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**Me, Myself, and My Thoughts: The Influence of Brooding and Reflective Rumination on Depressive Symptoms in Athletes in the United Kingdom**

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### Article

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1 **Me, Myself, and My Thoughts: The Influence of Brooding and Reflective Rumination on**  
2 **Depressive Symptoms in Athletes in the United Kingdom**

3

4

**Abstract**

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

19 **Me, Myself, and My Thoughts: The Influence of Brooding and Reflective Rumination on**

20 **Depressive symptoms in Athletes in the United Kingdom**

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

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

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

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

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

#### 84 **Cognitive Vulnerability to Depression**

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

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

102         In spite of these differences, a common thread across the vulnerability models is the  
103 shared understanding that vulnerable individuals have a relatively stable tendency to respond  
104 to stressors in a negatively biased, and self-focused manner (Ingram, Miranda, & Segal,  
105 2006). Cognitively vulnerable individuals may also be more likely than the non-vulnerables to  
106 engage in maladaptive cognitive processing or rumination when distressed, which may play a  
107 substantial role in the development and maintenance of depression (Abramson et al., 2002).  
108 To date, several different definitions or conceptualizations of rumination exists. For example,  
109 as described by Matthews and Wells (2004) rumination has been defined broadly as repetitive  
110 thoughts focused on discrepancies between current and desired goals, or as focus on past  
111 failures. Rumination can also be understood as controlled and automatic processes in relation  
112 to self-discrepant information (e.g., goal discrepancies and past failures), which are  
113 maintained by meta-cognitive (positive) beliefs about rumination as a coping mechanism  
114 (Matthews and Wells, 2004; Wells & Matthews, 1996). Rumination has also been  
115 conceptualized more specifically in relation to depression. In the Response Styles Theory  
116 (Nolen-Hoeksema, 1991) and in its subsequent revisions (Nolen-Hoeksema, Wisco, &  
117 Lyubomirsky, 2008), depressive rumination is defined as a relatively stable, cognitive  
118 processing style in response to sad or depressed mood involving repetitive thoughts about the

119 causes and implications of ones' negative feelings and problems. Consequently, engaging in  
120 repetitive, abstract, and evaluative thought cycles in response to depressed mood is likely to  
121 exacerbate this state and to disrupt effective problem-solving. Depressive rumination can,  
122 therefore, be understood from a process perspective (e.g., attention or memory), rather than by  
123 the specific contents of thoughts such as negative attributions or negative automatic thoughts  
124 (Joormann & Arditte, 2015; Nolen-Hoeksema, 2004).

125         Several empirical studies have provided evidence on the potential importance of  
126 depressive rumination, indicating that it has a central role in the onset (Just & Alloy, 1997;  
127 Nolen-Hoeksema, 2000) maintenance (Nolen-Hoeksema, 1991; Nolen-Hoeksema, McBride,  
128 & Larson, 1997; Spasojević & Alloy, 2001) and recurrence of depression and depression  
129 symptomology (Michalak, Hölz, & Teismann, 2011). It has been suggested that depressive  
130 rumination may in fact function as a proximal mechanism through which other cognitive  
131 vulnerabilities (e.g., negative cognitive styles or dysfunctional attitudes) may operate on  
132 depression (Abramson et al., 2002; Pössel & Winkeljohn Black, 2017; Spasojević & Alloy,  
133 2001). Although depressive rumination is considered a trait (i.e., it remains relatively stable  
134 over time), like other cognitive vulnerabilities, it is still amenable to change by means of  
135 therapy or intervention (Ingram et al., 2006). Indeed, sport psychology scholars have recently  
136 voiced the need for more research on cognitive vulnerability in athletes to better target  
137 prevention or intervention efforts within this population (Elbe & Jensen, 2016; Nixdorf et al.,  
138 2016).

