

Research Article

The Role of Ruminative Thinking in Effective Decision-Making Among Orienteering Athletes

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ABSTRACT

The aim of this study was to examine the effect of ruminative thinking on internal and external decision-making among orienteering athletes. The research was conducted within the framework of a relational survey model. The study group consisted of 218 athletes who competed as licensed orienteering athletes under the Turkish Orienteering Federation during the 2025-2026 season. Data were collected using the Sport Competition Rumination Scale and the Effective Decision-Making in Sport Scale. Descriptive statistics, Pearson correlation analysis, and structural equation modeling (SEM) were employed for data analysis. The findings revealed a positive and significant relationship between ruminative thinking and internal decision-making. In contrast, no significant effect of ruminative thinking on external decision-making was identified. In conclusion, it can be stated that ruminative thinking among orienteering athletes influences internal decision-making processes based on individuals' own cognitive evaluations, whereas it does not play a determining role in external decision-making processes based on environmental feedback.

Keywords: Orienteering; Rumination; Effective Decision-Making

Highlights

- The study examines the effect of ruminative thinking on internal and external decision-making among orienteering athletes.
- The study group consists of 218 licensed orienteering athletes in the 2025-2026 season.
- Structural equation modeling indicates a significant effect on internal decision-making and a non-significant effect on external decision-making.

Author Contributions

Contribution Area	Muhammed Özkan Turhan	Cengiz Kaya	Enes Yasun
A) Study design	Yes	Yes	Yes
B) Data collection	Yes	Yes	Yes
C) Data analysis	Yes	Yes	Yes
D) Manuscript writing	Yes	Yes	Yes
E) Critical revision	Yes	Yes	Yes

Introduction

Sports performance is a multidimensional construct that cannot be explained solely by physical capacity and is closely related to cognitive and psychological processes. Particularly in sports where environmental uncertainty is high and decisions must be made under time pressure, athletes' thought patterns and decision-making styles are among the key determinants of performance (Ashford et al., 2021). In this context, the study of psychological factors affecting athletes' cognitive processes has gained increasing importance in the sports psychology literature.

Orienteering is a sport that requires map reading, navigation, analyzing environmental clues, and making quick decisions between alternative routes, involving a high level of cognitive load. Athletes must simultaneously utilize not only their physical endurance but also their attention, perception, problem-solving, and decision-making skills throughout the competition. In this respect, orienteering offers a unique research area for examining the cognitive and psychological foundations of decision-making processes (Liu et al., 2022).

Ruminative thinking is defined as an individual's repetitive and difficult-to-control thinking about negative experiences, mistakes, or failures they have experienced in the past (Nolen-Hoeksema, 1991). This way of thinking can affect cognitive functioning by diverting the individual's attention resources away from the task at hand. In the context of sports, rumination can cause athletes to reevaluate the cognitive information they use in their decision-making process by focusing excessively on mistakes made, engaging in negative self-talk, and constantly replaying past performances in their minds (Smith & Alloy, 2009).

Ruminative thinking, defined as a repetitive and passive focus on negative thoughts and emotions, has been widely examined in the field of psychology due to its detrimental effects on cognitive functioning and decision-making processes (Nolen-Hoeksema et al., 2008). In the context of sports, especially those requiring rapid and accurate decisions under pressure, such as orienteering, the influence of ruminative thinking becomes particularly critical.

Orienteering is a sport that requires athletes to continuously process spatial information, interpret maps, and make effective route choices in dynamic and unpredictable environments. These processes demand high levels of attentional control, cognitive flexibility, and rapid decision-making. However, ruminative thinking may interfere with these cognitive processes by occupying attentional resources and increasing cognitive load, thereby reducing decision-making efficiency.

Previous research has demonstrated that increased cognitive interference and maladaptive thought patterns can impair attentional control and negatively influence performance under pressure (Beilock & Carr, 2001). Similarly, anxiety-related disruptions in attentional processes have been shown to reduce decision-making accuracy and performance in sport settings (Wilson et al., 2009). In this context, ruminative thinking may function as a cognitive mechanism that exacerbates attentional disruption and performance inefficiency.

