarding the Mediating Role of Mental Toughness in the Relationship Between Irrational Performance Beliefs and Continuous Anxiety in Sports

Within the scope of the main research purpose, the mediating role of mental toughness in the relationship between irrational performance beliefs and continuous anxiety in sports was examined. In this examination, Pearson correlation analysis and regression analysis were used, and the obtained findings are reported below.

Based on Table 1, the total level of mental toughness was positively and significantly associated with the total score of irrational performance beliefs. The strongest association was observed between the disintegration and low tolerance dimensions ($p < 0.05$). No significant association was found between mental toughness and the demandingness dimension ($p > 0.05$). Mental toughness was significantly and negatively associated with the total score of trait anxiety and its subdimensions of worry and concentration disruption ($p < 0.05$), while no significant association was observed with the somatic dimension of trait anxiety ($p > 0.05$).

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Table 1.
Correlational Relationship Between Mental Toughness, Irrational Performance Beliefs, and Trait Anxiety

	MT	Cnt.	Cmt.	CH	Dst	IPB	Dmn	Aw	LFT	Dpr	TA	St	Wr	CD
MT	1													
Cnt.	0.719**	1												
Cmt.	0.653**	0.189**	1											
CH	0.665**	0.378**	0.182**	1										
Dst	0.650**	0.180**	0.509**	0.209**	1									
IPB	0.193**	-0.010	0.180**	0.043	0.379**	1								
Dmn	0.051	-0.083	0.032	-0.049	0.302**	0.835**	1							
Aw	0.151**	0.017	0.113*	0.041	0.281**	0.862**	0.675**	1						
LFT	0.225**	-0.049	0.249**	0.099*	0.399**	0.820**	0.607**	0.549**	1					
Dpr	0.177**	0.059	0.129**	0.037	0.290**	0.839**	0.580**	0.696**	0.556**	1				
TA	-0.237**	-0.393**	-0.019	-0.241**	0.118*	0.404**	0.320**	0.371**	0.301**	0.379**	1			
St	-0.086	-0.263**	0.075	-0.131**	0.180**	0.314**	0.244**	0.306**	0.293**	0.218**	0.828**	1		
Wr	-0.240**	-0.352**	-0.020	-0.250**	0.062	0.406**	0.326**	0.347**	0.281**	0.415**	0.868**	0.526**	1	
CD	-0.287**	-0.380**	-0.134**	-0.221**	0.042	0.261**	0.205**	0.256**	0.146**	0.297**	0.788**	0.512**	0.566**	1

Note. MT: Mental Toughness (Total): Cnt: Control; Cmt: Commitment; CH: Challenge; Dst: Disintegration; IPB: Irrational Performance Beliefs (Total); Dmn: Demandingness; Aw: Awfulizing; LFT: Low Frustration Tolerance; Dpr: Depreciation; TA: Trait Anxiety (Total); St: Somatic; Wr:Worry; CD: Concentration Disruption.
Source: the authors

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The mediating role of mental toughness in the relationship between irrational performance beliefs in sports and trait anxiety was examined by regression analysis. The steps followed in the examination are given in Figure 3 (Hayes, 2018). According to Figure 3; In mediator variable analysis, there are 4-step paths such as a, b, c, and c1. In this study, irrational performance beliefs (X) represent the independent variable, trait anxiety (Y) the dependent variable, and mental toughness (M) the mediator variable.

