

The relationship between mental toughness, rumination, and depressive symptoms in athletes: A preliminary cross-sectional study

Richard E. Tahtinen^{a,*}, Sara Björk Jónsdóttir^a, Hafrún Kristjánsdóttir^b

^a University of Akureyri, Faculty of Psychology, Akureyri, Iceland

^b Reykjavik University, Physical Activity, Physical Education, Sport and Health (PAPESH) Research Centre, Sports Science Department, School of Social Sciences, Reykjavik, Iceland

ARTICLE INFO

Keywords:

Affect
Rumination
Sport
Distress
Coping
Cognitive
Processes

ABSTRACT

Research has shown that mental toughness (MT) may be a protective factor for depressive symptoms, however, we know little about how this relationship may emerge. The aim of this preliminary cross-sectional study was to explore potential indirect relationships between MT and depressive symptoms via brooding and reflective rumination. A total of 113 Icelandic national team athletes participated in the study, of which 80 were women (70.8%) and 33 were men (29.2%). Prevalence of clinically significant depressive symptoms was 4.5% (5.13% females and 3.03% males), with non-significant mean differences between genders in total symptom scores. The indirect association between MT and depressive symptoms via brooding was negative, with the confidence interval excluding zero, $b = -0.03$, 95% CI [-0.07, 0.01]. The confidence interval (95% CI [-0.16, -0.01]), and the standardized coefficient ($\beta_{\text{indirect}} = -0.08$) was consistent with a small indirect association. In contrast, the indirect association between MT and depressive symptoms via reflective rumination was not supported, as the confidence interval included zero. These findings suggest that MT may be associated with depressive symptoms in part through its negative relationship with brooding rumination. These findings should, however, be considered preliminary and limited due to the relatively small sample size and cross-sectional design. We also discuss how MT may overlap with other cognitive-affective constructs and how this conceptual breadth may introduce challenges to its current applied utility. Addressing these conceptual aspects with longitudinal and experimental research would benefit future applied efforts aimed at supporting athlete mental health.

Research on depressive symptoms among athletes has increased significantly in the past decade (Tahtinen, Shelley et al., 2021). While a range of potential protective factors have been identified as particularly relevant within athlete populations (Küttel & Larsen, 2020), less is known about *how* they associate with mental health outcomes. Understanding how protective factors may (and may not) convey their positive effects is central to the development of more targeted interventions aimed at supporting athlete mental health.

Mental toughness, a psychological trait previously identified as an important predictor of athletic performance (Guszkowska & Wójcik, 2021), has gained attention as a potential protective factor for mental health issues. Research in athletes has shown that mental toughness is associated with well-being and optimism (Bird et al., 2021; Nicholls et al., 2008), lower levels of burnout (Madigan & Nicholls, 2017), and depressive symptoms (Morrison et al., 2024). Furthermore, one study showed that mental toughness buffered the negative effects of stress on

depressive symptoms over time (Gerber et al., 2018). The protective association between mental toughness and mental health has also been reported across diverse populations including adolescents, university students, and the general population (Mutz et al., 2017).

While there is no one universally agreed upon definition of mental toughness, Gucciardi (2017) broadly defined mental toughness as a "... psychological resource that is purposeful, flexible, and efficient in nature for the enactment and maintenance of goal-directed pursuits" (p.18). These personal "resources" are perceived as especially significant when athletes are faced with challenging circumstances (Gucciardi, 2017). Sheard (2012) defined mental toughness as a multidimensional trait with three underlying dimensions; *confidence*, *constancy*, and *control*. Measured by the Sport Mental Toughness Questionnaire, *confidence* refers to subjective beliefs about abilities to achieve set goals; *constancy* refers to determination to set goals, take responsibility, and an ability to concentrate despite challenges and adversity; and *control* refers to the

* Correspondence author.

E-mail address: richard@unak.is (R.E. Tahtinen).

<https://doi.org/10.1016/j.peh.2026.100432>

Received 11 December 2025; Received in revised form 3 February 2026; Accepted 30 March 2026

Available online 4 April 2026

2211-2669/© 2026 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

individuals' perceived ability to be influential in the outcomes of their own lives, specifically through their ability to regulate emotions when faced with challenges and adversity (Sheard, 2012). While this definition assumes mental toughness as a stable trait, studies have generally supported both state and trait conceptualization of mental toughness (Crust, 2007; Gucciardi et al., 2015). Furthermore, mental toughness has also been conceptualized in terms of domain specificity, in the way that individuals may demonstrate high mental toughness in one domain, while less so in other domains (Hardy et al., 2014).

While scientific investigations generally support the notion of mental toughness as a protective factor for mental health issues – we know less about *how* this relationship may emerge. Some evidence suggests that mental toughness is associated with dispositional mindfulness (Wu et al., 2021) and adaptive behaviors (Gucciardi, 2017; Gucciardi et al., 2016; Percy et al., 2019) such as approach coping strategies (Nicholls et al., 2008). In more qualitative work, Swann et al. (2016) explored the lived experiences of accomplished mountaineers surviving the catastrophic events of the 2015 Nepal earthquake and subsequent avalanche at Mount Everest Base Camp. The participants in the study understood mental toughness as the ability to direct attention to the current task at hand, such as providing first aid to fellow mountaineers, despite the extreme and distressing catastrophic circumstances (Swann et al., 2016). It seems then that one of the potential mechanisms by which mental toughness may be related to improved functioning is via enhanced task-relevant focus. In the context of mental health, this could indicate that mental toughness allows individuals to remain approach-oriented and engage in adaptive behaviors in dealing with the task at hand (coping with distress) despite the potential aversiveness of the task.