Therefore, examining the role of ruminative thinking in effective decision-making among orienteering athletes is important for understanding how cognitive-emotional processes influence performance in this sport.

Decision-making is approached from both internal and external perspectives for athletes. Internal decision-making refers to an individual making decisions based on their own knowledge, experience, and intuition, while external

decision-making encompasses decision-making processes shaped by environmental feedback, the opinions of others, and the influence of external stimuli (Eccles & Tenenbaum, 2004). In orienteering, athletes must make decisions based on both their own cognitive assessments and environmental conditions during route selection and strategy determination processes.

When examining the effect of ruminative thinking on decision-making processes, it is noted that this type of thinking may lead individuals to incorporate more cognitive content into their decision-making process. It is stated that focusing excessively on experiences may cause individuals to pay more attention to both their internal evaluations and external cues (Roy et al., 2016). This situation suggests that ruminative thinking may have a directional effect on decision-making.

The literature contains studies examining the concept of rumination through the example of athletes (Korkmaz & Demir, 2025; Yılmaz and Mayda, 2025; Belli & Başoğlu, 2024) and similarly, studies examining decision-making processes (Kıratlı & İkizler, 2020; Önder et al., 2025; Cevahiroğlu et al., 2024). However, it is noteworthy that studies addressing the relationship between ruminative thinking and decision-making within a holistic framework, and specifically examining the direct impact of this structure on athletes' internal and external decision-making dimensions, are limited in the field of sports, with existing research being conducted primarily in different disciplines (Birch, 2017; Rowe, 2017). In this context, the sport of orienteering, which requires instant decision-making under high cognitive demands, environmental uncertainty, and time pressure, is considered to offer a unique research context for examining the relationship between ruminative thinking and decision-making processes and to provide original and complementary contributions to the field of sports psychology.

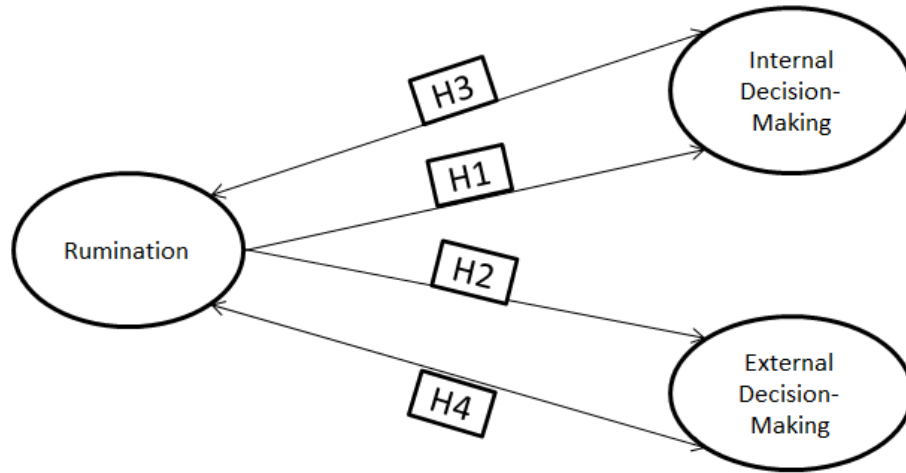
In this context, the present study examines the effect of rumination levels in orienteering athletes on internal and external decision-making and the relationships between these variables. The findings obtained from the research are expected to broaden the theoretical framework for understanding athletes' mental processes and contribute to psychological skill training in practice.

H1: Rumination levels of orienteering athletes have a positive and significant effect on internal decision-making.

H2: Rumination levels of orienteering athletes have a positive and significant effect on external decision-making.

H3: There is a relationship between rumination levels and internal decision-making of orienteering athletes.

H4: There is a relationship between rumination levels and external decision-making of orienteering athletes.



