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## What Lies Beneath: Exploring Specific Depressive Symptoms across Selected Risk Factors in Icelandic Team Sport Athletes

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18           Within the past decade, depression-related research in athletes has aimed at establishing  
19 an improved understanding of athletes' susceptibility to depression and depressive symptoms  
20 (Golding et al., 2020; Gorczynski et al., 2017; Wolanin et al., 2015). There is now an  
21 empirically grounded consensus that athletes are a unique population challenged by a range of  
22 generic and sport-specific stressors (Küttel & Larsen, 2019; Reardon et al., 2019; Wolanin et  
23 al., 2015), **and that prevalence rates of depressive symptoms in athletes may be**  
24 **comparable to those observed in the general population (Gorczynski et al., 2017; Junge &**  
25 **Feddermann-Demont, 2016; Nixdorf et al., 2013; Wolanin et al., 2016).** As reported in a  
26 recent review by Golding et al. (2020), depressive symptom prevalence has ranged from  
27 **6.7% to 34.0% across athlete samples, and that several demographic risk factors such as**  
28 **sex, level of competition, and type of sport have been linked with elevated depressive**  
29 **symptoms in this population. Similar to research on normative sex differences (Breslau et**  
30 **al., 2017; Hankin et al., 1998), female athletes have shown to report higher levels of**  
31 depressive symptoms than male athletes (Gorczynski et al., 2017; Wolanin et al., 2015). **It has**  
32 **also been suggested that** athletes competing at lower levels exhibit higher **prevalence of**  
33 depressive symptoms than those competing at higher levels (Junge & Prinz, 2018; Nixdorf et  
34 al., 2013). **However,** younger age has also shown to correlate with elevated depressive  
35 symptoms in athletes (Beable et al., 2017), and it is therefore uncertain whether the observed  
36 difference between higher- and lower-level athletes is due to the level of competition per-se, or  
37 whether this relationship is better explained by potential age-effects. **Recent evidence also**  
38 **shows that susceptibility to depression and depressive symptoms may vary across**  
39 **different types of sports (Schaal et al., 2011; Wolanin et al., 2016).** However, as discussed  
40 by several authors (e.g. Nixdorf et al., 2013; Tahtinen et al., 2020; Wolanin et al., 2016),  
41 **samples have often consisted of a relatively small number of athletes across different**  
42 **sports, and therefore, comparisons have tended to focus on differences between broader**  
43 **sport categories such as team and individual sports (e.g. Beable et al., 2017; Nixdorf et al.,**  
44 **2013).** Consequently, to better understand potential sport-specific differences, scholars

45 **have underlined that future studies should aim to include larger samples across specific**  
46 **sports** (Golding et al., 2020; Junge & Feddermann-Demont, 2016; Junge & Prinz, 2018;  
47 Nixdorf et al., 2013; Wolanin et al., 2016).

48 While the evidence-base on various depression-related topics in athletes has been  
49 growing rapidly, less attention has, however, been paid to the heterogeneous subset of  
50 symptoms that underlie the construct of depression itself (Ringland, 2016; Schuch, 2015), and  
51 the potential implications this heterogeneity may have on the interpretation and dissemination  
52 of research findings (Golding et al., 2020; Schuch, 2015). Therefore, we will shortly discuss  
53 the definition and assessment of depression, and how the current study aims to address these  
54 issues.

55 **According to** the Diagnostic and Statistical Manual of Mental Disorders (DSM-5;  
56 American Psychiatric Association, 2013), major depressive disorder (MDD) is defined as  
57 consisting of nine potential symptoms; depressed mood, decreased interest or pleasure  
58 (anhedonia), changes in weight or appetite, problems with sleep, psychomotor agitation or  
59 retardation, fatigue/loss of energy, worthlessness/guilt, problems with concentration, and  
60 thoughts of death. MDD is diagnosed by structured **or semi-structured** clinical interviews,  
61 **and to receive a diagnosis, individuals must exhibit five (or more) depressive symptoms of**  
62 **which at least one must be depressed mood or decreased interest/pleasure** (American  
63 Psychiatric Association, 2013). **Considering that depressed mood or decreased**  
64 **interest/pleasure is the only specified symptom required** for a diagnosis, the symptom  
65 presentation across individuals **diagnosed** with MDD can be highly heterogeneous (individuals  
66 exhibit different types of symptoms) (Zimmerman et al., 2015). **There are, in fact** "...roughly  
67 1,000 unique combinations of symptoms that all qualify for a diagnosis of MDD, some of  
68 which do not share a single symptom" (Fried & Nesse, 2015, p.2).