Empirical evidence concerning the mechanisms by which mental toughness may protect from negative mental health outcomes, such as depressive symptoms, is, however, largely non-existent. Some insights to the potential underlying processes can be gained from experimental research in fields outside of sport psychology. In one such study, Dewhurst et al. (2012) explored the cognitive basis of mental toughness via the directed forgetting paradigm. Dewhurst and colleagues found that higher scores on the commitment subscale of the Mental Toughness Questionnaire (MTQ-48) was correlated with higher performance on a task requiring cognitive inhibition (the ability to focus on relevant information and inhibit unwanted/task-irrelevant information). This is in line with correlational research within sport psychology and hints that some of the performance enhancing qualities of mental toughness may operate via improved cognitive-attentional processes. Interestingly, deficits in cognitive-attentional processes have also been found to be significant predictors of depression (Joormann & Vanderlind, 2014; Shimony et al., 2021). It should be noted, however, that Dewhurst and colleagues' study focused on non-athletes and did not assess the relationship between mental toughness and depressive symptoms. Also, it is difficult to generalize this knowledge to the broader concept of mental toughness, as the construct is defined and measured differently across studies (Crust & Swann, 2011). Also, while Dewhurst et al. (2012) and others (Welsh et al., 2023) have implied that the performance enhancing qualities of mental toughness may reside within the sphere of cognitive-attentional processes—this applied to only one specific sub-scale of mental toughness.

Depressive rumination

Depressive rumination (hereafter, rumination) is a cognitive-affective process involving sustained attentional focus on negative mood, that has been extensively researched and consistently identified as a robust predictor of depression in the non-athlete literature (Lyubomirsky et al., 2015). Rumination has been defined as a repetitive thought process (rather than thought content), which may disrupt adaptive responses to negative mood or affect by overwhelming other cognitive processes (e.g., problem solving/cognitive inhibition)

(Watkins & Brown, 2002). Subsequently, engaging in rumination in response to negative mood may exaggerate and prolong negative affective states (e.g., anger, anxiety, or sadness), increasing self-focus and focus on the discrepancy between one's desired and current state, and ultimately, creating a vicious cycle between negative thought processes and negative emotional states. Over time, this type of responding has shown to increase the risk for more severe and recurrent distress such as depression (Watkins & Roberts, 2020).

Built upon the original response styles theory (Nolen-Hoeksema, 1991), in the past two decades, rumination has often been defined by two dimensions; brooding and reflective rumination (Treynor et al., 2003). While brooding is characterized as a tendency to dwell repetitively on the negative implications and consequences of one's negative mood, reflection is more closely linked with a tendency to reflect upon, and to engage in cognitive problem solving to alleviate one's symptoms (Treynor et al., 2003). In more recent theoretical work, reflective rumination has been defined as a goal-directed and brooding as a habitual cognitive processing style in response to negative mood (Watkins & Nolen-Hoeksema, 2014). More specifically, brooding is characterized by "...automaticity, lack of conscious control, intent and awareness of ruminative thoughts" (Ólafsson et al., 2020, p. 482). In this context, a brooding habit develops through repeated pairing of a recurring cue (e.g., negative mood) and a cognitive response (e.g., abstract, passive, and evaluative thought process). Although high ruminators may possess awareness of adaptive coping strategies in response to distress, the habitual nature of rumination is believed to disrupt the goal-directed cognitive processes required to effectively engage in these strategies (Nolen-Hoeksema et al., 2008).

In the clinical psychology literature, research has consistently supported the notion that brooding rumination is more strongly related to negative mental health outcomes than reflective rumination. For example, brooding but not reflective rumination, seems to predict depressive symptoms over time (Pearson et al., 2010; Treynor et al., 2003). While engaging in self-reflection is also linked with increases in distress in the short term, it may serve adaptive functions over time (Nolen-Hoeksema et al., 2008; Treynor et al., 2003). Furthermore, Lo and colleagues (2008) demonstrated that brooding, but not reflective, rumination mediated the relationship between negative cognitive styles and depression (Lo et al., 2008). Indeed, brooding rumination is often identified as a central process, mediating the relationship between a range of predictors and different mental health-related outcomes, such as the relationship between cognitive inflexibility and suicidal ideation (Miranda et al., 2013), early maladaptive schemas and social anxiety (Orue et al., 2014), and multiple forms of discrimination and distress and well-being (Antebi-Gruszka et al., 2022). Among athletes, different forms of rumination have shown to mediate the relationship between dispositional mindfulness and sport specific coping (Josefsson et al., 2017), dispositional mindfulness and life stress (Kaiseler et al., 2017), as well as set-back related control beliefs and competition anxiety (Parker et al., 2024).

Potential relationship between mental toughness and rumination in athletes

In athletes rumination has often been voiced as a central process contributing to performance disruptions (Bennett et al., 2016) although this has yet to be tested experimentally. While research among athletes is still scarce, some studies have shown that rumination, especially brooding, is positively correlated with depressive symptoms also in athletes (Tahtinen et al., 2020; Tahtinen et al., 2021). Considering that previous research suggest that depressive rumination is an important process contributing to a range of different negative mental health outcomes (Kelley et al., 2021; Watkins, 2009), it is plausible that rumination could also be a relevant process in understanding how mental toughness may be associated with reduced susceptibility to depressive symptoms in athletes. Indeed, some sport psychology

scholars such as Swann et al. (2016) and Cowden et al. (2018) have discussed attenuated ruminative responding as one potential explanation to *how* mental toughness contributes to more adaptive responses to adversity — thus contributing to more positive mental health outcomes. Nevertheless, we are not aware of previous studies that have explicitly explored this hypothesis.

With this backdrop, the aim of this preliminary study was to explore the indirect associations between mental toughness and depressive symptoms via brooding and reflective rumination. Based on the reviewed literature on depressive rumination, we expected that higher levels of mental toughness would be indirectly related to lower levels of depressive symptoms via brooding, but not reflective rumination.