Materials and Methods

Research Group

A power analysis was performed using the G*Power 3.1 program to determine the adequacy of the sample size in the study. In the model based on multiple regression analysis, a moderate effect size ($f^2=0.15$), a 95% confidence level ($\alpha=.05$), and 80% test power ($1-\beta=.80$) were assumed for one predictor variable (rumination) and two predicted variables (internal decision-making, external decision-making). The analysis determined that significant results could be obtained with a minimum of 107 participants. The sample size of 218 participants in the study is well above this requirement, and the statistical power of the analyses is high ($1-\beta>.99$). The research group was determined using an appropriate sampling method. The research group consists of athletes competing under license with the Turkish Orienteering Federation during the 2025-2026 season. Participants' ages ranged from 14 to 65, with an average age of 21 ± 11.61 . The appropriate sampling method is for researchers to work on the most readily accessible sample (Cohen et al., 2011). The data was collected from participants in person, and voluntary participation was emphasized. The personal information of the participants is provided in Table 1.

Table 1. Information Regarding Participants' Personal Characteristics

Variables	Groups	(n)	(%)	$\bar{X}$
Gender	Male	118	54.1	
Gender	Female	100	45.9	
Category	B	80	36.7	
Category	A or Elite	111	50.9	
Category	Masters	27	12.4	
Age				21.05
Sports Year				4.88

Data Acquisition Tools

Personal Information Form

Data regarding participants' demographic characteristics such as gender, age, category, and year of participation in sports were collected by researchers using a personal information form.

Sports Competition Rumination Scale

It was developed by Michel-Kröhler et al. (2021) to assess ruminative (obsessive) thoughts that negatively affect athletes' performance during competitions, and its Turkish adaptation, validity, and reliability studies were conducted by Karafil & Pehlivan (2023). The scale has a single-factor structure and consists of a total of 6 items. Items are answered using a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree). The scores that can be obtained on the scale range from 6 to 30, with high scores indicating that athletes have more intense ruminative thoughts during the competition process. In the Turkish adaptation study, the scale's internal consistency coefficient was reported as Cronbach's $\alpha=.87$, the composite reliability coefficient as $CR=.87$, and the split-half reliability coefficient as .81.

Effective Decision-Making Scale in Sports

It was developed by Çetin & Kara (2024) to determine athletes' effective decision-making levels regarding situations they encounter in competition environments. The scale was developed on active, licensed athletes aged 18 and over and consists of a total of 15 items and two subscales. The subscales of the scale are named External Decision-Making (8 items) and Internal Decision-Making (7 items). Items are answered using a 5-point Likert scale (1=Strongly disagree, 5=Strongly agree). As a result of reliability analyses, Cronbach's alpha internal consistency coefficients were calculated as $\alpha=.87$ for the External Decision-Making subscale and $\alpha=.85$ for the Internal Decision-Making subscale.

Research Model

This research is descriptive in nature and was conducted within the framework of a correlational survey model. The correlational survey approach is a method that aims to determine the relationships between variables or the level of change that variables show together (Karasar, 2018). In this context, orienteering athletes were examined within the theoretical framework established for the research on the relationship and impact processes between rumination and effective decision-making. In the study, 'rumination' was determined as an independent variable and 'internal decision-making and external decision-making' as dependent variables. The hypotheses and theoretical model of the study are presented below.

H1: Rumination levels of orienteering athletes have a positive and significant effect on internal decision-making.

H2: Rumination levels of orienteering athletes have a positive and significant effect on external decision-making.

H3: There is a relationship between rumination levels and internal decision-making of orienteering athletes.

H4: There is a relationship between rumination levels and external decision-making of orienteering athletes.