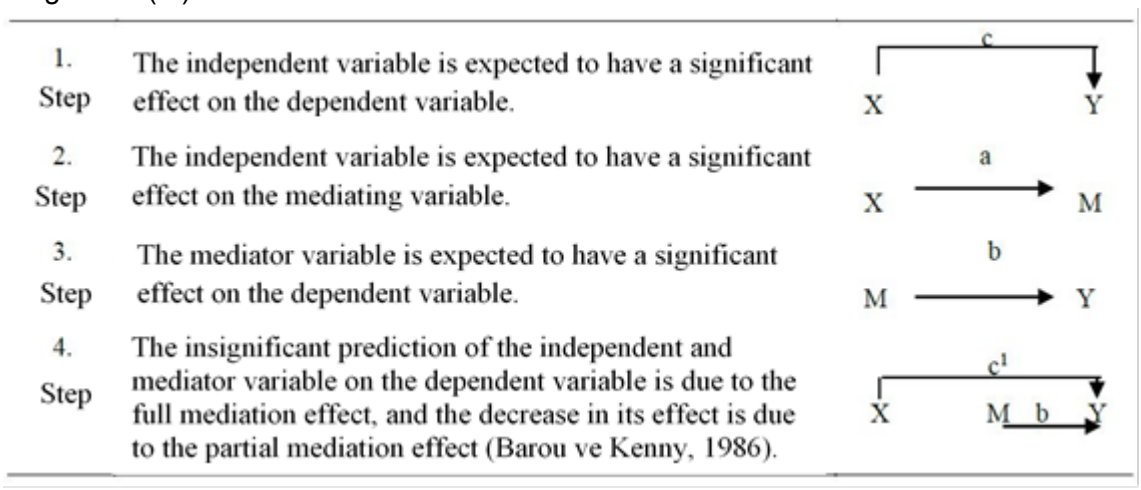

Figure 3. Intermediary Variable Analysis Process Steps. Source: the authors.

According to Figure 3, in mediator variable analyses, there are 4-step paths, namely a, b, c, and c1. In this research, irrational performance beliefs (X) represent the independent variable, trait anxiety (Y) represents the dependent variable, and mental toughness (M) represents the mediator variable.

Table 2.
Regression Analysis for the Mediating Role of Mental Toughness in the Relationship between Irrational Performance Beliefs and Trait Anxiety in Sports (Step 1)

	Dependent Variable							
	Trait Anxiety (Total)		Somatic		Worry		Concentration Disruption	
Independent Variable	*B*	t	*β*	t	*β*	t	*β*	t
IPB	**0.40**	**9.37****	**0.31**	**7.02****	**0.41**	**9.41****	**0.26**	**5.73****
Demandingness	**0.32**	**7.16****	**0.24**	**5.35****	**0.33**	**7.32****	**0.21**	**4.44****
Awfulizing	**0.37**	**8.48****	**0.31**	**6.82****	**0.35**	**7.84****	**0.26**	**5.61****
Low Frustration Tolerance	**0.30**	**6.70****	**0.29**	**6.51****	**0.28**	**6.20****	**0.15**	**3.13****
Depreciation	**0.38**	**8.68****	**0.22**	**4.74****	**0.42**	**9.68****	**0.30**	**6.60****

Source: the authors.

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Based on table 2; the total score for irrational performance beliefs, as well as its subdimensions of demandingness, awfulizing, low tolerance, and depreciation, were significantly associated with the total trait anxiety score and its somatic, worry, and concentration-disruption dimensions ($p<0.05$).

Table 3.
Regression Analysis for the Mediating Role of Mental Toughness in the Relationship between Irrational Performance Beliefs and Trait Anxiety in Sports (Step2)

	Mediator Variable									
	Mental Toughness (Total)		Control		Commitment		Challenge		Disintegration	
Independent Variable	*B*	t	*β*	t	*B*	t	*β*	t	*β*	t
IPB	**0.20**	**4.16****	0.01	0.21	**0.18**	**3.83****	0.04	0.91	**0.38**	**8.69****
Demandingness	**0.15**	**2.89****	0.08	1.77	**0.10**	**2.12***	0.05	1.04	**0.30**	**6.71****
Awfulizing	**0.15**	**3.23****	0.02	0.36	**0.11**	**2.42***	0.04	0.86	**0.28**	**6.21****
Low Frustration Tolerance	**0.23**	**4.89****	0.05	1.34	**0.25**	**5.45****	0.03	0.68	**0.40**	**9.23****
Depreciation	**0.18**	**3.82****	0.06	1.26	**0.13**	**2.76****	0.04	0.80	**0.29**	**6.43****

Source: the authors.