Methods

Participants

A total of 113 Icelandic national team and/or elite athletes participated in the study, of which 80 were women (70.8%) and 33 were men (29.2%). Athletes' age ranged between 18–37 years ($M = 24$ years, $SD = 5.0$). Participants competed in equestrian sports, gymnastics, handball, football (women only), basketball (women only), and MMA and jiu-jitsu. A total of 31 athletes defined their status as amateur (27.7%), 22 as professional (19.6%) and 59 as semi-professionals (52.7%). Sixteen athletes were currently injured (14.3%) and the majority ($N = 80$, 72.1%) played team sports. A total of 38 participants were currently in the youth national team (33.9%) and 51 in the A-national team (45.5%). A total of 48 participants reported being currently in the preseason (43.2%), 62 reported being in the in-season (55.5%), and only one participant was currently between the preseason and the in-season (0.9%).

Measures

Sports Mental Toughness Questionnaire (SMTQ; Sheard et al., 2009) is a multidimensional measure of mental toughness and consists of three dimensions: confidence, constancy and control. The questionnaire contains 14 items which are rated on a 4-point Likert scale from option 1 ("does not apply to me at all") to 4 ("applies to me very much"). Examples of questions include "I interpret threat as a positive opportunity" (confidence), "I am committed to completing the tasks I have to do" (constancy), and "I am overcome by self-doubt" (control) (Sheard et al., 2009). In a study by Kristjánsdóttir and colleagues (2019) the internal consistency of the Icelandic version was $\alpha = 0.82$ and in this study, the internal consistency of the scale was $\alpha = 0.88$. However, the internal consistency was variable across sub-scales with confidence $\alpha = 0.89$, constancy $\alpha = 0.58$, and control $\alpha = 0.70$.

Patient Health Questionnaire (PHQ-9) measures depressive symptoms over the past 2 weeks (Kroenke & Spitzer, 2002) and consists of nine items representing depressive symptom as defined in the DSM-V (American Psychiatric Association, 2013). Each item is assessed using a 4-point Likert scale indicating the frequency of symptom occurrence during the past two weeks, with response options ranging from 0 ("never") to 3 ("almost every day"). The combined score of the symptoms scores on this scale can range from 0–27 points: 0–4 = no symptoms, 5–9 = mild symptoms, 10–14 = moderate symptoms, 15–19 = moderately severe symptoms and 20–27 = severe symptoms (Kroenke & Spitzer, 2002). Clinically significant depressive symptoms cut-off score of > 9 (Manea et al., 2012) was used in this study. The internal consistency of the scale was $\alpha = 0.68$ which is lower than what has generally been reported in athlete samples in Iceland and elsewhere (Tahtinen, Shelley et al., 2021).

Procedures and ethical considerations

This study was part of a larger applied service project that examined

physical fitness and psychological attributes among Icelandic national team athletes. The study was conducted in collaboration between the Department of Sport Science at Reykjavik University and the national sport federations. Athletes were approached via an established collaboration with selected national sport federations, within which national team athletes regularly undergo physiological testing conducted at the Reykjavik University facilities. The measures assessing rumination and depressive symptoms in the current study were additional to the regular testing procedures. Importantly, all athletes were informed that responding to this additional survey was voluntary, that the data would only be available to the researchers, and would not be shared with coaches or other staff. It was also stated that answers to questions about mental health issues were optional and that participants could stop responding to the survey at any time. All personal information was coded with computer-generated ID numbers and all personal information was discarded once data collection was complete. Participants were also provided with contact information for psychological support and encouraged to seek help if they were experiencing distress. Participants did not receive any compensation for their participation. Ethical approval was granted by the National Bioethics Committee in Iceland (application number: VSNb2018050001/03.01) and the Icelandic Data Protection Authority.

Statistical analyses

SPSS was used for data processing and analysis. Missing responses on a limited number of scale items emerged for a subset of participants. Missing data was handled using listwise deletion, resulting in an analytic sample of $N = 101$ for the primary mediation model.

Parallel mediation tests were performed using the PROCESS macro extension for SPSS version 4.2., with 95% confidence intervals (CI) based on 10,000 bootstrap samples. Considering that the sample was predominantly women (70%) and that prior research has indicated that women typically report higher levels of mental health issues (Walton et al., 2021) and rumination (Johnson & Whisman, 2013); gender was included as a covariate in the mediation models. As the project combined elements of both service provision and research, the sample was constrained to the available national team population, and therefore an a priori power analysis was not conducted.

Our analytical strategy for the mediation analyses focused on standardized indirect associations and their corresponding confidence intervals (CIs). Evidence for an indirect association was evaluated by examining whether the CIs excluded zero. As noted by Preacher and Kelley (2011), although heuristic benchmarks for interpreting the magnitude of regression-based standardized effect sizes exist (e.g., 0.10 = small, 0.30 = medium, 0.50 = large; Field, 2013), these should be interpreted with caution. Accordingly, our interpretation focused not only on the *magnitude* of standardized estimates of indirect associations (i.e., β_{indirect}) but also on their *range* indicated by bootstrapped confidence intervals (95% CIs).

Results

In this athlete sample, 4.5% exhibited clinically significant symptoms of depression (5.13% women and 3.03% men), with non-significant mean differences between genders in total symptom score. Correlations of study variables are shown in Table 1. Facets of mental toughness showed significant negative correlations, while both rumination scales showed positive correlations with depressive symptoms. The total mental toughness score was negatively and significantly correlated with brooding, but not reflective, rumination. Only reflective rumination was, however, positively correlated with the *confidence* facet of mental toughness, while only brooding rumination was negatively correlated with the *control* facet. Neither brooding nor reflection were significantly correlated with the mental toughness facet *constancy*.

Table 1
Correlations between main study variables.

