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Author(s): Tahtinen, Richard; McDougall, Michael; Feddersen, Niels; Tikkanen, Olli; Morris, Robert; Ronkainen, Noora J.

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8

9 **Abstract**

10 Individual differences in vulnerability to depression are still underexplored in athletes. We
11 tested the influence of different brooding and reflective rumination profiles (i.e. repetitive
12 thought processes in response to low/depressed mood) on the odds of experiencing clinically
13 relevant depressive symptoms in competitive athletes (N=286). The Patient Health
14 Questionnaire 9 (PHQ – 9) and the Ruminative Responses Scale (RRS-short form) were
15 utilized to measure depression and rumination, respectively. Compared to athletes with a low
16 brooding/reflection profile, athletes with a high brooding/reflection profile had significantly
17 higher odds of experiencing clinical levels of depressive symptoms (OR=13.40, 95%
18 CI=3.81– 47.11). A high reflection/low brooding profile was not, however, related to
19 increased odds. Future research in the field could extend our findings by exploring
20 determinants of ruminative tendencies, especially brooding, in athletes. Furthermore,
21 psychological interventions targeting rumination could be examined as a potential prevention
22 and treatment approach to tackling depressive symptoms in athletes.

23 **Keywords:** Depression, cognitive vulnerability, ruminative response style, brooding, athletes

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26 Awareness of athlete mental health issues and corresponding recognition of the
27 importance of athlete welfare and duty of care needs has occupied an increasingly important
28 space in sport psychology literature and discourse (Moesch et al., 2018; Schinke, Stambulova,
29 Si, & Moore, 2018). Although some research on mental health issues in athletes date back as
30 far as the late 80s (Nudelman, Rosen, & Leitenberg, 1988), it is not until recently that
31 literature reviews on the topic have emerged (Armstrong, Burcin, Bjerke, & Early, 2015;
32 Frank, Nixdorf, & Beckmann, 2015; Gorczynski, Coyle, & Gibson, 2017; Goutteborge et al.,
33 2019; Rice et al., 2016; Wolanin, Gross, & Hong, 2015). Also, most of the primary research
34 on athlete mental health issues are fairly recent, for example, in a review by Goutteborge et al.
35 (2019) 32 of the 34 included studies were published after the year 2010.

36 The current knowledge indicates that psychological distress and disturbance in athletes
37 is common but often underreported due to stigma and a lack of awareness (Roberts, Faull, &
38 Tod, 2016). Furthermore, while athletes experience similar mental health risk factors to non-
39 athletes, athletes are also at risk from mental health decline due to sport-specific factors
40 (Moesch et al., 2018; Schinke et al., 2018). These include, for example: public evaluation of
41 performance (Doherty, Hannigan, & Campbell, 2016); post-Olympic blues (Howells &
42 Lucassen, 2018); career transitions (Stambulova, 2017); stressors that relate to acculturation,
43 cultural and athletic identity (Schinke, Blodgett, Ryba, & Middleton, 2018); difficulties
44 adjusting to the off-season and dealing with a post-competition void (Doherty et al., 2016);
45 injury and concussion (Rice et al., 2018); overtraining syndrome (Peluso & Andrade, 2005)
46 and burnout (Gerber et al., 2018). Whether athletes are more likely than non-athletes to
47 experience mental health issues is still, however, under debate. For example, while some
48 scholars suggest that athletes experience comparable levels of mental health issues as non-

49 athletes (Gorczyński et al., 2017; Rice et al., 2016), there is also support for lower levels
50 (Armstrong et al., 2015) and higher levels (Gouttebauge et al., 2019) in athletes than in non-
51 athletes.

52 In terms of specific mental health illnesses, depression has been one of the main topics
53 in the recent athlete mental health discourse (MacIntyre et al., 2017). Similar to broader
54 mental health research, most studies on self-reported depression in athletes have been
55 conducted with college-level athletes (Wolanin et al., 2015). The prevalence rates in this
56 population have been shown to vary from 15.6% (Proctor & Boan-Lenzo, 2010) to
57 considerably higher - for instance, Wolanin, Hong, Marks, Panchoo, and Gross (2016)
58 reported that 21% of male and 28% of female collegiate athletes experienced clinically
59 relevant depressive symptoms. Corresponding rates in college athletes were also reported for
60 males (19.2%) and females (25.6%) by Yang et al. (2007). In the contexts of non-collegiate
61 sport, Beable, Fulcher, Lee, and Hamilton (2017) reported a 21% prevalence rate in elite
62 athletes in New Zealand, while Gulliver, Griffiths, Mackinnon, Batterham, and Stanimirovic
63 (2015) found that 23.6% of male and 30.5% of female elite athletes in Australia reported
64 clinically significant depressive symptoms. In Germany, Nixdorf, Frank, Hautzinger, and
65 Beckmann (2013) reported a 15% prevalence for professional athletes, 19% for junior
66 professionals, and 29% for amateur athletes. In another study in Germany, Junge and Prinz
67 (2018) found a 12.8 % prevalence rate of mild-moderate symptoms and 11.7% prevalence of
68 severe depressive symptoms in female first league football players. For second league players,
69 the corresponding prevalence rates were 25.4% for mild-moderate and 20.6% for severe
70 symptoms of depression. In a study by Jensen, Ivarsson, Fallby, Dankers, and Elbe (2018) a
71 16.7% prevalence rate was found in Nordic male football players, with elite junior sample
72 reporting a 28% and professional sample a 10% prevalence. These findings – from college
73 and non-college sport contexts in various parts of the world – suggest that experiencing