Based on table 3, the total score for irrational performance beliefs as well as its subdimensions of demandingness, awfulizing, low tolerance, and worthlessness, were significantly associated with the total mental toughness score, and its dimensions of commitment and challenge ($p<0.05$).

Table 4.
Regression Analysis for the Mediating Role of Mental Toughness in the Relationship between Irrational Performance Beliefs and Trait Anxiety in Sports (Step 3)

	Dependent Variables											
	Trait Anxiety (Total)			Somatic			Worry			Concentration Disruption		
Mediator Variables	*B*	t	R^2	*β*	t	R^2	*β*	t	R^2	*β*	t	R^2
Mental Toughness	**0.24**	**5.17****	0.06	0.09	1.83	0.01	0.07	1.44	**0.06**	**0.29**	**6.36****	**0.08**
Commitment	**0.18**	**3.87****	0.01	0.08	1.59	0.01	0.02	0.43	**0.01**	**0.13**	**2.88****	**0.02**
Disintegration	**0.12**	**2.53***	0.01	0.02	0.40	0.03	0.06	1.32	**0.01**	**0.22**	**4.82****	**0.05**

Source: the authors.

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Based on table 4; the total score for mental toughness, as well as its dimensions of commitment and challenge, were significantly associated with the total trait anxiety score and the concentration-disruption dimension ($p < 0.05$). However, no significant associations were found between mental toughness and the somatic and worry dimensions of trait anxiety ($p > 0.05$).

Table 5.
Regression Analysis for the Mediating Role of Mental Toughness in the Relationship between Irrational Performance Beliefs and Trait Anxiety in Sports (Step 4)

		Mediator Variables								
		Mental Toughness (Total)			Commitment			Disintegration		
Dependent Variable	Independent Variables	*β*	t	R^2	*β*	t	R^2	*β*	t	R^2
Trait Anxiety (Total)	IPB	**0.47**	**11.34****	**0.27**	**0.42**	**9.65****	**0.17**	**0.42**	**9.00****	**0.17**
	Demandingness	**0.33**	**7.18****	**0.17**	**0.32**	**7.18****	**0.10**	**0.32**	**6.67****	**0.10**
	Awfulizing	**0.42**	**9.91****	**0.23**	**0.38**	**8.60****	**0.14**	**0.37**	**8.04****	**0.14**
	Low Frustration Tolerance	**0.37**	**8.56****	**0.19**	**0.33**	**7.06****	**0.10**	**0.30**	**6.16****	**0.09**
	Depreciation	**0.43**	**10.38****	**0.24**	**0.39**	**8.82****	**0.14**	**0.38**	**8.24****	**0.14**
Concentration Disruption	IPB	**0.33**	**7.57****	**0.19**	**0.30**	**6.48****	**0.10**	**0.29**	**5.82****	**0.07**
	Demandingness	**0.22**	**5.00****	**0.13**	**0.21**	**4.58****	**0.06**	**0.21**	**4.36****	**0.04**
	Awfulizing	**0.31**	**7.04****	**0.17**	**0.27**	**6.06****	**0.09**	**0.26**	**5.57****	**0.07**
	Low Frustration Tolerance	**0.22**	**4.90****	**0.13**	**0.19**	**4.03****	**0.05**	**0.15**	**3.01****	**0.02**
	Depreciation	**0.36**	**8.41****	**0.21**	**0.32**	**7.15****	**0.12**	**0.31**	**6.61****	**0.09**

Source: the authors.

Based on table 5; the total score for irrational performance beliefs and its subdimensions of demandingness, awfulizing, low tolerance, and worthlessness, as well as the total mental toughness score and its commitment and challenge dimensions, were significantly associated with the total trait anxiety score and the concentration-disruption dimension ($p < 0.05$).

When the mediating role of mental toughness in the relationship between irrational performance beliefs and trait anxiety is evaluated as a whole, the total mental toughness score

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and its commitment and challenge dimensions showed a mediating association between trait anxiety and concentration disruption across all subdimensions of irrational performance beliefs. The model of the study is presented in Figure 4.