69 **Depression** can also be assessed via self-report questionnaires in which **the overall**  
70 **symptom severity**, rather than a formal diagnosis, is the main outcome measure (Fried &  
71 Nesse, 2015b; Ingram et al., 2015). Questionnaires can vary in terms of their assessment period

72 (e.g. symptoms present the past week or past two weeks), and the number and type of  
73 symptoms assessed. For example, the Center for Epidemiologic Studies Depression Scale  
74 (CES-D, Radloff, 1977) **is a 20-item questionnaire, and assesses the presence of both**  
75 **positive and negative affect items** in the past week. Another commonly utilized self-report  
76 measure (Golding et al., 2020; Trojian, 2016) is the nine-item Patient Health Questionnaire  
77 (PHQ-9, Kroenke & Spitzer, 2002), which is specifically designed to assess the **presence of**  
78 **the nine depressive** symptoms listed in DSM over the past two weeks. Despite the structural  
79 differences of depression questionnaires or screening tools, a common feature is that the  
80 overall symptom severity is calculated by summing scores from individual symptom items.  
81 Specified cut-off points are then imposed to indicate the clinical significance of symptom  
82 **severity**, that is, whether the summed scores reach severity levels that may call for intervention  
83 or further assessment (Kroenke & Spitzer, 2002; Radloff, 1977). However, when summed  
84 symptom **scores** are utilized to determine clinical significance, **there is no criteria for the**  
85 **type or number of symptoms that must be present** (Fried et al., 2016). Consequently, the  
86 symptom heterogeneity discussed **concerning** MDD is further escalated when depression is  
87 operationalised in terms of summed symptom scores (Fried et al., 2016).

88 While questionnaires have been the most common method of assessment in depression-  
89 related research in athletes (Golding et al., 2020), **studies sometimes identify this method as**  
90 **a limitation of their study - highlighting that questionnaires do not provide a diagnosis of**  
91 **depression (e.g. Beable et al., 2017; Weber et al., 2018). However, if questionnaires are**  
92 **not designed to diagnose depression (Levis et al., 2020), then identifying them as a**  
93 **limitation in this context may convey a paradoxical message - implicitly suggesting that,**  
94 **in essence, the objective of the research is to estimate the prevalence of MDD.** When this is  
95 coupled with the interchangeable use of terms depression and depressive symptoms, there is an  
96 increased risk that sum-scores on **questionnaires** become interpreted as a proxy for MDD  
97 (Schuch, 2015). This would be problematic, however, considering that clinically significant  
98 scores identified by questionnaires could be acquired in the absence of the core **symptoms** of

99 **depression**, and that clinically significant sum-scores do not require the presence of any  
100 specified number of symptoms (Fried & Nesse, 2015a). **Consequently, on some screening**  
101 **tools such as the PHQ-9, it would be plausible for an athlete to report an elevated score**  
102 **merely on a single symptom, and still receive a clinically significant sum-score. In-fact,**  
103 **clinically significant scores could be attained by athletes who would not fulfil a single**  
104 **criterion for a diagnosis of MDD, if assessment would be performed via clinical**  
105 **interviews. Indeed, recent findings suggest that screening tools such as the PHQ-9**  
106 **significantly over-estimate rates of MDD (Levis et al., 2020).**