Data Analysis

The data were analyzed using the SPSS 24.0 and AMOS 22.0 software packages. First, the participants' demographic information was presented using descriptive statistics. Z-scores were calculated for each question to evaluate outliers, and 4 participants with scores above 3.30 were excluded from the analysis. Pearson correlation analysis was performed among the variables, and the coefficients identified were evaluated as follows: .00-.10:

insignificant, .10-.39: weak, .40-.69: moderate, .70-.89: strong, .90-1: very strong (Schober et al., 2018). After validating the structures of the scales to be used in the study with CFA, attention was paid to the skewness and kurtosis values for the normality assumption, and it was observed that these values were between -1 and +1 (George & Mallery, 2010). Structural equation modeling (SEM) was used to test the theoretical model. SEM is an analysis method that can be used to test theoretical causal relationships between variables in studies conducted using a relational model (Akday, 2019).

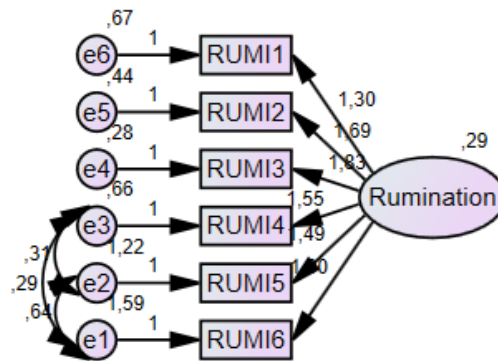
Table 2. Relationships Between Variables, Alpha, and Skewness and Kurtosis Values

		Variables	(α)	S/K	1	2	3
1	SCRS	Sports Competition Rumination Scale	.84	-.487/-1.290	-		
2	EDMSS	Internal Decision-Making	.79	-.263/-1.115	.31*	-	
3	EDMSS	External Decision-Making	.72	.423/-1.011	.13*	-.07	-

The Cronbach α coefficient ranges from 0 to 1, and it is generally accepted that this coefficient should be at least 0.70 to yield reliable results (Field, 2009; Hair et al., 2019). The skewness and kurtosis values of the variables are between -1 and +1 and satisfy the normal distribution condition (George and Mallery, 2010). Pearson correlation analysis was used to examine the correlation between variables. In this regard, weak positive correlations were found between rumination and internal decision-making ($r=.31$; $p<0.05$) and external decision-making ($r=.13$; $p<0.05$).

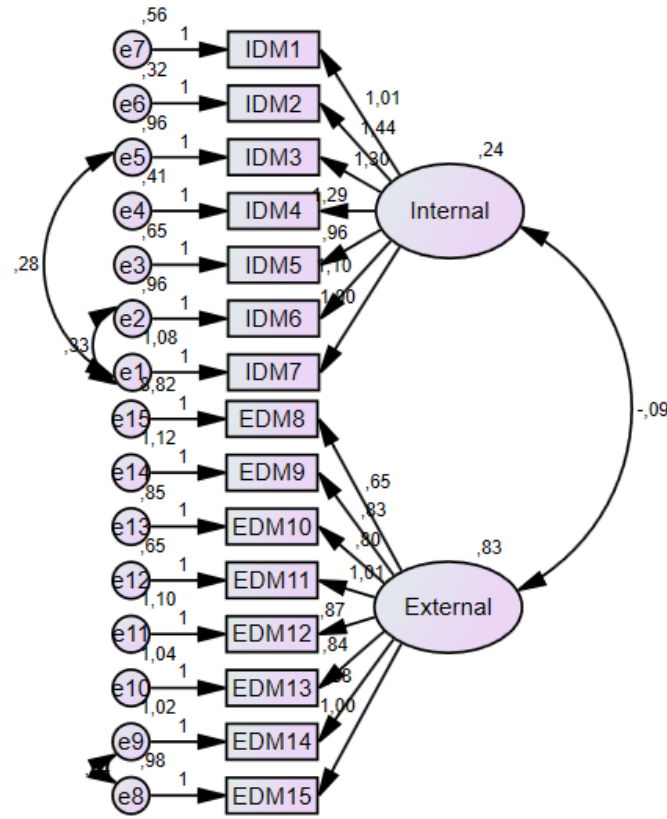
Compliance Index Values of Measurement Tools

The structures of the scales used in the study were subjected to confirmatory factor analysis in line with the research problems, and the results are presented in Figures 1 and 2.