### 139 **Brooding and Reflection**

140         Although ruminative responses to depressed mood are generally understood as  
141 maladaptive processes, they may also serve an adaptive function (Joormann, Dkane, & Gotlib,  
142 2006). Indeed, focusing ones' thoughts on issues at hand may be adaptive in problem-solving,  
143 and self-reflection may contribute to the understanding of the self and the world (Watkins,

2016). This two-dimensional view of rumination as an adaptive and maladaptive process has been acknowledged in the continued refinement of the 22-item Ruminative Responses Scale (RRS), which was developed to measure depressive rumination. The original scale was criticized for including items highly similar in content to items in measures of depression (Treyner, Gonzalez, & Nolen-Hoeksema, 2003). Subsequently, Treyner et al. (2003) removed items with depression-related content and conducted a principal component analysis on the 10 remaining items on the refined RRS. In these analyses, Treyner and colleagues identified two separate factors of depressive rumination: brooding and reflective pondering (reflection). In testing the relationship between these factors, they found that brooding was related to higher levels of depression concurrently and longitudinally. Although reflection was also related to more depression concurrently, it was associated with less depression over time. This finding led the authors to conclude that a tendency to engage in brooding may be more maladaptive than engaging in reflection. This assumption was supported by Lo, Ho, and Hollon (2008) who demonstrated that brooding, but not reflection, mediated the effects of negative attributional/cognitive style on depression. Despite these findings, the role of reflection as an adaptive trait is still uncertain and is likely to be dependent on individuals' tendency to brood as well as on their current levels of depression (Joormann et al., 2006).

### **Ruminative Response Style in Athletes**

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



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

### 189 **The Current Study**

190 Our study aims to extend mental health research in athletes by seeking to clarify the  
191 relationship between depressive rumination and depressive symptoms, therefore responding to  
192 Frank et al. (2015) call to validate knowledge acquired from general populations in athletes.  
193 Specifically, the aims were to; (1) report prevalence and severity rates of clinically relevant

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

## 209 **Methods**

### 210 **Participants**

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

219 during their athletic careers, and 30.5 % were currently competing at international/top tier  
220 professional level. The most frequently reported male sports (or clusters of sports) were rugby  
221 (n=25), ultra-marathon/marathon/running (cluster) (n=21), ironman/triathlon/duathlon  
222 (cluster) (n=16), martial arts (cluster) (n=13), golf (n=14), football (soccer) (n=13), ice  
223 hockey (n=11) and swimming (n=9). The most frequently reported female sports were rowing  
224 (n=12), ironman/triathlon/duathlon (cluster) (n=11), volleyball (n=6), water polo (n=6), and  
225 martial arts (cluster) (n=5). In total, athletes represented 54 different types of sports.

## 226 **Measures**

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

233 **Ruminative Responses Scale - short form (RRS-short form)** is a 10-item scale  
234 adapted from the original 22-item RRS to measure rumination in response to depressed or  
235 negative mood, without including items confounded by depression content (Treynor et al.,  
236 2003). The 10-items in the RRS-short form consist of five reflective pondering (reflection)  
237 items, such as “Analyse recent events to try to understand why you are depressed”, and five  
238 brooding items, such as “Think why do I have problems other people don’t have?”.

239 Respondents rate each of the 10 items in the questionnaire from 1 (almost never) to 4 (almost  
240 always) with higher scores representing higher tendency to engage in reflective and brooding  
241 rumination when feeling low, sad or depressed. The internal consistency of the scales in the  
242 current sample was  $\alpha= .82$  for brooding and  $\alpha= .79$  for reflection.

243 **Ethical Considerations**

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

252 **Procedures**

253           Online survey data was collected between November 9th, 2018 and February 20th,  
254 2019. We utilized a convenience sampling method to recruit athletes from various sport  
255 organizations and clubs in the UK. We contacted potential gatekeepers, such as performance  
256 directors, coaches and established members of sport clubs/organizations to assist in the  
257 recruitment of athletes. Finally, we also recruited participants through social media channels  
258 such as Twitter and LinkedIn. Potential participants received a link to the anonymous online  
259 survey including an information page with all relevant information concerning the study.