107         Considering the heterogeneity of depressive symptoms, there is also an inherent  
108 disadvantage in interpreting questionnaire data solely in relation to sum-scores, as **they** may  
109 mask important information of the underlying symptomology (Fried et al., 2014; Ingram et al.,  
110 2015; Moriarity & Alloy, 2020). Consequently, the interpretation of findings could in some  
111 cases turn out to be "...as inadequate as the count of broken bones in a trauma victim" (Fried &  
112 Nesse, 2015a, pp., 6-7). This is, however, not to mean that sum-scores should not be applied or  
113 that they are not meaningful in research **or practice**, but rather, that there may be several  
114 opportunities over and beyond sum-scores that symptom-based assessment could offer. For  
115 example, while elevated depressive symptoms have shown to increase the risk for developing  
116 MDD over time (Ingram et al., 2015), **experiencing issues with a specific** depressive  
117 **symptom, such as problems with sleep**, can in itself be a significant source of distress and  
118 impairment for athletes (Moesch et al., 2018; Reardon et al., 2019; Roberts et al., 2016).  
119 **Depressive symptoms** may also vary in their impact on individuals' psychosocial functioning,  
120 and can differ in their salience across different life domains (e.g. work and interpersonal  
121 relationships) (Fried et al., 2016; Fried & Nesse, 2014). There is also evidence suggesting that  
122 **depressive symptoms** may be differentially related to risk factors. Lux and Kendler (2010) for  
123 example observed that in a sample of individuals diagnosed with MDD, females were more  
124 likely to exhibit depressed mood, appetite/weight changes, and fatigue, while males were more

125 likely to exhibit psychomotor agitation/retardation. Furthermore, elevated symptoms of  
126 depressed mood and psychomotor agitation/retardation were related to older age.

127 Despite the recent **developments** in **research on** depressive symptom prevalence and  
128 associated risk factors in athletes (Golding et al., 2020; Moesch et al., 2018; Reardon et al.,  
129 2019; Wolanin et al., 2015), to our knowledge, previous studies have not explored the  
130 prevalence of **the specific** symptoms that may lie beneath summed symptom scores. We  
131 propose that exploring specific **symptoms** in addition to sum-scores offers an opportunity for  
132 establishing a richer understanding of the **underlying issues that may be especially relevant**  
133 in athletes. Exploring specific symptomology may also be especially fruitful as this "...may  
134 enable the development of personalized prevention that focuses on specific problems and  
135 symptoms before they transition into a full-fledged depressive episode" (Fried & Nesse, 2015b,  
136 p.4). Against this backdrop, in this preliminary investigation, we first aim to *complement*  
137 previous research by reporting the overall prevalence rates of depressive symptoms and  
138 compare these across age, sex, type of team sport, and **level of** competition. We also aim to  
139 *extend* current symptom-based research by 1) exploring the prevalence of the core symptoms  
140 of depression (**i.e. depressed mood and lack of interest/pleasure**) across different sum-score  
141 severity, and by identifying the number of additional symptoms exhibited by athletes with or  
142 without these core symptoms, and 2) by testing potential differences in the likelihood of  
143 exhibiting specific depressive symptoms across age, sex, type of team sport, and **level of**  
144 competition.

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146

## Methods

### 147 Participants

148 The data for the current study were derived from a project exploring gambling  
149 **behaviours** in Icelandic athletes competing in football, basketball, and handball. Of the  
150 estimated population of Icelandic competitive adult athletes in these sports (N=3641), a total of  
151 1241 athletes (34.1%) participated in the research project. For the current study, however, only

152 athletes with valid responses to one or more depressive symptom items were included.  
153 Therefore, of the 1241 participants, 894 athletes (72.0%) were included in the current study  
154 (football=63.2%; basketball=100%; handball=70.5%). More specifically, the current sample  
155 for football represented 20.3% of the Icelandic football population (N=2170 across 105 teams)  
156 with a total of 441 participants included (age range 18-41 years, male 70.1%). For basketball,  
157 **the** sample represented 36.1% of the Icelandic basketball population (N=659 across 56 teams)  
158 with a total of 238 participants (age range 18-41 years, male 62.6%). For, handball, sample  
159 represented 26.5% of the Icelandic handball population (N=812 across 20 teams) with a total of  
160 215 participants (age range 18-42 years, male 51.2%).