Factor	1	2	3	4	5	6	7
1. SMTQ	1						
2. Confidence	0.91**	1					
3. Constancy	0.80**	0.66**	1				
4. Control	0.74**	0.46**	0.45**	1			
5. Reflection	0.12	0.21*	0.14	−0.15	1		
6. Brooding	−0.29**	−0.17	−0.13	−0.49**	0.57**	1	
7. PHQ9	−0.44**	−0.29**	−0.30**	−0.51**	0.34**	0.52**	1

Note. * $p < .05$, ** $p < .01$, SMTQ = Sport Mental Toughness Questionnaire, PHQ = Patient Health Questionnaire.

Mental toughness, rumination, and depressive symptoms

We conducted a parallel mediation analysis to explore the indirect associations between mental toughness and depressive symptoms via brooding and reflective rumination. The overall model including gender as a covariate was statistically significant [$R^2 = 0.44$, $F(4, 96) = 18.95$, $p < .001$], hence explaining 44% of the sample variance in depressive symptoms. Mental toughness was negatively associated with depressive symptoms ($b = -0.19$, $SE = 0.04$, 95% CI $[-0.27, -0.11]$). As shown in Table 2, indirect association between mental toughness and depressive symptoms via brooding was negative, with the confidence interval excluding zero, $b = -0.03$, 95% CI $[-0.07, -0.01]$. In line with heuristic benchmarks and the confidence interval (95% CI $[-0.16, -0.01]$), the magnitude of the standardized coefficient ($\beta_{\text{indirect}} = -0.08$) was consistent with a small indirect association. In contrast, the indirect association between mental toughness and depressive symptoms via reflective rumination was not supported, as the confidence interval included zero (Table 2).

To further contextualize the mediation results, a standardized path model was examined to illustrate the pattern and relative magnitude of direct associations among the study variables (Fig. 1). Mental toughness had a negative association with depressive symptoms ($\beta = -0.41$) and brooding rumination ($\beta = -0.28$) suggesting that higher scores on mental toughness were associated with lower scores on depressive symptoms and brooding. In contrast, higher brooding scores were associated with increased depressive symptoms scores ($\beta = 0.26$). This pattern of associations provides descriptive support for the small indirect association between mental toughness and depressive symptoms via brooding identified in the mediation analyses (Table 2).

Discussion

In this study we explored whether mental toughness was associated with depressive symptoms through its relationship with brooding and reflective rumination.

Our data was consistent with a small indirect association between mental toughness and depressive symptoms via brooding, but not reflective, rumination. Athletes who reported higher mental toughness scores tended to report lower depressive symptoms scores with brooding rumination accounting for a small proportion of this association.

Table 2
Unstandardized indirect effects of brooding and reflective rumination.

	Indirect Effect	Bootstrapped SE	Lower CI	Upper CI
Total Indirect Effect	−0.01	0.03	−0.07	0.04
Indirect Effect 1: Reflection	0.02	0.02	−0.01	0.05
Indirect Effect 2: Brooding	−0.03	0.02	−0.07	−0.01
Indirect Effect 1: Mental toughness → Reflection → Depression				
Indirect Effect 2: Mental toughness → Brooding → Depression				

Dewhurst and colleagues' (2012) showed that higher levels of mental toughness were linked to enhanced cognitive inhibition, a key cognitive-attentional process involved in suppressing task-irrelevant information. Deficits in such processes are implicated in brooding rumination, which is characterized by repetitive and abstract negative thinking (Joormann & Vanderlind, 2014; Shimony et al., 2021). Hence, our findings raise the possibility that mental toughness is associated with a reduced tendency to engage in brooding rumination, which may support a more adaptive allocation of cognitive resources and thereby facilitate more concrete and goal-directed responses when athletes experience negative affect or distress. Although the magnitude of the observed indirect association via brooding was modest, our preliminary findings provide an important first step toward identifying individual-level cognitive-affective processes that may be relevant for understanding the association between mental toughness and depressive symptoms as observed in previous athlete samples (e.g., Gerber et al., 2018).

It should, however, be noted that the modest indirect associations observed in our data also underscore that brooding likely represents only one of several potential psychological processes in the relationship between mental toughness and depressive symptoms. This aligns with the understanding that mental toughness is a broad concept that may function via a range of different pathways depending on the individual-environment interactions (Sheard, 2012). Such breadth further complicates claims about specific underlying mechanisms and instead points to a constellation of interrelated psychological processes that may jointly shape mental health outcomes (Cohen et al., 2005).

Considering the conceptual breadth of mental toughness, and that brooding is defined as depression-specific cognitive-affective process – the small indirect effect could also suggest that individual differences in brooding may emerge independently of mental toughness. Hence, athletes with higher mental toughness may still develop a ruminative response style and, consequently, remain vulnerable to depressive symptoms. As Swann et al. (2016) noted, self-identified mentally tough individuals who experienced the Mount Everest avalanche experienced divergent mental health outcomes – from post-traumatic stress symptoms to post-traumatic growth – which the authors speculated could have been shaped by differences in brooding tendencies. This raises the question whether rumination could be better understood as an important moderator in the relationship between mental toughness and depressive symptoms.