260 **Statistical Analyses**

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

268 four categories: “low = low brooding/low reflection”, “moderate = low brooding/high  
269 reflection”, high = high brooding/low reflection, and “very high = high brooding/high  
270 reflection”. Although there are limitations with the median split method, in some situations it  
271 may allow for a more parsimonious interpretation of analyses (DeCoster, Gallucci, & Iselin,  
272 2011). As our outcome variable was binary (i.e. clinical symptoms or not), a multiple  
273 regression analysis was not possible. Also, acknowledging that athletes may have different  
274 subsets of brooding and reflection tendencies, categorising athletes into rumination profiles  
275 (rather than using a continuous measure), allowed us to explore the relationship between  
276 different profiles and clinically relevant depressive symptoms. Hence, for the purpose of our  
277 logistic regression analyses we coded three dummy variables in which athletes with a “low  
278 brooding/low reflection” profile served as the reference category (“0”) to the three remaining  
279 combinations (“1”). Hence, the first model included low vs moderate vulnerability, the second  
280 model low vs high vulnerability, and the third model low vs very high vulnerability groups.  
281 We controlled all models for gender, age, and injury status and conducted analyses in IBM  
282 SPSS version 25.0.

## 283 **Results**

### 284 **Prevalence and Severity of Depressive Symptoms**

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

292 **Mean Depressive Symptom Scores**

293 Table 1 presents athletes' gender and age distribution and sport-related characteristics  
294 along with mean scores for depressive symptoms. There was a significant difference in mean  
295 depressive symptom scores between male (M=5.11, SD=4.49) and female (M=7.48,  
296 SD=5.93) athletes [ $t(181.74) = -3.56, p < .001$ ]. A significant difference was also found across  
297 age groups [ $F(2, 267) = 3.66, p = .027$ ]. Based on Tukey's post hoc test, athletes 35 and older  
298 had significantly lower scores (M=4.53, SD=4.82) than athletes in the age range 25-34  
299 (M=6.43, SD=5.34) and 18-24 (M=6.50, SD=5.22). Across sport-related factors, the only  
300 differences in mean depressive symptom scores were between injured and non-injured  
301 athletes [ $t(284) = 2.49, p = .013$ ]. Within the injured group, we also found a significant  
302 difference in mean symptom scores between athletes with 20 days or less to recovery  
303 (M=5.43, SD=3.80) and those with more than 20 days to recovery (M=8.80, SD=5.78)  
304 [ $t(50.92) = -2.67, p = .010$ ].

305 [Insert Table 1 here]

306 **Mean Brooding and Reflection Scores**

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

316 **Brooding and Reflection Profiles and the Odds of Experiencing Clinically Relevant**  
317 **Depressive symptoms**

318 As shown in table 2, when compared to athletes with a low brooding and reflection  
319 profile, significantly higher odds of experiencing clinically relevant depressive symptoms  
320 were observed for athletes with a high brooding/low reflection profile (OR=7.33,  
321 95%CI=1.93- 27.84) and high brooding/reflection (OR=13.40, 95%CI=3.81– 47.11) profile.  
322 Athletes with a low brooding/high reflection profile did not have significantly higher odds of  
323 experiencing clinically relevant symptoms than the reference category.