74 clinically relevant levels of depressive symptoms is not uncommon in athletes. Furthermore,
75 the growing literature base has identified a range of risk groups/factors for elevated depressive
76 symptoms in athletes, including, but not limited to; female gender (Beable et al., 2017),
77 individual sport (vs. team sport) (Beable et al., 2017; Nixdorf, Frank, & Beckmann, 2016),
78 athletic injury (Appaneal, Levine, Perna, & Roh, 2009), athletic failure (Hammond,
79 Gialloreto, Kubas, & Davis, 2013), involuntary career termination (Wippert & Wippert,
80 2008), younger age (e.g. 18-24 years vs. older) and daily life-stress (Beable et al., 2017). As
81 the reviewed literature suggests, many of the factors that have been linked to elevated
82 depressive symptoms in athletes are largely unmodifiable, such as age, gender or type of
83 sport, or factors that are inherent in the context of sports such as performance failure, career
84 transitions, or injury. From an applied perspective, an understanding of these risk factors is
85 essential as it allows stakeholders to determine potential target groups for prevention.
86 However, to identify *what* exactly should be targeted, it is also important to explore individual
87 differences in susceptibility to depression. That is, why do risk factors contribute to elevated
88 depressive symptoms in some athletes but not in others?

89 **Cognitive Vulnerability to Depression**

90 One way to understand individual differences in susceptibility to depression is through
91 the lens of cognitive vulnerability-stress models of depression, which suggest that individuals' ⁴
92 interpretation of events or situations influences their mood and the subsequent likelihood of
93 becoming depressed (Abramson et al., 2002). Two major cognitive theories of depression, the
94 cognitive theory (Beck, 1967) and the hopelessness model (Abramson, Metalsky, & Alloy,
95 1989) are based on the vulnerability-stress accounts of depression. Although these theories are
96 conceptually similar, each theory identifies distinct vulnerabilities that are considered central
97 in the development and maintenance of depression (Hankin, 2008; Joormann & Arditte,
98 2015). For example, as described by Abramson et al. (2002), Beck's cognitive theory

99 identifies highly dysfunctional attitudes (e.g. maladaptive perfectionism) as the key cognitive
100 vulnerability to depression. According to this theory, dysfunctional attitudes interact with a
101 salient stressor to trigger negative automatic thoughts about oneself, the world and the future,
102 which in turn give rise to depressive symptoms. In the hopelessness model, attributional or
103 cognitive style is framed as the key vulnerability to depression. Here, a vulnerable individual
104 is more likely than the non-vulnerable individual to make internal (self-focused), stable (an
105 enduring characteristic), and global (generalizable across contexts) interferences of a negative
106 event, subsequently leading to hopelessness (depression).

107 In spite of these differences, a common thread across the vulnerability models is the
108 shared understanding that vulnerable individuals have a relatively stable tendency to respond
109 to stressors in a negatively biased, and self-focused manner (Ingram, Miranda, & Segal,
110 2006). Cognitively vulnerable individuals may also be more likely than the non-vulnerables to
111 engage in maladaptive cognitive processing or rumination when distressed, which may play a
112 substantial role in the development and maintenance of depression (Abramson et al., 2002).
113 To date, several different definitions or conceptualizations of rumination exists. For example,
114 as described by Matthews and Wells (2004) rumination has been defined broadly as repetitive
115 thoughts focused on discrepancies between current and desired goals, or as focus on past
116 failures. Rumination can also be understood as controlled and automatic processes in relation
117 to self-discrepant information (e.g., goal discrepancies and past failures), which are
118 maintained by meta-cognitive (positive) beliefs about rumination as a coping mechanism
119 (Matthews and Wells, 2004; Wells & Matthews, 1996). Rumination has also been
120 conceptualized more specifically in relation to depression. In the Response Styles Theory
121 (Nolen-Hoeksema, 1991) and in its subsequent revisions (Nolen-Hoeksema, Wisco, &
122 Lyubomirsky, 2008), depressive rumination is defined as a relatively stable, cognitive
123 processing style in response to sad or depressed mood involving repetitive thoughts about the