Conceptual reflections: mental toughness and rumination

Our correlational analyses showed that the *confidence* facet of mental toughness was significantly correlated only with reflective rumination. This association may reflect related but distinct aspects of self-focused cognition; while some confidence items may be related to potential outcomes of self-reflection (e.g., “I have qualities that set me apart from other competitors”), reflective rumination encompasses the cognitive process of self-focused thinking (especially in response to distress). Cowden (2017) similarly reported that self-reflection was associated with higher confidence on the SMTQ, noting, however, that the adaptive value of reflective thought (higher overall mental toughness) may

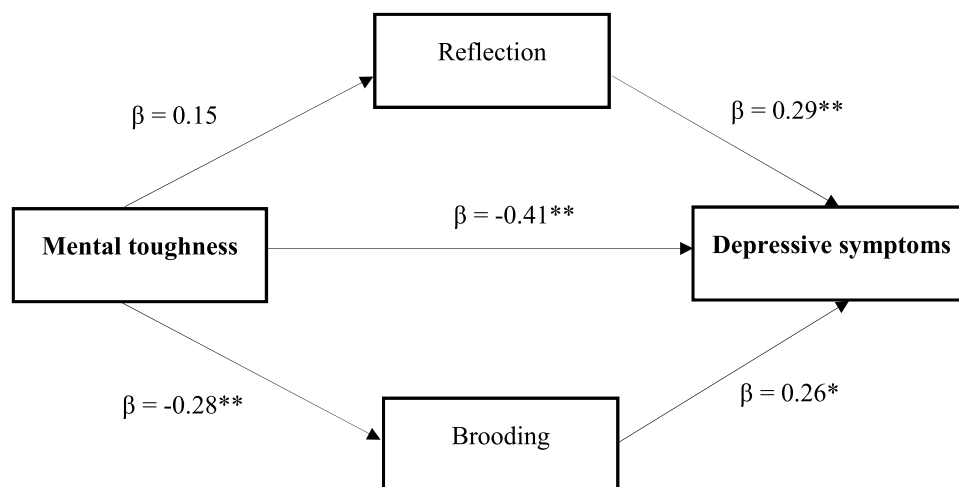


Fig. 1. Parallel mediation path model showing the relationship between mental toughness, brooding, reflection, and depressive symptoms, ** $p < .005$, * $p < .05$.

depend on whether it leads to self-insight. The lack of significant relationship between *confidence* and brooding suggests that some athletes may tend to brood in response to distress—even when they perceive themselves as highly confident in the sporting context.

In contrast, brooding rumination was negatively correlated with the *control* subscale. The control subscale is intended to reflect beliefs about one's ability to influence outcomes, particularly by regulating emotions when facing adversity (Sheard, 2012). A closer inspection of the item wording of the SMTQ control scale items; "I am overcome by self-doubt", "I worry about performing poorly", "I get anxious by events I did not expect or cannot control", and "I get angry and frustrated when things do not go my way"; suggests, however, that the scale primarily captures athletes' experience of negative affective states rather than how they control or regulate them. The symptom-focused wording of the items on the control scale may therefore introduce some conceptual overlap with depressive symptomatology that should be further examined in future research.

Neither brooding nor reflective rumination significantly correlated with the constancy scale. According to Crust and Swann (2011) the constancy subscale of the SMTQ may capture a heterogeneous set of attributes - including perseverance ("I give up in difficult situations"), personal responsibility ("I take responsibility for setting myself challenging targets"), and concentration ("I get distracted easily and lose my concentration") - rather than a single, conceptually coherent construct. The observed internal consistency in our data ($\alpha = 0.58$) for the constancy facet is in line with this criticism.

Limitations and future research

Although the inclusion of an elite athlete sample, comprising exclusively athletes who had represented their country at the national team level, was ecologically valid and central to the study, it also constrained our sample size. This likely reduced the precision of our effect size estimates, particularly for very small indirect associations, which may have gone undetected. The modest sample size also increases the risk that parameter estimates may be sample-specific. Although we utilized bootstrapping to estimate confidence intervals for indirect associations, this approach does not compensate for limited power or guarantee stability of parameter estimates. Accordingly, we interpreted confidence intervals as ranges of plausible effect sizes rather than as precise estimates. The cross-sectional design also limits our ability to draw causal or directional inferences and does not allow differentiation between trait and state processes. Alternative model structures, including the possibility that elevations in negative affect or state rumination influence athletes' self-perceptions of mental toughness,

should therefore be explored. Furthermore, disentangling temporal dynamics should be considered in longitudinal studies, with ecological momentary assessment approaches being particularly appropriate. Indeed, prior research suggests that brooding rumination and depressive symptoms are embedded in dynamic feedback loops rather than unidirectional pathways (Watkins & Roberts, 2020).

There may also be important challenges related to the definition and measurement of mental toughness. As defined by the SMTQ, the mental toughness construct may encompass heterogeneous psychological content and may overlap with related affective and self-evaluative constructs. As discussed in the present study, the conceptual breadth of mental toughness may complicate efforts to clarify the relationship between mental toughness and mental health outcomes. Addressing these conceptual aspects would benefit future research and more targeted applied efforts aimed at supporting athlete mental health.

Finally, the overall depressive symptom scores were low in our sample. This could implicate that the observed variability in depressive symptom scores was unlikely reflective of syndromal differences characterized by pronounced elevations in core depressive symptoms (i.e., depressed mood or anhedonia) and accompanying symptom clusters, but rather more subtle variations across specific symptoms. Depression is a heterogeneous construct, encompassing neurovegetative and cognitive-affective symptoms, which have shown to relate to partly distinct biopsychosocial mechanisms (Fried & Nesse, 2014). In this context, potential floor effects in total depressive symptoms scores, as well as symptom-level heterogeneity within the sample, may partly explain the modest magnitude of the observed indirect associations.

Despite these limitations, our findings echo a substantial body of prior research that has identified brooding rumination as a robust vulnerability factor for depressive symptoms (e.g., Watkins, 2009; Kelley et al., 2021) and as a relevant cognitive-affective process across clinical and sport-related contexts (e.g., Miranda et al., 2013; Josefsson et al., 2017). By focusing on athletes' depressive rumination, our study adds new insight into the potential cognitive-affective processes that may be relevant for further investigations concerning the relationship between mental toughness and depressive symptoms.