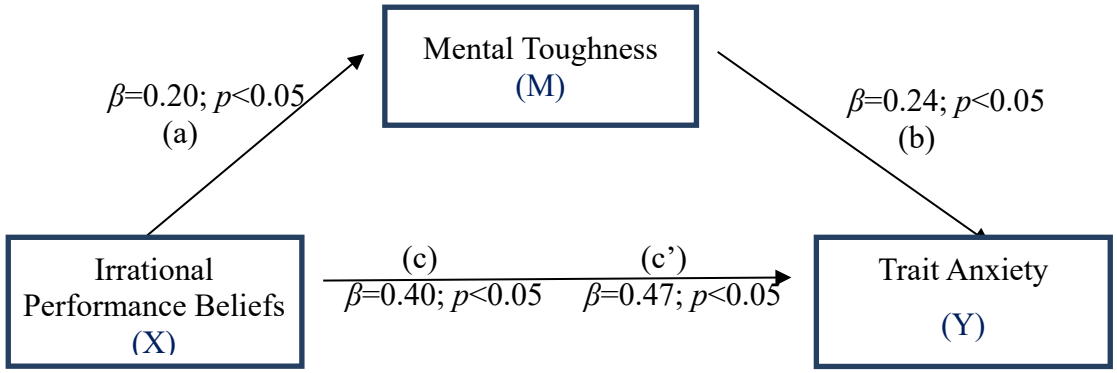

Figure 4. The Mediating Role of Mental Toughness in the Relationship between Irrational Performance Beliefs and Trait Anxiety in Sports. Source: The Authors.

6. Discussion

This study aimed to examine the mediating effect of mental toughness on the relationship between irrational performance beliefs and trait anxiety in individual and team athletes. The findings obtained from the analyses were discussed in accordance with the hypotheses tested in this study. Subsequently, the mediating effect of mental toughness on the relationship between irrational performance beliefs and trait anxiety levels of the participating athletes was discussed in light of the mediation analysis findings and the relevant literature. This section concludes with a summary of the general results and suggestions of the study.

Analysis of the Effect of Irrational Performance Beliefs on Trait Anxiety in Athletes (Hypothesis 1)

The significant positive relationship between athletes' irrational performance beliefs and trait anxiety supports Ellis's (1962, 1994) theory, which suggests that emotions like anxiety are shaped not by events themselves, but by individuals' beliefs about those events. This highlights the important role of irrational beliefs in athletes' anxiety levels. This finding supports the hypothesis that "Irrational performance beliefs are positively associated with trait anxiety among Turkish licensed athletes".

Literature in sport and exercise psychology consistently links irrational performance beliefs to anxiety. A meta-analysis by Vîslâ et al. (2016) reviewed 83 studies on the relationship between irrational beliefs and psychological problems like anxiety and found a positive correlation. Turner et al. (2019b) also found a positive relationship between irrational beliefs and anxiety in a study that included athletes, non-athletes, and regular exercisers. A review of the wider literature confirms a positive and significant relationship between athletes' irrational performance beliefs and trait anxiety. Thus, our findings are consistently supported and validated by existing research,

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aligning with our expectations. This relationship is also evident in experimental studies. Numerous studies that have investigated the effect of ADDT (Acceptance and Defusion-based Training) interventions on athletes' anxiety levels have consistently found that a decrease in irrational performance beliefs is accompanied by a decrease in trait anxiety (Mesagno et al., 2020; Turner et al., 2020; Wood et al., 2018).

The findings of the present study indicate that irrational performance beliefs are closely related to athletes' trait anxiety. Specifically, a significant positive relationship was observed, suggesting that athletes who endorse stronger irrational beliefs about their performance are more likely to experience higher levels of trait anxiety. This result supports the notion that athletes' cognitive interpretations and expectations play a crucial role in shaping their emotional experiences. As mentioned above, this finding is consistent with Ellis's theory: emotional responses such as anxiety are shaped by individuals' beliefs rather than events themselves. Supporting evidence from the sport psychology literature, including experimental studies, further suggests that reducing irrational performance beliefs can lead to lower trait anxiety, highlighting the significant role of cognitive factors in athletes' emotional experiences.