124 causes and implications of ones' negative feelings and problems. Consequently, engaging in
125 repetitive, abstract, and evaluative thought cycles in response to depressed mood is likely to
126 exacerbate this state and to disrupt effective problem-solving. Depressive rumination can,
127 therefore, be understood from a process perspective (e.g., attention or memory), rather than by
128 the specific contents of thoughts such as negative attributions or negative automatic thoughts
129 (Joormann & Arditte, 2015; Nolen-Hoeksema, 2004). Furthermore, several empirical studies
130 have provided evidence on the potential importance of depressive rumination, indicating that
131 it has a central role in the onset (Just & Alloy, 1997; Nolen-Hoeksema, 2000) maintenance
132 (Nolen-Hoeksema, 1991; Nolen-Hoeksema, McBride, & Larson, 1997; Spasojević & Alloy,
133 2001) and recurrence of depression and depression symptomology (Michalak, Hölz, &
134 Teismann, 2011). It has been suggested that depressive rumination may in fact function as a
135 proximal mechanism through which other cognitive vulnerabilities (e.g., negative cognitive
136 styles or dysfunctional attitudes) may operate on depression (Abramson et al., 2002; Pössel &
137 Winkeljohn Black, 2017; Spasojević & Alloy, 2001). Although depressive rumination is
138 considered a trait (i.e., it remains relatively stable over time), like other cognitive
139 vulnerabilities, it is still amenable to change by means of therapy or intervention (Ingram et
140 al., 2006). Indeed, sport psychology scholars have recently voiced the need for more research
141 on cognitive vulnerability in athletes to better target prevention or intervention efforts within
142 this population (Elbe & Jensen, 2016; Nixdorf et al., 2016).

143 **Brooding and Reflection**

144 Although ruminative responses to depressed mood are generally understood as
145 maladaptive processes, they may also serve an adaptive function (Joormann, Dkane, & Gotlib,
146 2006). Indeed, focusing ones' thoughts on issues at hand may be adaptive in problem-solving,
147 and self-reflection may contribute to the understanding of the self and the world (Watkins,
148 2016). This two-dimensional view of rumination as an adaptive and maladaptive process has

149 been acknowledged in the continued refinement of the 22-item Ruminative Responses Scale
150 (RRS), which was developed to measure depressive rumination. The original scale was
151 criticized for including items highly similar in content to items in measures of depression
152 (Treyner, Gonzalez, & Nolen-Hoeksema, 2003). Subsequently, Treyner et al. (2003) removed
153 items with depression-related content and conducted a principal component analysis on the 10
154 remaining items on the refined RRS. In these analyses, Treyner and colleagues identified two
155 separate factors of depressive rumination: brooding and reflective pondering (reflection). In
156 testing the relationship between these factors, they found that brooding was related to higher
157 levels of depression concurrently and longitudinally. Although reflection was also related to
158 more depression concurrently, it was associated with less depression over time. This finding
159 led the authors to conclude that a tendency to engage in brooding may be more maladaptive
160 than engaging in reflection. This assumption was supported by Lo, Ho, and Hollon (2008)
161 who demonstrated that brooding, but not reflection, mediated the effects of negative
162 attributional/cognitive style on depression. Despite these findings, the role of reflection as an
163 adaptive trait is still uncertain and is likely to be dependent on individuals' tendency to brood
164 as well as on their current levels of depression (Joormann et al., 2006).

165 **Ruminative Response Style in Athletes**

166 It has been suggested that a ruminative response style can develop as a coping
167 mechanism to highly controlling and critical parenting style, or when individuals are
168 socialized through environments where expression of thoughts and opinions may be restricted
169 (Watkins, 2016). Considering that some sport contexts may expose athletes to similar
170 environments where coach mediated control behaviours may involve manipulation or verbal
171 abuse, excessive personal control or dismissal of athlete individuality and autonomy
172 (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009), examining the link between
173 rumination and depression in athletes may be highly relevant. In addition, maladaptive

174 rumination may also involve a repetitive and evaluative approach to thinking about oneself in
175 relation to others and the discrepancy between current and desired state (Watkins, 2016).
176 Considering that performance outcomes are central in competitive sports and that athletes are
177 likely to set high standards for achievement, often in comparison to others, rumination may
178 indeed be a highly relevant characteristic to be explored. Although we are not aware of
179 studies that have examined the relationship between depressive rumination and depression
180 symptomology in athletes, there is evidence that rumination may be linked to performance
181 blocks (Bennett & Maynard, 2017) or Yips and Lost movement syndrome (Bennett,
182 Rotherham, Hays, Olusoga, & Maynard, 2016). Furthermore, in two studies by Roy et al.
183 (2016) brooding and reflective rumination tendencies were explored first in male football
184 players and then female field hockey players including non-athlete comparison groups. Their
185 results showed that reflective rumination decreased as skill level increased, suggesting that
186 low reflective rumination may be advantageous in the context of sports. No significant
187 differences were found in brooding rumination between the male football players and non-
188 athletes. Low ruminative brooding was however related to a longer athletic career in
189 professional players. In the female sample, field hockey players had significantly lower
190 brooding and reflective rumination than female non-athletes. In conclusion, although limited
191 in scope, previous studies in athletes suggest that having a tendency to engage in reflective
192 and/or brooding rumination may be detrimental for athletic performance.