161

## 162 **Measures**

163 Depressive symptoms were assessed by the Patient Health Questionnaire 9 (PHQ – 9)  
164 (Kroenke & Spitzer, 2002), which assesses the presence of the nine depressive symptoms listed  
165 in DSM during the past two weeks: “little interest or pleasure doing things” (interest), “feeling  
166 down, depressed, or hopeless” (depressed mood), “trouble falling or staying asleep, or sleeping  
167 too much” (sleep), “feeling tired or having little energy” (fatigue), “poor appetite or  
168 overeating” (appetite), “feeling bad about yourself - or that you are a failure or have let  
169 yourself or your family down” (worthlessness/guilt), “trouble concentrating on things, such as  
170 reading the newspaper or watching television” (concentration), “moving or speaking so slowly  
171 that other people could have noticed? Or the opposite - being so fidgety or restless that you  
172 have been moving around a lot more than usual” (psychomotor), and “thoughts that you would  
173 be better off dead or of hurting yourself in some way” (**suicidal thoughts**) (Kroenke & Spitzer,  
174 2002). Each item is scored on a range from 0 to 3, where 0 = “not at all”, 1= “several days”, 2  
175 = “more than half the days”, and 3 = “nearly every day”, with **sum-scores** ranging from 0 to  
176 27. Kroenke and Spitzer (2002) suggested a cut-off score of  $\geq 10$  (at least moderate severity) for  
177 identifying individuals with clinically relevant symptoms. **However**, it has also been noted that  
178 **it is important to report prevalence rates using different cut-off points to offer more valid**

179 **comparisons across studies** (Manea et al., 2012). Considering the exploratory nature of the  
180 current study we **report the** prevalence of clinically significant symptoms utilizing cut-offs,  
181  $\geq 10$  (at least moderate symptoms) and  $\geq 15$  (at least moderately severe symptoms) (Kroenke &  
182 Spitzer, 2002). Furthermore, the PHQ-9 scores **can also be** analysed using an algorithm  
183 method. As described by Manea et al. (2015), when using the algorithm method, clinical  
184 significance is determined based on the DSM criteria where at least five symptoms must be  
185 present (item scored  $\geq 2$ , except for suicidal ideation scored  $\geq 1$ )<sup>1</sup>, **of which** at least **one** must be  
186 depressed mood or lack of interest/anhedonia. The algorithm method has low sensitivity  
187 (**increased risk for false-negatives**) but shows excellent specificity (**decreased likelihood of**  
188 **false-positives**), while **the sum-score method has shown to have more optimal trade-off**  
189 **between sensitivity and specificity** (Manea et al., 2015). As the goal of questionnaires (or  
190 screening **tools**) is to overestimate true rates to minimize potential false-negative cases (**failing**  
191 **to identify cases** with the condition), the **sum-score** method has been more commonly utilized  
192 (Manea et al., 2015). However, as the aim of this study is to explore the underlying  
193 symptomology in more detail, we also explore prevalence rates using the algorithm method.  
194 The psychometric properties of PHQ-9 have shown to be good among the clinical (Kroenke &  
195 Spitzer, 2002) and the general populations (Martin et al., 2006), **including the Icelandic**  
196 **population** (Palsdottir, 2007). The internal consistency of the scale in the current sample was  
197  $\alpha = .86$ .

198

## 199 **Procedure**

200 In collaboration with the Icelandic national associations in football  
201 (Knattspyrnusamband Íslands, KSÍ), basketball (Körfuknattleikssamband Íslands), and  
202 handball (Handknattleikssamband Íslands, HSÍ), the general managers of all clubs in Iceland  
203 were contacted and requested to participate and to co-operate in recruiting gatekeepers

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<sup>1</sup> When we report **the** overall prevalence of each symptom (see table 2), to make interpretations of the prevalences across symptoms comparable, a score  $\geq 2$  was used to identify symptom presence for all symptoms.