Investigation of the Effect of Irrational Performance Beliefs on Mental Toughness Levels in Athletes (Hypothesis 2)

Our analysis revealed a positive and significant relationship between irrational performance beliefs and mental toughness. Contrary to our hypothesis and expectations of this study, a positive relationship was found. These findings therefore contradict our hypothesis that "there is a negative relationship between athletes' irrational performance beliefs and their mental toughness levels among Turkish licensed athletes." In other words, while this finding was unexpected, it does not invalidate the mediation model or the other results obtained in this study. On the contrary, the finding that irrational performance beliefs influence and are related to mental toughness supports the other hypotheses and objectives of the study.

In addition to these findings, there is a dearth of studies in the literature that directly examine the relationship between irrational performance beliefs and mental toughness. However, some studies suggest that irrational beliefs and mental toughness are related. For example, in a cross-sectional study, Orhan and Ünlü (2022) found that athletes' irrational performance beliefs affect their mental toughness levels.

From the perspective of the Acceptance and Defusion-based Training (ADDT) approach, individuals develop certain beliefs and shape their identity by creating a set of flexible and rigid cognitive, emotional, and behavioral responses to the adversities they face throughout life (Dryden, 2011). In this context, an individual develops and acquires the belief and personality trait of being tough by facing and adapting to life's difficulties and challenges (Gucciardi et al., 2009). Conversely, it can be said that an individual who fails to adapt to difficulties develops the trait and belief of not being tough. In other words, when faced with difficulties, an individual develops certain beliefs and characteristics. Based on this, we can conclude that there is a relationship between an individual's beliefs and their mentally tough response or trait. Although this study's finding is contrary to expectations, it is similar to the results of the literature in that it demonstrates a relationship between the variables.

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Many methodological (scale reliability, discriminant validity of scales, etc.) and statistical aspects (e.g., standard error of estimates) influence whether a study's hypothesis is confirmed. These variables can alter the probability of replication and help explain some of the variations in estimated correlations (Fabrigar et al., 1999). Therefore, it can be said that this finding may be due to factors such as the age range and number of the sample, the professional or amateur status of the athletes, their psychological state while participating in the study, and the measurement tools used differences in the measurement tools used compared to other studies.

Investigation of the Effect of Mental Toughness Levels on Trait Anxiety Levels in Athletes (Hypothesis 3)

Based on the findings of this study, a negative and significant relationship exists between mental toughness levels and trait anxiety. As athletes' mental toughness levels increase, their anxiety levels in sports decrease. This finding confirms Hypothesis 4 of the study. In other words, as predicted in Hypothesis 4, there is a negative relationship between mental toughness and trait anxiety. Upon examining the literature, we can see that numerous studies support this finding. Both mental toughness (Beardslee & Podorefsky, 1998) and trait anxiety (Spielberger, 1966) are defined as relatively stable personality traits that can be developed.

In this sense, mental toughness and trait anxiety share a common structure as personality traits. Studies in this context show that athletes' mental toughness levels affect their trait anxiety levels. In other words, as athletes' mental toughness levels increase, they tend to experience less anxiety.

The finding obtained in this study is consistent with the current theoretical definition of mental toughness. This finding indicates that individuals with strong mental toughness demonstrate high levels of control, commitment, consistency, and challenge even in difficult situations and view problems as opportunities for growth (Gucciardi et al., 2014).