CMIN/df:1,486 ; AGFI: ,987 ; GFI:,987 ; NFI,985 ; CFI:,995 ; IFI:,995 ; RMSEA: ,047

Figure 1. CFA Regarding Sports Competition Rumination Scale



CMIN/df:1,997 ; AGFI: ,911 ; GFI: ,911 ; NFI: ,831 ; CFI: ,906 ; IFI: ,908 ; RMSEA: ,068

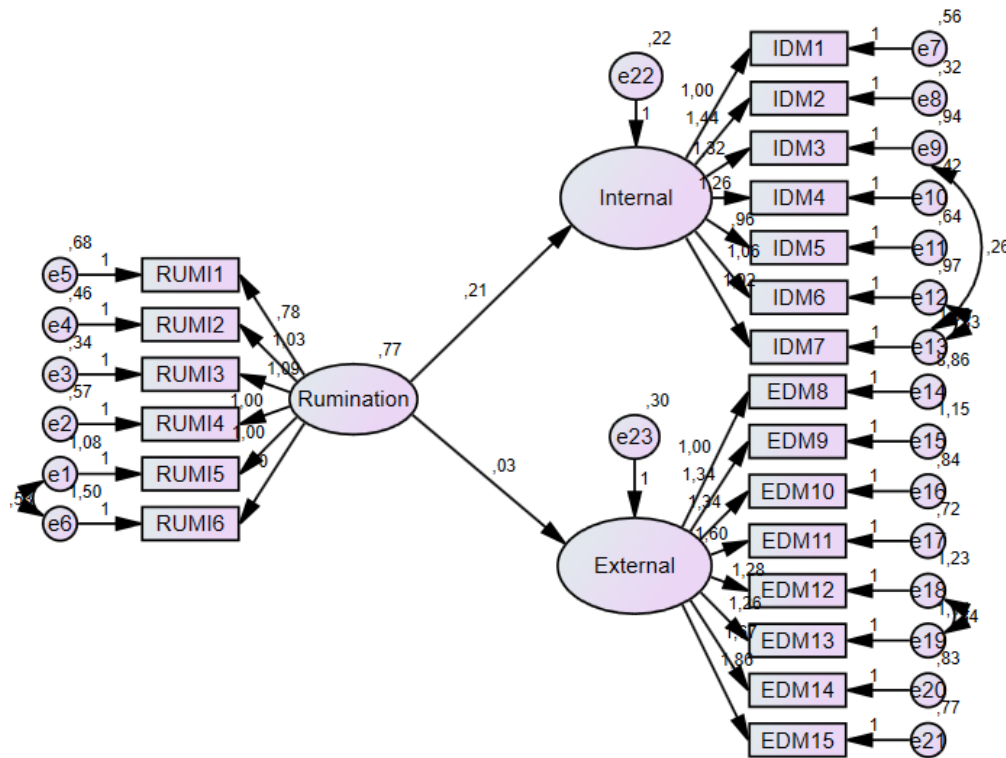
Figure 1. CFA Regarding Effective Decision-Making Scale in Sports

It is recommended that the CMIN/df ratio be less than 5 (Kline, 2015). Values of .08 and below indicate good fit for RMSEA, while values between .08 and .10 indicate poor fit (Hooper et al., 2008). It has been determined that the RMSEA value for the sports competition rumination scale is above the recommended limits. However, the literature indicates that RMSEA values may be artificially inflated, particularly in single-factor models with low degrees of freedom, and that this index should not be used as the sole criterion for decision-making in such models (Kenny et al., 2015). For the GFI, CFI, NFI, and IFI indices, a value of 0.90 indicates acceptable fit and 0.95 indicates excellent fit, while a value of 0.85 for the AGFI represents acceptable model fit (Hu & Bentler, 1999; Bentler & Bonett, 1980; Marsh et al., 2006; Schermelleh-Engel et al., 2003). However, the modifications suggested by the statistical program were made within the framework of theoretical foundations. Şimşek (2007) stated that modifications made to the indicator variables of the same latent variable did not cause any problems.