204 (coaches) from their respective clubs. Only one football club declined the invitation to  
205 participate in the study. Following approval for co-operation, a link to the questionnaire was  
206 sent to the gatekeepers within every team, who then shared the link with their players (age  $\geq 18$ )  
207 and encouraged them to participate in the study. Gatekeepers were contacted approximately 2-  
208 3 weeks following the initial contact, requesting them to remind the players about the study.  
209 All potential participants were informed that participation in the study was optional, responses  
210 on the questionnaire were anonymous, and that they could withdraw from the study at any  
211 point. Participants were also provided with contact information for psychological support and  
212 encouraged to seek help if they were experiencing any type of distress. Participants did not  
213 receive any form of compensation for their participation. Permission for the study was obtained  
214 from the National Bioethics Committee in Iceland (B20171100004 and S1512-00001) and the  
215 Icelandic Data Protection Authority.

216

### 217 **Statistical Analyses**

218 We utilized logistic regression models with adjusted odds ratios and 95% confidence  
219 intervals to test differences across two generic (sex and age), and two sport-specific (level of  
220 competition and type of team sport) variables on the odds of exhibiting **specific** depressive  
221 symptoms.

222 Binary dependent variables (specific symptoms) were coded as “0” = not present and  
223 “1” = present. For eight symptoms the score of  $\geq 2$  (“more than half the days” or “nearly every  
224 day”) signified the presence of the symptom, however, for the 9<sup>th</sup> symptom “**suicidal**  
225 **thoughts**” a score of  $\geq 1$  (at least “several days”) implied the presence of the symptom (Lux &  
226 Kendler, 2010; Manea et al., 2015). We coded predictors as binary dummy variables with **the**  
227 reference category coded as “0” and each remaining level within the predictor as “1”. Each  
228 level (“1”) was then tested separately against the reference category (“0”). The reference group  
229 was chosen based on the literature when possible, such as that the reference category was  
230 assumed to exhibit the lowest levels of depressive symptoms. The reference categories across

231 predictive variables were; male (sex), older (age), and top-level (level of competition). As  
232 previous literature has not explored differences across the specific sports included in our study,  
233 football (type of team sport) was chosen as the reference group (lowest mean sum-score). Due  
234 to a low number of female athletes 27 and older – the older female group (reference category)  
235 included ages  $\geq 24$ , while for males the reference group consisted of athletes  $\geq 27$  years old.

236 **The regression models for comparing male and female athletes across specific**  
237 **symptoms were adjusted for age, type of sport and level of competition, while the models**  
238 **comparing different sports were adjusted for sex, age, and level of competition. Analyses**  
239 **on sex differences within athletes with clinically significant scores (PHQ-9  $\geq 10$ ) were,**  
240 **however, un-adjusted due to the low number of athletes in this sub-group (n=72). Models**  
241 **testing differences across age and level of competition were conducted separately for male**  
242 **and female athletes adjusting for the remaining predictors.**

243 Two participants had one missing value on the PHQ-9 scale (case 1, response on sleep  
244 missing, and case 2, response on concentration missing) but were included in the sum-score  
245 analyses by replacing the missing value with 0 (symptom not present). Results for sum-score  
246 and logistic regression analyses were tested with and without this correction and there were no  
247 notable differences in the outcome. Nine other cases had **more than one missing item** on the  
248 PHQ-9 scale and were therefore not included in the sum-score analyses. However, all cases  
249 with valid responses to specific items were included **in** the logistic regression analyses **across**  
250 **specific** symptoms. All analyses were conducted using the IBM SPSS version 25.0.

251

252

## Results

### Sum-score Means and Prevalence across determinants

254 The overall prevalence of clinically significant depressive symptoms in the sample  
255 (N=885) was 8.1 % and 2.7% when applying a cut-off score  $\geq 10$  and  $\geq 15$ , respectively. As  
256 shown in Table 1, the corresponding prevalence rates **when applying cut-offs  $\geq 10$  and  $\geq 15$ ,**  
257 were 5.8% and 2.3% for male athletes (N=565), and 12.2% and 3.4% for female athletes