Kalinin (2019a) included student-athletes aged 13-19 in their research. A latent regression analysis conducted to examine the relationship between mental toughness and anxiety showed that mental toughness, as a personality-like individual factor, is related to anxiety. Suggesting that interventions aimed at increasing mental toughness may also reduce sports anxiety. In another study, Hossein et al. (2016) included 102 athletes aged 18 and over from various sports to assess whether mentally tough athletes normally experience anxiety. The results of this research, which aimed to examine the relationship between mental toughness and trait anxiety, found a significant relationship between mental toughness and the sub-dimensions of trait anxiety. Haghighi and Gerber (2019) conducted a regression analysis on medical students in the literature, which found that the students' mental toughness was related to their trait anxiety levels. These studies conducted within and outside the field of sport and exercise psychology collectively support and validate the findings of the present study.

The results of this study indicate that higher levels of mental toughness are associated with lower anxiety, aligning with theoretical definitions of mental toughness as a personality-like trait that enables individuals to face challenges with control, commitment, and resilience. Evidence from previous research in both sports and non-sports contexts further supports this link, suggesting that developing mental toughness can be an effective strategy for reducing athletes' anxiety and enhancing their psychological readiness for performance.

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Investigation of the Mediating Role of Mental Toughness in the Relationship Between Athletes' Irrational Beliefs and Trait Anxiety (Hypothesis 4)

To examine the mediating effect of mental toughness on the relationship between athletes' irrational performance beliefs and trait anxiety sub-dimensions, a Pearson correlation analysis and a regression analysis were conducted. The regression analysis was performed in four steps to investigate the mediating effect of mental toughness (mediating variable) in the relationship between irrational performance beliefs (independent variable) and trait anxiety (dependent variable).

According to the results of Step 1 of the regression analysis, irrational performance beliefs have a significant effect on trait anxiety levels. This finding confirms the results obtained for Hypothesis 2. In other words, the level of athletes' irrational beliefs significantly affects their trait anxiety levels in a sports environment. As hypothesized, a positive relationship was found between irrational beliefs and anxiety.

In Step 2 of the regression analysis, the effect of irrational performance beliefs on mental toughness was examined. In this step, it was observed that the total scores and sub-dimensions of irrational performance beliefs had a significant effect on the total score and the Commitment and Distractibility sub-dimensions of mental toughness. However, irrational performance beliefs did not significantly affect the Control and Challenge sub-dimensions of mental toughness. This suggests that irrational beliefs may have a more nuanced impact on different aspects of mental toughness.

The sub-dimensions of irrational performance beliefs included Demandingness, Awfulizing, Low Frustration Tolerance, and Worthlessness—demandingness is characterized by a rigid and excessive set of demands. These beliefs and behaviors are often expressed through phrases such as "-should," "-must," and "I have to," such as "I must win the competition," "I must not lose the match," and "I have to perform well." Having rigid beliefs about performance, goals, and desires, and the trait of believing in the necessity of not giving up and succeeding no matter the circumstances, also brings about the athlete's dedication and commitment to their goals. The findings at this stage suggest that desires in rigid demands and irrational beliefs indirectly lead athletes to feel dedicated and committed to life and their goals. Furthermore, the characteristics of irrational performance beliefs affect the athletes' ability to recover from negative thoughts and pressures during their performance.

The results of Step 3 of the regression analysis showed that the Commitment and Distractibility sub-dimensions of mental toughness significantly predicted the Concentration Disruption sub-dimension of anxiety. However, these sub-dimensions of mental toughness did not have a significant effect on the somatic and worry sub-dimensions of anxiety.

In the final stage of the mediation analysis, it was observed that the total and sub-dimension scores of irrational performance beliefs, in conjunction with the Commitment and Distractibility sub-dimensions of mental toughness, predicted the Concentration Disruption sub-dimension of anxiety. This suggests that both irrational beliefs and mental toughness influence athletes' trait anxiety levels (although the study design cannot rule out that the reverse is true). Specifically, the Distractibility and Commitment sub-dimensions of mental toughness mediate the relationship between the sub-dimensions of irrational performance beliefs and the Concentration Disruption

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dimension of trait anxiety. Ultimately, the findings indicate that athletes' irrational performance beliefs affect their trait anxiety levels through the mediating effect of mental toughness.