Practical implications

Based on our findings and acknowledging the exploratory and cross-sectional nature of the study, we cautiously offer some practical implications. Although our findings echo previous findings on the negative association between mental toughness and depressive symptoms, it is important to acknowledge that mental toughness is a broad construct with relatively limited conceptual clarity. In applied settings, this

conceptual breadth may increase the risk that mental toughness is interpreted and applied in an oversimplified—or potentially harmful—manner. Also, applying measures of mental toughness as indicators of risk and resilience to mental health issues could potentially increase the likelihood that underlying vulnerability and distress are overlooked among athletes who score highly on mental toughness. Until the mechanisms linking mental toughness to mental health outcomes are better understood, caution is warranted in using mental toughness measures as stand-alone indicators of mental health risk in applied practice.

For sport psychology practitioners and other important stakeholders working with athletes, it may be more helpful to attend to observable behaviors such as how athletes respond to stress, setbacks, or negative mood states. Here it may be especially important to design training and performance environments that promote more concrete (vs. evaluative and abstract) approach-oriented responding to distress and adversity. Practitioners and coaches may benefit from paying close attention to early signs that athletes are turning inward, withdrawing, or becoming overly self-focused and critical in response to negative affect. Timely engagement—through modelling adaptive responses, encouraging concrete problem-solving, while normalizing emotional discomfort—may help prevent or attenuate habitual maladaptive response patterns. This perspective aligns with acceptance- and commitment-based approaches in sport psychology, which emphasize openness to difficult internal experiences while maintaining engagement with valued actions, rather than attempting to suppress or avoid distress.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) used [ChatGPT / version 5.1] in order to improve the wording of a limited number of sentences in the discussion. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