324

325 [Insert Table 2 here]

326 **Discussion**

327 In the current study, we explored the prevalence of depressive symptoms and  
328 depressive rumination (i.e. brooding and reflection) in a sample of competitive athletes in the  
329 UK. We were specifically interested in testing the relationship between different brooding and  
330 reflective rumination profiles and the odds of experiencing clinically relevant depressive  
331 symptoms. Approximately one in five athletes reported clinically relevant symptoms of  
332 depression, with female athletes reporting a 30.6 % and male athletes a 13.1% prevalence.  
333 Our study adds to the rapidly growing evidence-base that demonstrates clinically relevant  
334 depressive symptoms in athletes and reports overall prevalence rates that are comparable with  
335 those found in other studies (e.g., Beable et al., 2017; Wolanin 2016). Our findings also  
336 support previously reported gender difference in athlete depression and reaffirm that female  
337 athletes show higher levels of depressive symptoms than their male counterparts (Gulliver et  
338 al., 2015; Yang et al., 2007; Wolanin 2016). We also found that athletes between the ages of  
339 18-34 had higher depressive symptom scores than athletes 35 years and older and that injured  
340 athletes had significantly higher levels of depression than uninjured athletes. Although

341 previous studies have reported several other risk factors in athletes, we did not find any  
342 significant differences across the other measured characteristics. For example, and contrary to  
343 some other studies (Nixdorf et al., 2016; Nixdorf, Hautzinger, & Beckmann, 2013; Schaal et  
344 al., 2011; Wolanin et al., 2016), we did not find a difference between team and individual  
345 sport athletes. This finding could be due to the specific type of sports that were included (or  
346 not) in this study. For instance, in our sample, there were few athletes competing in aesthetic  
347 sports which are sport contexts shown to increase the risk of mental health issues (Schaal et  
348 al., 2011; Sundgot-Borgen & Torstveit, 2004). Future studies could, therefore, explore  
349 whether differences between team and individual sports may be more accurately explained by  
350 specific sports (e.g., rugby vs figure skating) or types of sport (e.g., team ball sports vs  
351 aesthetic) rather than by the broad distinction alone.

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



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

374 Exploring reflective rumination across sample characteristics, the only difference was  
375 found between injured and uninjured athletes. Specifically, injured athletes showed  
376 significantly higher tendency to engage in reflective rumination than uninjured athletes.  
377 Similar to findings on higher brooding in off-season than in-season athletes, it is possible that  
378 higher reflection scores in injured than uninjured athletes reflected increased coping efforts in  
379 response to stressors associated with athletic injury. As discussed by Roy et al. (2016), higher  
380 reflective rumination has also been linked to a lower ability to shift attention between tasks.  
381 Perhaps athletes with a higher tendency to engage in reflective rumination in our sample were  
382 more likely to be injured due to a decreased ability to switch focus, and consequently being  
383 less likely to react to or avoid situations that may lead to injury.

384 A particular focus of the current study was to deepen understandings of cognitive  
385 vulnerability in relation to depressive symptoms in athletes. Specifically, we wanted to test  
386 whether the odds of experiencing clinically relevant symptoms of depression differed  
387 depending on the athletes' tendency to engage in brooding and reflective rumination. Based  
388 on the response style theory and recent accounts of the role of reflection and brooding  
389 rumination in depression, we expected that athletes with a high brooding and reflection profile

390 would have higher odds of experiencing clinically relevant depressive symptoms when  
391 compared to athletes with low brooding and low reflection profile. We found support for this  
392 expectation as athletes with a tendency to engage in high levels of brooding and reflection had  
393 the highest odds for experiencing clinically relevant depressive symptoms. More specifically,  
394 in comparison to athletes with a low brooding/reflection profile, the odds of clinically relevant  
395 symptoms were seven-fold in athletes with high brooding but low reflection. For athletes with  
396 a high brooding and high reflection profile, however, the odds of clinically relevant symptoms  
397 were 13-fold. Our findings are in line with studies conducted in non-athlete samples  
398 (Joormann et al., 2006; Treynor et al., 2003), suggesting that brooding represents a  
399 maladaptive process that has a significant impact on individuals' likelihood of experiencing  
400 clinically relevant depressive symptoms.

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

414 an adaptive function over time and/or through other outcomes, such as increased meaning in  
415 life and/or sport.