Only one of the hypotheses proposed in this study was rejected. The results of the regression analysis provide clarity and precision regarding the main objective of the study. Furthermore, the results offered a detailed answer to the research questions identified within the study. The findings of this study are partially supported by and show similarities with the results of previous studies in the sport and exercise psychology literature.

Although the concepts of irrational beliefs, mental toughness, and trait anxiety are crucial in sports, the lack of prior research examining these variables together in both the general sports literature or the sport and exercise psychology literature renders the results and findings of this study highly significant. This study can provide a foundation for other researchers interested in the topic and inform future studies in the field. Furthermore, it can make significant contributions to both the practical and research domains of sport and exercise psychology.

This study demonstrates that athletes' irrational beliefs about their performance can exacerbate their anxiety levels, but mental toughness, particularly their dedication (Commitment) and ability to maintain focus (Distractibility), can mitigate this effect. In other words, even when athletes hold rigid or demanding beliefs, those with higher mental toughness are better equipped to manage their concentration under pressure. These findings underscore the buffering role of mental toughness between stressful beliefs and anxiety, highlighting its protective function. By examining irrational beliefs, mental toughness, and trait anxiety in conjunction, this study offers novel insights that can inform future research and practical interventions aimed at supporting athletes' mental well-being and performance.

7. Conclusion

The results obtained from this study are presented below:

- A positive relationship exists between athletes' irrational performance beliefs and mental toughness.
- No significant gender differences were found in athletes' levels of irrational performance beliefs, trait anxiety and mental toughness.
- A negative relationship exists between the worry and concentration disruption sub-dimensions of athletes' mental toughness, and trait anxiety.
- A positive relationship exists between athletes' irrational performance beliefs and trait anxiety levels.
- Athletes' irrational performance beliefs influence the commitment and distractibility sub-dimensions of mental toughness.
- The commitment and distractibility sub-dimensions of mental toughness influence the concentration disruption sub-dimension of trait anxiety.
- The commitment and distractibility sub-dimensions of mental toughness mediate the relationship between irrational performance beliefs and the concentration disruption sub-dimensions of trait anxiety.

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Mental toughness plays a mediating role in the relationship between athletes' irrational performance beliefs and trait anxiety.

8. Recomendations for Future Research

The findings of this study may be limited by the cultural context in which the athletes were raised and live. Therefore, these topics could be investigated at an international level, incorporating athletes from diverse cultural backgrounds.

Given that an individual's beliefs are shaped by environmental factors such as family and peers, as well as their emotional, cognitive, and behavioral responses to past challenges, future studies could examine the relationship between athletes' irrational performance beliefs and the irrational beliefs of their parents and coaches, who are significant influencers. In addition to cross-sectional studies, practical counseling sessions or training programs based on the Acceptance and Diffusion-based Training (ADDT) implemented to mitigate the adverse effects of athletes' irrational performance beliefs and foster the development of their necessary mental skills.

Based on the findings of this study, given that irrational performance beliefs, mental toughness, and trait anxiety are interrelated and that mental toughness and trait anxiety are considered aspects of personality, future research could investigate the relationship between irrational beliefs and constructs from personality theories.

This study employed quantitative research design. Further in-depth investigations into these topics could be conducted by incorporating experimental, qualitative, and applied approaches.

Recommendations for Practice

Examining irrational performance beliefs, mental toughness, and trait anxiety collectively offers a new perspective on the impact of individual differences on athletic performance. The information presented by this study regarding cognitive processes like irrational beliefs, emotions like anxiety, and personality traits like mental toughness, -all of which are integral to sports and directly related to athletic performance- can be integrated into applied work to inform experimental and practical studies. The findings obtained from the analysis of the sample and participants included in this study can be validated in experimental and applied research settings.

Contributions: Zabehulla Ahmad Ali (A, B, C, D, E), Cengiz Karagozoglu (B, D, E)

A-Financing**, B-**Study design, **C-**Data collection, **D-**Statistical analysis and interpretation of results, **E-**Manuscript preparation

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