Structural Equation Model (SEM)

Structural equation models are a comprehensive analytical approach that combines the measurement model and the structural model. In this context, the structural model consists of equation structures that explain the relationships between latent variables and the sub-dimensions of these variables.

SEM Model Fit Results



CMIN/df:1,899 ; AGFI: ,870 ; GFI: ,870 ; NFI: ,802 ; CFI: ,894 ; IFI: ,895 ; RMSEA: ,064

Figure 3. Structural Equation Model

SEM Estimation Results

Structural Relationship	Direction	β	S.E	C.R.	p	Conclusion	R ²
RU → IDM	+	.370	0.52	3.990	***	Significant	.206
RU → EDM	p > 0.5	.056	.51	.681	.496	Insignificant	.035

RU=Rumination, IDM=Internal Decision-Making, EDM=External Decision-Making.

According to SEM estimation results, rumination was found to have a positive and significant effect on internal decision-making ($\beta=.370$, $p<.05$). Accordingly, a one-unit increase in rumination leads to an approximate 0.370-unit increase in the level of internal decision-making. Also, the explanatory power of rumination on internal decision-making was found to be $R^2=.206$. It has been determined that rumination has no significant effect on external decision-making ($\beta=.056$, $p>.05$).

Discussion and Conclusion

Decision-making plays an important role in sports competitions. Decisions made correctly and in a timely manner ensure positive performance, while incorrect or untimely decisions can negatively affect both the athlete's performance and the outcome of the game (Bayraktar et al., 2024; Leveaux, 2010). Rumination, defined as the repetition of negative thoughts in the mind, can be described as athletes' persistent and repetitive focus on past mistakes, failures, or experiences related to their performance (Kara & Genç, 2025; Maxwell, 2004). This study aims to examine the effect of rumination levels on internal and external decision-making among athletes actively competing in races organized by the Turkish Orienteering Federation, as well as the relationship between these variables. The research found that ruminative thinking has a significant effect on internal decision-making. However, it has been observed that it has an insignificant effect on external decision-making.

The research found that rumination levels in orienteering athletes affect internal decision-making but have no effect on external decision-making. Sevilmiş and Çolakoğlu (2025) stated that breaking out of the ruminative thought cycle that arises in athletes as a result of negative experiences, developing effective cognitive coping strategies, accelerating problem-solving processes, and increasing goal-oriented awareness can contribute to this. Karanfil and Pehlivan (2025) state that cognitive, physical, behavioral, social, and belief-based techniques can contribute to coping with the negativity brought about by ruminative thinking. A review of the literature reveals that rumination is multifacetedly related to cognitive processes, emotion regulation, mental resilience, and decision-making behaviors in athletes. Yılmaz et al., (2024) found a positive relationship between cognitive flexibility and rumination; Dönmez et al., (2025) stated in their study on referees that cognitive flexibility has a significant effect on decision-making processes. Studies examining the relationship between rumination and emotion regulation have indicated that the tendency toward ruminative thinking is negatively associated with cognitive reappraisal (Okan et al., 2023) and that cognitive reappraisal mediates the relationship between ruminative thoughts and goal orientation (Solakumar & Ünlü, 2023). However, some studies have shown that as rumination levels increase, mental training levels also increase (Cevahircioğlu et al., 2023), while ruminative thoughts can affect the ability to adapt to tactically changing situations during competition (Eskiyecek & Sezan, 2025). On the other hand, the negative impact of rumination on psychological outcomes has been emphasized; psychological flexibility and mental resilience decrease as rumination levels increase (Akbulut, 2025; Genç, 2024), and a similar study indicated that the control dimension of mental resilience may play a role in reducing ruminative thoughts (Yılmaz et al., 2025). When examining the decision-making literature, it is observed that psychological variables such as self-talk, empathy, and trust increase self-esteem and careful decision-making tendencies while reducing panic, procrastination, and avoidant decision-making styles (Keskin et al., 2020; Acar et al., 2023; Güvendi et al., 2020). Additionally, it has been reported that athletes' mental readiness, in terms of interest, focus, motivation, and mental preparation, significantly predicts both rational and intuitive decision-making styles, while the fear dimension is only related to rational decision-making (Güler et al., 2022). However, while some studies suggest that rumination has no direct effect on decision and reasoning accuracy (Bloß et al., 2022), a study conducted on boxers found that rumination was positively associated with external decision-making and negatively associated with internal decision-making and that it significantly predicted both forms of decision-making (Sürmeneli, 2024).