193 **The Current Study**

194 Our study aims to extend mental health research in athletes by seeking to clarify the
195 relationship between depressive rumination and depressive symptoms, therefore responding to
196 Frank et al. (2015) call to validate knowledge acquired from general populations in athletes.
197 Specifically, the aims were to; (1) report prevalence and severity rates of clinically relevant
198 depressive symptoms in the current athlete sample, (2) explore potential differences in

199 depressive symptom and depressive rumination scores (brooding and reflection) across athlete
200 characteristics, and (3) test whether athletes with different types of brooding and reflection
201 (vulnerability) profiles would differ in rates of clinically relevant depressive symptoms. Based
202 on previous studies, we hypothesized that female gender, lower level of competition,
203 engaging in individual sports, and being currently injured would relate to higher depressive
204 symptom scores (aim 2). In terms of brooding and reflection, we did not set any specific
205 hypotheses regarding differences across sport-related variables, however, we did expect to see
206 that brooding and reflective rumination scores would be higher in female athletes than in male
207 athletes (aim 2). Finally, we hypothesized that athletes with a high brooding/reflection profile
208 would have higher odds of experiencing clinically relevant depressive symptoms when
209 compared to athletes with a low brooding/reflection profile (aim 3). Considering that the role
210 of reflective rumination as an adaptive trait is still unclear, we did not set any specific
211 hypothesis on the relationship between a high reflection/low brooding profile and the odds of
212 experiencing depressive symptoms.

213 **Methods**

214 **Participants**

215 The participants of the present study were 286 competitive athletes (62.0 % male, age
216 $M= 30.43$, $SD=10.86$, range 18-69 years) in the UK. For the purpose of this study, we defined
217 ‘competitive athletes’ as athletes at any competitive level who reported the main sport in
218 which they were currently competing. The majority of athletes were UK citizens (87.4 %) and
219 89.9% reported being of white/Caucasian ethnic background. Other ethnic backgrounds
220 included mixed/multiple (3.5%), Black/African/Caribbean/Black British (3.1%), Asian/Asian
221 British (2.4%), and Arab (.3%). Two participants did not report ethnic background. More
222 than half of the athletes (53.5 %) had been selected to represent their country at some point
223 during their athletic careers, and 30.5 % were currently competing at international/top tier

224 professional level. The most frequently reported male sports (or clusters of sports) were rugby
225 (n=25), ultra-marathon/marathon/running (cluster) (n=21), ironman/triathlon/duathlon
226 (cluster) (n=16), martial arts (cluster) (n=13), golf (n=14), football (soccer) (n=13), ice
227 hockey (n=11) and swimming (n=9). The most frequently reported female sports were rowing
228 (n=12), ironman/triathlon/duathlon (cluster) (n=11), volleyball (n=6), water polo (n=6), and
229 martial arts (cluster) (n=5). In total, athletes represented 54 different types of sports.

230 **Measures**

231 **Patient Health Questionnaire 9 (PHQ – 9)** assesses depressive symptoms (present
232 more than half the days) during the past two weeks (Kroenke & Spitzer, 2002). Each item is
233 scored from ‘0’ to ‘3’ ranging from “not at all” to “nearly every day”, thus total scores range
234 from 0 to 27. The psychometric properties of PHQ-9 have shown to be good among the
235 clinical (Kroenke & Spitzer, 2002) and the general population (Martin, Rief, Klaiberg, &
236 Braehler, 2006). The internal consistency of the scale in the current sample was $\alpha=.88$.

237 **Ruminative Responses Scale - short form (RRS-short form)** is a 10-item scale
238 adapted from the original 22-item RRS to measure rumination in response to depressed or
239 negative mood, without including items confounded by depression content (Treyner et al.,
240 2003). The 10-items in the RRS-short form consist of five reflective pondering (reflection)
241 items, such as “Analyse recent events to try to understand why you are depressed”, and five
242 brooding items, such as “Think why do I have problems other people don’t have?”.
243 Respondents rate each of the 10 items in the questionnaire from 1 (almost never) to 4 (almost
244 always) with higher scores representing higher tendency to engage in reflective and brooding
245 rumination when feeling low, sad or depressed. The internal consistency of the scales in the
246 current sample was $\alpha= .82$ for brooding and $\alpha= .79$ for reflection.