CRedit authorship contribution statement

Richard E. Tahtinen: Writing – review & editing, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sara Björk Jónsdóttir:** Writing – original draft, Formal analysis, Conceptualization. **Hafrún Kristjánsdóttir:** Writing – review & editing, Validation, Resources, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5)*. American Psychiatric Publishing. <https://doi.org/10.1176/appi.books.9780890425596>.
- Antebi-Gruszka, N., Friedman, A. A., & Balsam, K. F. (2022). Multiple forms of discrimination, mental distress, and well-being among lesbian, gay, bisexual, and queer individuals: The role of brooding. *Journal of Gay & Lesbian Mental Health*, 28(1), 86–111. <https://doi.org/10.1080/19359705.2022.2089425>
- Bennett, J., Rotherham, M., Hays, K., Olusoga, P., & Maynard, I. (2016). Yips and lost Move Syndrome: Assessing impact and exploring levels of perfectionism, rumination, and reinvestment. *Sport and Exercise Psychology Review*, 12(1), 14–27. <https://doi.org/10.53841/bpssepr.2016.12.1.14>
- Bird, M. D., Simons, E. E., & Jackman, P. C. (2021). Mental toughness, sport-related well-being, and mental health stigma among national collegiate athletic association division I student-athletes. *Journal of Clinical Sport Psychology*, 15(4), 306–322. <https://doi.org/10.1123/jcsp.2020-0043>
- Cohen, L. H., Gunther, K. C., Butler, A. C., O'Neill, S. C., & Tolpin, L. H. (2005). Daily affective reactivity as a prospective predictor of depressive symptoms. *Journal of Personality*, 73(6), 1687–1714. <https://doi.org/10.1111/j.0022-3506.2005.00363.x>
- Cowden, R. G. (2017). On the mental toughness of self-aware athletes: Evidence from competitive tennis players. *South African Journal of Science*, 113(1–2), 1–6. <https://doi.org/10.17159/sajs.2017/20160112>
- Cowden, R. G., Crust, L., Joynt, S., Hook, J. N., & Worthington, L. E., Jr. (2018). How do mentally tough athletes overcome self-directed anger, shame, and criticism? A self-forgiveness mediation analysis. *International Journal of Sport Psychology*, 49(4), 327–348. <https://doi.org/10.7352/IJSP.2018.49.327>
- Crust, L. (2007). Mental toughness in sport: A review. *International Journal of Sport and Exercise Psychology*, 5(3), 270–290. <https://doi.org/10.1080/1612197X.2007.9671836>
- Crust, L., & Swann, C. (2011). Comparing two measures of mental toughness. *Personality and Individual Differences*, 50(2), 217–221. <https://doi.org/10.1016/j.paid.2010.09.032>
- Dewhurst, S. A., Anderson, R. J., Cotter, G., Crust, L., & Clough, P. J. (2012). Identifying the cognitive basis of mental toughness: Evidence from the directed forgetting paradigm. *Personality and Individual Differences*, 53(5), 587–590. <https://doi.org/10.1016/j.paid.2012.04.036>
- Field, A. (2013). *Discovering Statistics using SPSS (4th ed.)*. London: Sage.
- Fried, E. I., & Nesse, R. M. (2014). The impact of individual depressive symptoms on impairment of psychosocial functioning. *PLoS One*, 9(2), Article e90311. <https://doi.org/10.1371/journal.pone.0090311>
- Gerber, M., Best, S., Meester, F., Walter, M., Ludyga, S., Brand, S., Bianchi, R., Madigan, D. J., Isoard-Gautheur, S., & Gustafsson, H. (2018). Effects of stress and mental toughness on burnout and depressive symptoms: A prospective study with young elite athletes. *Journal of Science and Medicine in Sport*, 21(12), 1200–1205. <https://doi.org/10.1016/j.jsams.2018.05.018>
- Gucciardi, D. F. (2017). Mental toughness: Progress and prospects. *Current Opinion in Psychology*, 16, 17–23. <https://doi.org/10.1016/j.copsyc.2017.03.010>
- Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2015). The concept of mental toughness: Tests of dimensionality, nomological network, and traitness. *Journal of Personality*, 83(1), 26–44. <https://doi.org/10.1111/jopy.12079>
- Gucciardi, D. F., Peeling, P., Ducker, K. J., & Dawson, B. (2016). When the going gets tough: Mental toughness and its relationship with behavioural perseverance. *Journal of Science and Medicine in Sport*, 19(1), 81–86. <https://doi.org/10.1016/j.jsams.2014.12.005>
- Guszkowska, M., & Wójcik, K. (2021). Effect of mental toughness on sporting performance: Review of studies. *Baltic Journal of Health and Physical Activity*, 13(7), 1. <https://doi.org/10.29359/BJHPA.2021.Suppl.2.01>
- Hardy, I. I. I., J. H., Imose, R. A., & Day, E. A. (2014). Relating trait and domain mental toughness to complex task learning. *Personality and Individual Differences*, 68, 59–64. <https://doi.org/10.1016/j.paid.2014.04.011>
- Johnson, D. P., & Whisman, M. A. (2013). Gender differences in rumination: A meta-analysis. *Personality and Individual Differences*, 55(4), 367–374. <https://doi.org/10.1016/j.paid.2013.03.019>
- Joormann, J., & Vanderlind, W. M. (2014). Emotion regulation in depression: The role of biased cognition and reduced cognitive control. *Clinical Psychological Science*, 2(4), 402–421. <https://doi.org/10.1177/2167702614536163>
- Josefsson, T., Ivarsson, A., Lindwall, M., Gustafsson, H., Stenling, A., Böröy, J., Mattsson, E., Carnebratt, J., Sevholt, S., & Falkevik, E. (2017). Mindfulness mechanisms in sports: Mediating effects of rumination and emotion regulation on sport-specific coping. *Mindfulness*, 8(5), 1354–1363. <https://doi.org/10.1007/s12671-017-0711-4>
- Kaiseler, M., Poolton, J. M., Backhouse, S. H., & Stanger, N. (2017). The relationship between mindfulness and life stress in student-athletes: The mediating role of coping effectiveness and decision rumination. *The Sport Psychologist*, 31(3), 288–298. <https://doi.org/10.1123/tsp.2016-0083>
- Kelley, K., Walgren, M., & DeShong, H. L. (2021). Rumination as a transdiagnostic process: The role of rumination in relation to antisocial and borderline symptoms. *Journal of Affective Disorders*, 295, 865–872. <https://doi.org/10.1016/j.jad.2021.08.034>
- Kristjánsdóttir, H., Jóhannsdóttir, K. R., Pic, M., & Saavedra, J. M. (2019). Psychological characteristics in women football players: Skills, mental toughness, and anxiety. *Scandinavian Journal of Psychology*, 60(6), 609–615. <https://doi.org/10.1111/sjop.12571>
- Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: A new depression diagnostic and severity measure. *Psychiatric Annals*, 32(9), 509–515. <https://doi.org/10.3928/0048-5713-20020901-06>
- Küttel, A., & Larsen, C. H. (2020). Risk and protective factors for mental health in elite athletes: a scoping review. *International Review of Sport and Exercise Psychology*, 13(1), 231–265. <https://doi.org/10.1080/1750984X.2019.1689574>
- Lo, C. S., Ho, S. M., & Hollon, S. D. (2008). The effects of rumination and negative cognitive styles on depression: A mediation analysis. *Behaviour Research and Therapy*, 46(4), 487–495. <https://doi.org/10.1016/j.brat.2008.01.013>
- Lyubomirsky, S., Layous, K., Chancellor, J., & Nelson, S. K. (2015). Thinking about rumination: The scholarly contributions and intellectual legacy of Susan Nolen-Hoeksema. *Annual Review of Clinical Psychology*, 11, 1–22. <https://doi.org/10.1146/annurev-clinpsy-032814-112733>
- Madigan, D. J., & Nicholls, A. R. (2017). Mental toughness and burnout in junior athletes: A longitudinal investigation. *Psychology of Sport and Exercise*, 32, 138–142. <https://doi.org/10.1016/j.psychsport.2017.07.002>
- Manea, L., Gilbody, S., & McMillan, D. (2012). Optimal cut-off score for diagnosing depression with the Patient Health Questionnaire (PHQ-9): A meta-analysis.