258 (N=320). Kruskal-Wallis test showed that female athletes had a significantly higher  
259 prevalence than male athletes when cut-off score 10 was applied [ $H(1) = 11.00, p = .001$ ],  
260 however, no significant difference was observed when cut-off 15 was applied. In female  
261 athletes, Kruskal-Wallis test showed that prevalence (cut-off 10) was significantly different  
262 between age groups [ $H(4) = 11.55, p = .02$ ], with 18-20-year-olds having significantly higher  
263 prevalence rate (19%) than 21-23-year-olds (8.3%,  $p = .02$ ), 24-26 year-olds (6.3%,  $p = .20$ ),  
264 and 27-29 year olds (3.8%,  $p = .03$ ). When **applying the** cut-off score of 15, no significant  
265 differences were observed in female athletes across the predictive variables. **Independent of**  
266 the cut-off score used, there were no significant differences in prevalence rates across the  
267 predictive variables in male athletes.

268 As also shown in table 1, female athletes had significantly higher mean symptom scores  
269 ( $M=5.11, SD= 4.38$ ) than male athletes ( $M=3.05, SD=3.70$ ) [ $t(575.17) = -7.10, p < .001$ ]. **In**  
270 male athletes, the only mean depressive symptom score difference was found between type of  
271 sports [ $F(2, 562) = 4.04, p = .018$ ], with Tukey post hoc test revealing a significantly higher  
272 score for male handball players ( $M=3.93, SD=3.82$ ) than football players ( $M=2.77, SD=3.35$ )  
273 ( $p=.013$ ). In female athletes, the only significant **difference was found across age** [ $F(4, 315) =$   
274  $3.90, p = .004$ ], and **according to** Tukey post hoc test, this difference was significant between  
275 the youngest (18-20 year-old,  $M= 6.02, SD=4.63$ ) and oldest athletes (30-42 year-old,  $M=$   
276  $2.80, SD=3.29$ ) ( $p = .004$ ).

277

## 278 **Prevalence of Specific and Total Number of Symptoms**

279 Table 2 shows the overall prevalence of the **specific** depressive symptoms in the  
280 sample, and **among** athletes with and without clinically significant sum-scores. Prevalence of  
281 specific symptoms **for the whole sample** ranged from 1.6 % for suicidal ideation to 12.2 % for  
282 fatigue. The core symptoms of depression, lack of interest and depressed mood, were present  
283 for most of the days in the past two weeks in 6.8% and 5.9% of the sample, respectively.  
284 Approximately half of the athletes with clinically significant sum-scores exhibited the core

285 symptoms of depression. In terms of **the** total number of symptoms (table 2), 75.7% of the  
286 sample did not exhibit any symptoms, and 16.3% exhibited 1-2 symptoms. Within athletes  
287 **who had** clinically significant scores, 51.4 % reported 3-4, and 38.9% five or more symptoms.

288

### 289 **Prevalence of Core Symptoms of Depression across Sum-score Severity**

290 **Table 3 illustrates the prevalence of the core symptoms (i.e. depressed mood and**  
291 **lack of interest/pleasure) across athletes with different sum-score severity.** Of the male  
292 athletes **with PHQ-9 sum-scores in the 10-14 range** (moderate depressive symptoms, n=20),  
293 45% did not exhibit either of the core symptoms of depression. **Of** the male athletes with  
294 **PHQ-9 scores in the 15-27 range (moderately severe to severe symptoms, n=13)**, 23.1% did  
295 not exhibit the core symptoms. In females, 53.6% of athletes **within the 10-14 range** (n=28)  
296 did not exhibit the core symptoms, while all female athletes within the **15-27 range** (n=11)  
297 exhibited at least one of the core symptoms. Overall, 37.5% (27/72) of all athletes **with**  
298 clinically significant sum-scores (PHQ-9  $\geq 10$ ) did not exhibit the core symptoms of depression.  
299 However, when the **PHQ-9 cut-off  $\geq 15$**  was applied, **only** 12.5% (3/24) of athletes **with**  
300 **clinically significant scores** did not exhibit the core symptoms.