Individuals decision-making processes are shaped by the interaction of various dynamics. Whilst these Dynamics are sometimes linked to an individuals internal cognitive structures, at other times they develop under the influence of environmental and external factors (Çetin & Kara, 2024). When considered within a sporting context, the decision-making process is not limited to solely cognitive mechanisms; rather, it emerges from the mutual interaction of environmental conditions, perceptual processes and action components (Raab et al., 2019). In studies featured in the literature, (Cevahircioğlu et al. noted a positive relationship between athletes' levels of mindfulness and external decision-making. Similarly, Karakuş (2026) demonstrated a positive relationship between cognitive flexibility and creative thinking skills and external decision-making. Furthermore, in a study conducted by Gayretli & Yüksel (2026) on sports science students, it was stated that solution-focused thinking skills are positively associated with external decision-making. In the literature, rumination has been examined in comparison with

constructs such as mindfulness, cognitive flexibility and solution-focused thinking, which have been shown to be positively associated with external decision-making. In contrast to these cognitive processes, it is thought that rumination may play a limiting role in external decision-making because it directs attention towards internal processes.

Focusing on negative experiences in orienteering can be an important factor in improving future performance. By its very nature, orienteering is a sport where individual decisions take precedence and external factors play a relatively minor role. In this regard, it can be said that ruminative thinking tendencies in orienteering athletes have an effect on internal decision-making processes but no significant effect on external decision-making. For this reason, it is important for coaches and sports psychologists to incorporate cognitive strategies (such as shifting the focus of attention and mindfulness exercises) into training processes to help athletes avoid dwelling excessively on past mistakes. On the other hand, the fact that rumination has no significant effect on external decision-making suggests that these decisions are more closely linked to environmental clues. In this regard, it may be advisable to prioritise psychological interventions aimed at developing internal decision-making skills in practice.

Limitations

The study is limited to athletes competing under the Turkish Orienteering Federation during the 2025-2026 season only; therefore, the findings cannot be generalised to other disciplines. The study focused solely on the variables of ruminative thinking and decision-making, whilst other psychological factors that could influence performance (such as anxiety, motivation and attention) were excluded. Although the sample size was of a certain magnitude, a more balanced distribution across different age groups, levels of experience and levels of elite status could not be achieved.

Recommendations

- The relationship between rumination and decision-making can be examined comparatively through studies conducted across different sports disciplines.
- Longitudinal studies can be carried out to reveal in greater detail how ruminative thinking changes over time and its impact on decision-making processes.
- Through experimental studies, the effects of psychological interventions aimed at reducing rumination (such as mindfulness and cognitive restructuring) on decision-making can be tested.
- In future research, more comprehensive analyses could be conducted by incorporating variables such as anxiety, mental resilience, attention and cognitive flexibility into the model.
- Qualitative or mixed-methods studies could be used to examine athletes' experiences regarding rumination and decision-making processes in greater depth.

Declarations

Item	Statement
Ethics Approval	Ethics approval for this study was obtained from the Ethics Committee of Muş Alparslan University Rectorate with Decision No. 73, Meeting No. 16, dated January 9, 2026. The study was conducted in accordance with the Directive on Scientific Research and Publication Ethics of Higher Education Institutions.
Informed Consent	Informed consent was obtained from all participants included in the study.
Conflict of Interest	The authors declare that there is no financial conflict of interest with any institution, organization, or person related to this article, and that there is no conflict of interest among the authors.
Funding	No external funding was declared for this study.
Data Availability	The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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