247 **Ethical Considerations**

248 The relevant University ethics committee granted ethical approval for this study. The
249 online survey consisted of an information page that briefly described the study objectives. A
250 link to a detailed information letter was included on the information page, which the
251 participants were encouraged to read before consenting to participation. In addition to study
252 details, the information letter also included contact details for various mental health
253 organizations to encourage participants to seek support if they were experiencing any mental
254 health issues or concerns. Participation in the study was voluntary, and answers to the survey
255 were anonymous.

256 **Procedures**

257 Online survey data was collected between November 9th, 2018 and February 20th,
258 2019. We utilized a convenience sampling method to recruit athletes from various sport
259 organizations and clubs in the UK. We contacted potential gatekeepers, such as performance
260 directors, coaches and established members of sport clubs/organizations to assist in the
261 recruitment of athletes. Finally, we also recruited participants through social media channels
262 such as Twitter and LinkedIn. Potential participants received a link to the anonymous online
263 survey including an information page with all relevant information concerning the study.

264 **Statistical Analyses**

265 To define clinically relevant symptoms of depression, we used a cut-off score ≥ 10
266 (Kroenke & Spitzer, 2002; Manea, Gilbody, & McMillan, 2015). We utilized logistic
267 regression models with adjusted odds ratios and 95% confidence intervals to test different
268 brooding and reflection profiles, as predictors of clinically relevant symptoms of depression.
269 First, we conducted a median split to categorize athletes based on their responses to RRS-
270 scale: high/low brooding and high/low reflection categories (coded as low=0, high=1,
271 respectively). After this, we computed a “vulnerability to depressive symptoms” variable with

272 four categories: “low = low brooding/low reflection”, “moderate = low brooding/high
273 reflection”, high = high brooding/low reflection, and “very high = high brooding/high
274 reflection”. For the purpose of our logistic regression analyses, we coded three dummy
275 variables in which athletes with a “low brooding/low reflection” profile served as the
276 reference category (“0”) to the three remaining combinations (“1”). Hence, the first model
277 included low vs moderate vulnerability, the second model low vs high vulnerability, and the
278 third model low vs very high vulnerability groups. We controlled all models for gender, age,
279 and injury status and conducted analyses in IBM SPSS version 25.0.

280 **Results**

281 **Prevalence and Severity of Depressive Symptoms**

282 The collective prevalence rate for clinically relevant depressive symptoms in the
283 sample was 19.9%. Of the female athletes reporting clinically relevant symptoms (30.6%),
284 15.7% reported moderate, 10.2% moderately severe, and 4.6% severe symptoms. In male
285 athletes reporting clinically relevant symptoms (13.1%), 8.0% reported moderate, 3.4%
286 moderately severe and 1.7% severe symptoms of depression. Finally, of the injured athletes
287 reporting clinically relevant symptoms (31.1%), 14.8% reported moderate, 14.8% moderately
288 severe and 1.6% severe symptoms.

289 **Mean Depressive Symptom Scores**

290 Table 1 presents athletes’ gender and age distribution and sport-related characteristics
291 along with mean scores for depressive symptoms. There was a significant difference in mean
292 depressive symptom scores between male (M=5.11, SD=4.49) and female (M=7.48,
293 SD=5.93) athletes [$t(181.74) = -3.56, p < .001$]. A significant difference was also found across
294 age groups [$F(2, 267) = 3.66, p = .027$]. Based on Tukey’s post hoc test, athletes 35 and older
295 had significantly lower scores (M=4.53, SD=4.82) than athletes in the age range 25-34
296 (M=6.43, SD=5.34) and 18-24 (M=6.50, SD=5.22). Across sport-related factors, the only

297 differences in mean depressive symptom scores were between injured and non-injured
298 athletes [$t(284) = 2.49, p = .013$]. Within the injured group, we also found a significant
299 difference in mean symptom scores between athletes with 20 days or less to recovery
300 ($M=5.43, SD=3.80$) and those with more than 20 days to recovery ($M=8.80, SD=5.78$)
301 [$t(50.92) = -2.67, p = .010$].

302 [Insert Table 1 here]

303 **Mean Brooding and Reflection Scores**

304 Brooding rumination was significantly higher in female ($M=10.25, SD=3.80$) than
305 male ($M=8.91, SD=3.20$) athletes, $t(191.45) = -3.01, p = .003$. Brooding was also significantly
306 higher in athletes who were currently in their off-season ($M=10.43, SD= 3.90$) compared to
307 athletes who were currently in-season ($M=9.03, SD=3.27$), $t(107.86) = -2.72, p = .008$. No
308 other significant differences were found in brooding across participant characteristics.
309 Reflective rumination was also significantly higher in female ($M=10.43, SD=3.57$) than male
310 ($M=9.14, SD=3.05$) athletes, $t(270) = -3.17, p = .002$. In addition, reflection scores were
311 significantly higher in injured ($M=10.41, SD=3.66$) than non-injured athletes ($M=9.42,$
312 $SD=3.18$), $t(272) = 2.04, p = .04$.