416 It is likely that the stressors that trigger depression in athletes may often be linked to  
417 sport-related issues such as athletic failure, injury, or career termination (Appaneal et al.,  
418 2009; Hammond et al., 2013; Wippert & Wippert, 2008; Wolanin et al., 2015). Although the  
419 stressors may indeed revolve around sport-related issues, the mechanism by which these  
420 stressors elicit depression would be expected to be similar to the general population. For  
421 example, Nixdorf and colleagues (2016) found that a higher tendency to make internal, stable,  
422 and global attributions after athletic failure explained differences in depressive symptoms  
423 between individual sport athletes and team sport athletes. Nixdorf and colleagues' study is  
424 one of the few studies on cognitive vulnerability to depressive symptoms in athletes and  
425 provides some evidence for the potential importance of the sport context (e.g., type of sport)  
426 in the development of these vulnerabilities. However, as they tested attributional style in  
427 relation to athletic failure, the results from their study are limited to this specific context. As  
428 athletes may be challenged by a multitude of stressors (Howells & Fletcher, 2015; Moesch et  
429 al., 2018; Sarkar & Fletcher, 2014; Schinke, Stambulova, et al., 2018), even at times when  
430 athletes are not engaged in their sporting endeavours (Doherty et al., 2016; Nesti & Sewell,  
431 1999), our study deliberately focused on the maladaptive processes that may take place in  
432 response to negative/depressed mood, be it due to athletic failure, injury, or any other  
433 significant event or situation in the athletes' life.

434 Depressive rumination is defined as maladaptive abstractive thought patterns in  
435 response to distress that can be characterized as asking oneself unanswerable questions  
436 (Nolen-Hoeksema et al., 2008; Watkins, 2016). This type of processing of negative  
437 information is seen as one of the active ingredients in maintaining attentional resources on the  
438 causes and implications of one's depressive symptoms. This negative processing of

439 information then subsequently increases and maintains depressed mood, as well as impairs  
440 effective problem solving (Nolen-Hoeksema et al., 2008; Watkins, 2009). While targeting  
441 ruminative processes in treatment have shown to be effective in decreasing levels of  
442 depression (Manicavasagar, Perich, & Parker, 2012), rumination could also be a potential  
443 target in prevention approaches as "...it is observed to be elevated as a risk factor prior to the  
444 onset of depression, during episodes of major depression, in partial remission, and in full  
445 remission from depression." (Watson, 2016, p.20). Based on our findings, a ruminative  
446 tendency, especially brooding, may also be an important cognitive process to be considered in  
447 treatment and prevention within athlete populations. However, future studies should utilize  
448 longitudinal and intervention designs across different in-risk athlete populations to test the  
449 temporal patterns between rumination and depressive symptoms.

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

464 context on the development of ruminative tendencies could be gained by exploring different  
465 youth sport environments (e.g. outcome-oriented, early initiation or specialization) and/or  
466 youth coaching environments (e.g. criticism, excess control). If some contexts are more likely  
467 to contribute to an increased tendency to ruminate, early prevention strategies could be  
468 designed to attenuate these trends.

469         Our study findings should be interpreted with an understanding of its' main  
470 limitations. Firstly, due to the cross-sectional study design, causal or temporal inferences  
471 cannot be concluded. Also, due to the convenience sampling methodology, self-selection bias  
472 may have influenced our findings. We also had a broad inclusion of athletes in terms of the  
473 type and the level of sports. As we did not have sufficiently large sample sizes across different  
474 sports, we were not able to conduct specific analyses to disentangle potential sport-specific  
475 effects. It is also important to note, that our findings were limited to athletes from the United  
476 Kingdom and hence, interpretations should be made with an understanding of this cultural  
477 specificity.

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

489 we also wanted to explore ratios of non-cases to cases across the different levels of our  
490 predictor variable.