- Canadian Medical Association Journal, 184(3), E191–E196. <https://doi.org/10.1503/cmaj.110829>
- Miranda, R., Valderrama, J., Tsypes, A., Gadol, E., & Gallagher, M. (2013). Cognitive inflexibility and suicidal ideation: Mediating role of brooding and hopelessness. *Psychiatry Research*, 210(1), 174–181. <https://doi.org/10.1016/j.psychres.2013.02.033>
- Morrison, J., Coulter, T. J., & Polman, R. (2024). The relationships between role strain, mental toughness and mental health amongst adolescent athletes. *Advanced Exercise and Health Science*, 1(1), 59–66. <https://doi.org/10.1016/j.aehs.2024.01.007>
- Mutz, J., Clough, P., & Papageorgiou, K. A. (2017). Do individual differences in emotion regulation mediate the relationship between mental toughness and symptoms of depression? *Journal of Individual Differences*, 44(5), 1182–1192. <https://doi.org/10.1027/1614-0001/a000224>
- Nicholls, A. R., Polman, R. C., Levy, A. R., & Backhouse, S. H. (2008). Mental toughness, optimism, pessimism, and coping among athletes. *Personality and Individual Differences*, 44(5), 1182–1192. <https://doi.org/10.1016/j.paid.2007.11.011>
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, 100(4), 569. <https://doi.org/10.1037/0021-843X.100.4.569>
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, 3(5), 400–424. <https://doi.org/10.1111/j.1745-6924.2008.00088>
- Ólafsson, R. P., Guðmundsdóttir, S. J., Björnsdóttir, T. D., & Snorrason, I. (2020). A test of the habit-goal framework of depressive rumination and its relevance to cognitive reactivity. *Behavior Therapy*, 51(3), 474–487. <https://doi.org/10.1016/j.beth.2019.08.005>
- Orue, I., Calvete, E., & Padilla, P. (2014). Brooding rumination as a mediator in the relation between early maladaptive schemas and symptoms of depression and social anxiety in adolescents. *Journal of Adolescence*, 37(8), 1281–1291. <https://doi.org/10.1016/j.adolescence.2014.09.004>
- Parker, P. C., Daniels, L. M., Ortner, C. N., & Tulloch, S. L. (2024). Examining the relationship between collegiate athletes' Setback-related control beliefs, rumination, and psychosocial outcomes: A mediation analysis. *Journal of Sport and Exercise Psychology*, 46(6), 362–372. <https://doi.org/10.1123/jsep.2023-0296>
- Pearson, K. A., Watkins, E. R., & Mullan, E. G. (2010). Submissive interpersonal style mediates the effect of brooding on future depressive symptoms. *Behaviour Research and Therapy*, 48(10), 966–973. <https://doi.org/10.1016/j.brat.2010.05.029>
- Percy, D. B., Streith, L., Wong, H., Ball, C. G., Widder, S., & Hameed, M. (2019). Mental toughness in surgeons: Is there room for improvement? *Canadian Journal of Surgery*, 62(6), 482. <https://doi.org/10.1503/cjs.010818>
- Preacher, K. J., & Kelley, K. (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. *Psychological methods*, 16(2), 93–115. <https://doi.org/10.1037/a0022658>
- Sheard, M. (2012). *Mental Toughness: The Mindset Behind Sporting Achievement* (2nd ed.). Routledge. <https://doi.org/10.4324/9780203103548>
- Sheard, M., Golby, J., & Van Wersch, A. (2009). Progress toward construct validation of the sports Mental toughness questionnaire (SMTQ). *European Journal of Psychological Assessment*, 25(3), 186–193. <https://doi.org/10.1027/1015-5759.25.3.186>
- Shimony, O., Einav, N., Bonne, O., Jordan, J. T., Van Vleet, T. M., & Nahum, M. (2021). The association between implicit and explicit affective inhibitory control, rumination and depressive symptoms. *Scientific Reports*, 11(1), Article 11490. <https://doi.org/10.1038/s41598-021-90875-3>
- Swann, C., Crust, L., & Allen-Collinson, J. (2016). Surviving the 2015 Mount Everest disaster: A phenomenological exploration into lived experience and the role of mental toughness. *Psychology of Sport and Exercise*, 27, 157–167. <https://doi.org/10.1016/j.psychsport.2016.08.012>
- Tahtinen, R. E., Kristjánssdóttir, H., Oddson, H. R., Saavedra, J. M., & Morris, R. (2021). Depressive symptoms in Icelandic elite athletes: A prospective examination through the lens of the response styles theory. *Psychology of Sport and Exercise*, 54, Article 101964. <https://doi.org/10.1016/j.psychsport.2021.101964>
- Tahtinen, R. E., Shelley, J., & Morris, R. (2021). Gaining perspectives: A scoping review of research assessing depressive symptoms in athletes. *Psychology of Sport and Exercise*, Article 101905. <https://doi.org/10.1016/j.psychsport.2021.101905>
- Tahtinen, R., McDougall, M., Feddersen, N., Tikkanen, O., Morris, R., & Ronkainen, N. J. (2020). Me, myself, and my thoughts: The influence of brooding and reflective rumination on depressive symptoms in athletes in the United Kingdom. *Journal of Clinical Sport Psychology*, 14(3), 1–20. <https://doi.org/10.1123/jcsp.2019-0039>
- Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, 27(3), 247–259. <https://doi.org/10.1023/A:1023910315561>
- Walton, C. C., Rice, S., Gao, C. X., Butterworth, M., Clements, M., & Purcell, R. (2021). Gender differences in mental health symptoms and risk factors in Australian elite athletes. *BMJ Open Sport & Exercise Medicine*, 7(1), Article e000984. <https://doi.org/10.1136/bmjsem-2020-000984>
- Watkins, E., & Brown, R. G. (2002). Rumination and executive function in depression: An experimental study. *Journal of Neurology, Neurosurgery & Psychiatry*, 72(3), 400–402. <https://doi.org/10.1136/jnnp.72.3.400>
- Watkins, E. R. (2009). Depressive rumination and co-morbidity: Evidence for brooding as a transdiagnostic process. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 27(3), 160–175. <https://doi.org/10.1007/s10942-009-0098-9>
- Watkins, E. R., & Nolen-Hoeksema, S. (2014). A habit-goal framework of depressive rumination. *Journal of Abnormal Psychology*, 123(1), 24. <https://doi.org/10.1037/a0035540>
- Watkins, E. R., & Roberts, H. (2020). Reflecting on rumination: Consequences, causes, mechanisms and treatment of rumination. *Behaviour Research and Therapy*, 127, Article 103573. <https://doi.org/10.1016/j.brat.2020.103573>
- Welsh, J. C., Dewhurst, S. A., & Perry, J. L. (2023). The influence of mental toughness on responses to feedback in snooker: A real-time examination. *Psychology of Sport and Exercise*, 68, Article 102466. <https://doi.org/10.1016/j.psychsport.2023.102466>
- Wu, C.-H., Nien, J.-T., Lin, C.-Y., Nien, Y.-H., Kuan, G., Wu, T.-Y., Ren, F.-F., & Chang, Y.-K. (2021). Relationship between mindfulness, psychological skills, and mental toughness in college athletes. *International Journal of Environmental Research and Public Health*, 18(13), 6802. <https://doi.org/10.3390/ijerph18136802>