313 **Brooding and Reflection Profiles and the Odds of Experiencing Clinically Relevant**

314 **Depressive symptoms**

315 As shown in table 2, when compared to athletes with a low brooding and reflection
316 profile, significantly higher odds of experiencing clinically relevant depressive symptoms
317 were observed for athletes with a high brooding/low reflection profile ($OR=7.33,$
318 $95\%CI=1.93- 27.84$) and high brooding/reflection ($OR=13.40, 95\%CI=3.81- 47.11$) profile.
319 Athletes with a low brooding/high reflection profile did not have significantly higher odds of
320 experiencing clinically relevant symptoms than the reference category.

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[Insert Table 2 here]

Discussion

In the current study, we explored the prevalence of depressive symptoms and depressive rumination (i.e. brooding and reflection) in a sample of competitive athletes in the UK. We were specifically interested in testing the relationship between different brooding and reflective rumination profiles and the odds of experiencing clinically relevant depressive symptoms. Approximately one in five athletes reported clinically relevant symptoms of depression, with female athletes reporting a 30.6 % and male athletes a 13.1% prevalence. Our study adds to the rapidly growing evidence-base that demonstrates clinically relevant depressive symptoms in athletes and reports overall prevalence rates that are comparable with those found in other studies (e.g., Beable et al., 2017; Wolanin 2016). Our findings also support previously reported gender difference in athlete depression and reaffirm that female athletes show higher levels of depressive symptoms than their male counterparts (Gulliver et al., 2015; Yang et al., 2007; Wolanin 2016). We also found that athletes between the ages of 18-34 had higher depressive symptom scores than athletes 35 years and older and that injured athletes had significantly higher levels of depression than uninjured athletes. Although previous studies have reported several other risk factors in athletes, we did not find any significant differences across the other measured characteristics. For example, and contrary to some other studies (Nixdorf et al., 2016; Nixdorf, Hautzinger, & Beckmann, 2013; Schaal et al., 2011; Wolanin et al., 2016), we did not find a difference between team and individual sport athletes. This finding could be due to the specific type of sports that were included (or not) in this study. For instance, in our sample, there were few athletes competing in aesthetic sports which are sport contexts shown to increase the risk of mental health issues (Schaal et al., 2011; Sundgot-Borgen & Torstveit, 2004). Future studies could, therefore, explore

346 whether differences between team and individual sports may be more accurately explained by
347 specific sports (e.g., rugby vs figure skating) or types of sport (e.g., team ball sports vs
348 aesthetic) rather than by the broad distinction alone.

349 In terms of brooding and reflection, we found that brooding and reflection was
350 significantly higher in female than in male athletes. This is in line with previous studies in
351 non-athlete samples that have suggested that gender differences in depression may be partly
352 explained by females' higher tendency to engage in rumination (Johnson & Whisman, 2013).
353 It is also likely that wider socioeconomic forces contribute to the development of gender
354 differences in depression that emerge during middle to late adolescence (Nolen-Hoeksema,
355 2001). For example, females may be more likely than males to experience victimization such
356 as sexual abuse and harassment, and chronic strains due to their societal status and roles
357 (Nolen-Hoeksema, 2001). For female athletes, additional stressors may emerge from the
358 context of sports where male sports are often portrayed as the norm, and female sports merely
359 as secondary (Fink, 2015). It is therefore important for future research to explore how
360 potential contextual stressors interact with rumination in terms of gender differences in athlete
361 depression.

362 We also found that brooding was higher in off-season athletes when compared to in-
363 season athletes. We are unable to infer any causal directions due to our cross-sectional design,
364 however, it is possible that levels of brooding vary across the athletic season. Although
365 brooding rumination is considered a stable trait, there is evidence suggesting that this stability
366 is relative rather than absolute (Bagby, Rector, Bacchiochi, & McBride, 2004). That is, while
367 levels of brooding may fluctuate due to contextual influences (e.g., change in stressors), they
368 do so in a predictable pattern over time. Future studies could hence explore whether athletes
369 with a high brooding tendency may be especially vulnerable to experiencing depression
370 during off-season periods (Doherty et al., 2016).

371 Exploring reflective rumination across sample characteristics, the only difference was
372 found between injured and uninjured athletes. Specifically, injured athletes showed
373 significantly higher tendency to engage in reflective rumination than uninjured athletes. As
374 discussed by Roy et al. (2016), higher reflective rumination has been linked to a lower ability
375 to shift attention between tasks. Perhaps athletes with a higher tendency to engage in
376 reflective rumination in our sample were more likely to be injured due to a decreased ability
377 to switch focus, and consequently being less likely to react to or avoid situations that may lead
378 to injury.