### 491 **Clinical Implications**

492 Considering our findings that brooding was a significant predictor of current clinically  
493 relevant symptoms of depression, and that a ruminative response style may develop early in  
494 life, psychologists working in youth sport could potentially screen for ruminative tendencies  
495 to promote more adaptive cognitive skills early in athletes' careers. Practitioners working with  
496 athletes could benefit from a detailed assessment and conceptualization of ruminative  
497 tendencies to identify the potential functions of rumination in the athlete's presenting issues  
498 such as depressed mood. This could allow the practitioner and the athlete to tackle ruminative  
499 tendencies and potential barriers (e.g., positive beliefs about rumination as an effective coping  
500 mechanism) to optimal outcomes. Considering that several different potential approaches to  
501 targeting ruminative tendencies exist (Fisher & Wells, 2009; Gardner & Moore, 2007; Segal  
502 & Teasdale, 2018; Watkins, 2016), and that rumination may be a relevant cognitive process,  
503 not only in terms of clinical disorders, but also in terms of sport-specific functioning of  
504 athletes (Bennett et al., 2016; Uphill & Dray, 2009); introducing and applying rumination-  
505 focused approaches in the context of sports could provide exciting opportunities for future  
506 prevention, treatment, and research efforts in athlete populations.

### 507 **Conclusion**

508 Depressive rumination might be an important vulnerability factor to be considered in  
509 future research, prevention, and treatment in athlete depression. Our findings indicated that a  
510 tendency to engage in brooding rumination significantly increased the odds of experiencing  
511 clinically relevant symptoms of depression, independent of athletes' reflection profile.  
512 Prospective studies are needed to disentangle temporal patterns in the relationship between

513 rumination and depressive symptoms, and to identify potential sport-specific factors that may  
514 contribute to the development of ruminative tendencies in athletes.

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725 *Table 1 Mean Depression Symptom Scores on the Patient Health Questionnaire (PHQ-9)*  
 726 *Across Selected Sample Characteristics*

Factor	n	%	PHQ-9
			M (SD)
Gender			
Male	176	61.5	5.11 (4.49)*
Female	108	37.8	7.48 (5.93)
Age			
18-24	102	35.7	6.50 (5.22)
25-34	98	34.3	6.43 (5.34)
35+	70	24.5	4.53 (4.82)*
Type of sport			
Team	124	43.4	6.68 (5.53)
Individual	162	56.6	5.53 (4.96)
Current competitive level			
International/Top tier professional	87	30.4	6.45 (5.37)
Local/Regional/National	179	61.3	6.02 (5.27)
Currently injured			
Yes	61	21.3	7.49 (5.47)
No	225	78.7	5.63 (5.11)*
Estimated time to full recovery (injured)			
≤ 20 days	19	32.4	5.43 (3.78)*
> 20 days	40	67.8	8.80 (5.78)
Competitive season			
In-season	213	74.5	5.86 (5.13)
Off-season	73	25.5	6.53 (5.55)

Note. % refers to the percentage of the total sample within each factor, \*  $p < .05$

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729 *Table 2 Prevalence Odds Ratios for Clinically Relevant Depression Symptoms (PHQ-9 ≥ 10)*  
 730 *Relative to Athletes' Rumination Profiles*

Factor	%	n/N	OR (95% CI)
Rumination profiles (vulnerability)			
Low brooding/Low reflection (low)	3.5	3/86	1.0
Low brooding/High reflection (moderate)	9.1	4/44	4.25 (0.65 – 27.70)
High brooding/low reflection (high)	19.7	12/61	7.33 (1.93- 27.84)*
High brooding/High reflection (very high)	39.5	32/81	13.40 (3.81– 47.11)**

Note. % = within group prevalence of clinically relevant depression symptoms, n= frequency of cases, N=total sample size within (vulnerability) category. OR= Odds ratio, 95%CI= 95% confidence intervals. All analyses were adjusted for gender, age and injury status. \*p<.005, \*\*p<.001.

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