379 A particular focus of the current study was to deepen understandings of cognitive
380 vulnerability in relation to depressive symptoms in athletes. Specifically, we wanted to test
381 whether the odds of experiencing clinically relevant symptoms of depression differed
382 depending on the athletes' tendency to engage in brooding and reflective rumination. Based
383 on the response style theory and recent accounts of the role of reflection and brooding
384 rumination in depression, we expected that athletes with a high brooding and reflection profile
385 would have higher odds of experiencing clinically relevant depressive symptoms when
386 compared to athletes with low brooding and low reflection profile. We found support for this
387 expectation as athletes with a tendency to engage in high levels of brooding and reflection had
388 the highest odds for experiencing clinically relevant depressive symptoms. More specifically,
389 in comparison to athletes with a low brooding/reflection profile, the odds of clinically relevant
390 symptoms were seven-fold in athletes with high brooding but low reflection. For athletes with
391 a high brooding and high reflection profile, however, the odds of clinically relevant symptoms
392 were 13-fold. Our findings are in line with studies conducted in non-athlete samples
393 (Joormann et al., 2006; Treynor et al., 2003), suggesting that brooding represents a
394 maladaptive process that has a significant impact on individuals' likelihood of experiencing
395 clinically relevant depressive symptoms.

396 We did not set any specific hypotheses to how reflection would relate to depressive
397 symptoms. Our results suggested that having a high tendency to engage in reflective
398 rumination did not increase the odds of clinically relevant depressive symptoms when
399 combined with a low tendency to brood. On the other hand, when combined with a *high*
400 tendency to brood, reflection was linked to increased odds of depressive symptoms. These
401 findings support the general consensus among clinically oriented psychology researchers that
402 the adaptiveness of reflection may be largely dependent on individuals' tendency to brood, in
403 the way that high levels of brooding may override the adaptive effects of reflection (Joormann
404 et al., 2006). In line with this, engaging in reflective rumination may be adaptive in non-
405 depressed individuals, but a maladaptive in depressed individuals (Treynor et al., 2003;
406 Whitmer & Gotlib, 2011). Considering that we found that reflective rumination was higher in
407 injured than uninjured athletes, it is possible that reflection is, in fact, a maladaptive trait in
408 the context of sports. Future research could further investigate whether reflection could have
409 an adaptive function over time and/or through other outcomes, such as increased meaning in
410 life and/or sport.

411 It is likely that the stressors that trigger depression in athletes may often be linked to
412 sport-related issues such as athletic failure, injury, or career termination (Appaneal et al.,
413 2009; Hammond et al., 2013; Wippert & Wippert, 2008; Wolanin et al., 2015). Although the
414 stressors may indeed revolve around sport-related issues, the mechanism by which these
415 stressors elicit depression would be expected to be similar to the general population. For
416 example, Nixdorf and colleagues (2016) found that a higher tendency to make internal, stable,
417 and global attributions after athletic failure explained differences in depressive symptoms
418 between individual sport athletes and team sport athletes. Nixdorf and colleagues' study is
419 one of the few studies on cognitive vulnerability to depressive symptoms in athletes and
420 provides some evidence for the potential importance of the sport context (e.g., type of sport)

421 in the development of these vulnerabilities. However, as they tested attributional style in
422 relation to athletic failure, the results from their study are limited to this specific context. As
423 athletes may be challenged by a multitude of stressors (Howells & Fletcher, 2015; Moesch et
424 al., 2018; Sarkar & Fletcher, 2014; Schinke, Stambulova, et al., 2018), even at times when
425 athletes are not engaged in their sporting endeavours (Doherty et al., 2016; Nesti & Sewell,
426 1999), our study deliberately focused on the maladaptive processes that may take place in
427 response to negative/depressed mood, be it due to athletic failure, injury, or any other
428 significant event or situation in the athletes' life.

429 Depressive rumination is defined as maladaptive abstractive thought patterns in
430 response to distress that can be characterized as asking oneself unanswerable questions
431 (Nolen-Hoeksema et al., 2008; Watkins, 2016). This type of processing of negative
432 information is seen as one of the active ingredients in maintaining attentional resources on the
433 causes and implications of one's depressive symptoms. This negative processing of
434 information then subsequently increases and maintains depressed mood, as well as impairs
435 effective problem solving (Nolen-Hoeksema et al., 2008; Watkins, 2009). While targeting
436 ruminative processes in treatment have shown to be effective in decreasing levels of
437 depression (Manicavasagar, Perich, & Parker, 2012), rumination could also be a potential
438 target in prevention approaches as "...it is observed to be elevated as a risk factor prior to the
439 onset of depression, during episodes of major depression, in partial remission, and in full
440 remission from depression." (Watson, 2016, p.20). Based on our findings, a ruminative
441 tendency, especially brooding, may also be an important cognitive process to be considered in
442 treatment and prevention within athlete populations. However, future studies should utilize
443 longitudinal and intervention designs across different in-risk athlete populations to test the
444 temporal patterns between rumination and depressive symptoms.

445 Targeting rumination may also be effective, not only in treating levels of depression,
446 but also co-morbid issues (e.g., anxiety) and residual symptoms of depression (e.g., sleep) that
447 may significantly impair daily functioning (Watkins et al., 2007). From this perspective,
448 theoretical approaches that have a more generic conceptualization of rumination (e.g., the S-
449 REF model, Wells & Matthews, 1996) in relation to emotional disorders, could provide a
450 promising avenue for future applied and empirical investigations across different clinical and
451 subclinical issues in athletes. As already partly voiced by Uphill and Dray (2009), another
452 interesting avenue for future research in athletes would be to collectively examine cognitive
453 vulnerability factors (e.g., negative attributions, dysfunctional attitudes, and rumination) in
454 relation to depression in athletes. Furthermore, linking these vulnerabilities to other concepts
455 that may be relevant in the context of sports, such as mental toughness or flow, would allow
456 for improved understanding of the interaction between depression (or mental health) and
457 athletic performance. Also, considering that ruminative response style may develop early in
458 individuals' life (Spasojevic & Alloy, 2002), important insights into the influence of the sport
459 context on the development of ruminative tendencies could be gained by exploring different
460 youth sport environments (e.g. outcome-oriented, early initiation or specialization) and/or
461 youth coaching environments (e.g. criticism, excess control). If some contexts are more likely
462 to contribute to an increased tendency to ruminate, early prevention strategies could be
463 designed to attenuate these trends.

464 Our study findings should be interpreted with an understanding of its' main
465 limitations. Firstly, due to the cross-sectional study design, causal or temporal inferences
466 cannot be concluded. Also, due to the convenience sampling methodology, self-selection bias
467 may have influenced our findings. We also had a broad inclusion of athletes in terms of the
468 type and the level of sports. As we did not have sufficiently large sample sizes across different
469 sports, we were not able to conduct specific analyses to disentangle potential sport-specific

470 effects. It is also important to note, that our findings were limited to athletes from the United
471 Kingdom and hence, interpretations should be made with an understanding of this cultural
472 specificity.

473 In spite of these limitations, we believe that our study is an important addition to the
474 mental health literature in sport psychology. It provides a theory-driven glance into the
475 relationship between depressive rumination and depression symptomology in an athlete
476 sample, which to our knowledge is first of its kind in the field. Furthermore, the study
477 responds to a call voiced by other scholars to explore and validate cognitive vulnerability
478 research in the athlete population. By doing this, we hoped to open new avenues to further
479 understand depressive symptoms in the sport context, especially in terms of potentially
480 modifiable risk factors. Finally, many of the previous studies have merely assessed
481 differences in depressive symptoms across hypothesized predictors by comparing mean
482 differences. Although informative of differences, these types of analyses are not sensitive to
483 the clinical relevance of the observed differences. Therefore, in addition to mean differences,
484 we also wanted to explore ratios of non-cases to cases across the different levels of our
485 predictor variable.

486 **Clinical Implications**

487 Considering our findings that brooding was a significant predictor of current clinically
488 relevant symptoms of depression, and that a ruminative response style may develop early in
489 life, psychologists working in youth sport could potentially screen for ruminative tendencies
490 to promote more adaptive cognitive skills early in athletes' careers. Practitioners working with
491 athletes could benefit from a detailed assessment and conceptualization of ruminative
492 tendencies to identify the potential functions of rumination in the athlete's presenting issues
493 such as depressed mood. This could allow the practitioner and the athlete to tackle ruminative
494 tendencies and potential barriers (e.g., positive beliefs about rumination as an effective coping

495 mechanism) to optimal outcomes. Considering that several different potential approaches to
496 targeting ruminative tendencies exist (Fisher & Wells, 2009; Gardner & Moore, 2007; Segal
497 & Teasdale, 2018; Watkins, 2016), and that rumination may be a relevant cognitive process,
498 not only in terms of clinical disorders, but also in terms of sport-specific functioning of
499 athletes (Bennett et al., 2016; Uphill & Dray, 2009); introducing and applying rumination-
500 focused approaches in the context of sports could provide exciting opportunities for future
501 prevention, treatment, and research efforts in athlete populations.

502 **Conclusion**

503 Depressive rumination might be an important vulnerability factor to be considered in
504 future research, prevention, and treatment in athlete depression. Our findings indicated that a
505 tendency to engage in brooding rumination significantly increased the odds of experiencing
506 clinically relevant symptoms of depression, independent of athletes' reflection profile.
507 Prospective studies are needed to disentangle temporal patterns in the relationship between
508 rumination and depressive symptoms, and to identify potential sport-specific factors that may
509 contribute to the development of ruminative tendencies in athletes.

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