301

### 302 **Number of Additional Symptoms across Athletes with and without Core Symptoms of** 303 **Depression**

304 The total number of additional symptoms across athletes with or without the core  
305 symptoms of depression are presented in table 4. Of the athletes that did not exhibit the core  
306 symptoms of depression (n=813), the vast majority exhibited no other depressive symptoms  
307 (82.4%) or 1-2 symptoms (15.1%). Of those athletes that presented only lack of interest (n=20)  
308 or only depressed mood (n=11), two athletes (6.5%) exhibited 4 additional symptoms. Of the  
309 athletes presenting with both core symptoms of depression (n=39), 61.5% exhibited three or  
310 more additional symptoms. Hence, overall, 2.9 % (n=26) of athletes exhibited a total of five  
311 symptoms of which at least one was either depressed mood or lack of interest.

312

313 **Differences in the Odds of Experiencing Specific Depressive Symptoms across Selected**  
314 **Determinants**

315

316 Table 5 shows adjusted logistic regression models, for each depressive symptom across

317 the selected determinants. Compared to male athletes, female athletes were **significantly more**

318 **likely to report** depressed mood, sleep problems, fatigue, problems relating to appetite,

319 feelings of worthlessness/guilt, and problems with concentration (**controlling for the effects of**

320 **age, level of competition, and type of sport**). The highest odds for females in comparison to

321 males was found in fatigue (OR=3.88, CI95%=2.37-6.37), depressed mood (OR=2.08,

322 CI95%=1.91-3.97), and appetite-related issues (OR=2.08, CI95%= 1.15-3.74). When sex

323 differences were explored **among** athletes **with** clinically significant sum-scores (PHQ-9  $\geq 10$ )

324 (not included in table 5), female athletes showed significantly higher odds of fatigue

325 (OR=6.60, CI95%=2.18-19.97), while males showed significantly higher odds of psychomotor

326 issues (OR=.26, CI95%=.08 -.84) than females.

327 When football players were compared to players from the two other team sports,

328 handball players had significantly higher odds of experiencing depressed mood, and issues

329 with sleep and appetite, while basketball players showed higher odds of sleep and appetite-

330 related issues than football players (**adjusting for sex, age, and level of competition**). Most

331 notably, the likelihood of experiencing appetite-related issues more than half the days in the

332 past two weeks was more than four-fold (OR=4.31, CI95%= 2.03-9.18) in basketball players

333 than in football players.

334 **Due to sex-differences in the distribution of scores in age and level of competition,**

335 **these variables** were explored separately for male and female athletes. Models for age were

336 adjusted for level of competition and type of sport, and models for **the** level of competition

337 were adjusted for type of sport and age. As shown in Table 5, when male athletes 27 years and

338 older were compared to the other age groups, **21-23-** and 18-20-year-olds had significantly

339 **higher** odds of exhibiting depressed mood and issues with sleep and appetite. Odds of

340 experiencing issues with appetite were notably high, with 21-23-year-olds showing almost  
341 five-fold (OR=4.90, CI95%=1.01-23.90), and 18-20-year-olds seven-fold increase in odds  
342 (OR=7.06, CI95%=1.52-32.79) when compared to male athletes 27 years and older.  
343 Furthermore, male athletes 18-20-years-old showed significantly higher odds of experiencing  
344 lack of interest than male athletes 27 years and older. Within female athletes, 18-20-year-olds  
345 showed significantly higher odds of exhibiting the core symptoms of depression (lack of  
346 interest and depressed mood) than female athletes 24 years and older. Female athletes 18-20-  
347 years-old also had a higher likelihood of feeling worthlessness/guilt and having problems with  
348 concentration. In these comparisons the most notable difference was found in the likelihood of  
349 experiencing depressed mood, with the youngest female athletes having **an** almost five-fold  
350 increase in odds (OR=4.78, CI95%=1.37-16.65) compared to female athletes 24 years and  
351 older.

352 **Concerning the level of** competition, the only differences were observed between male  
353 top-level and male **first** division players. Male athletes competing in **first** division (second-  
354 highest level) had significantly higher odds of experiencing worthlessness/guilt and  
355 psychomotor issues than top-level players. **Most notably, first** division players had more than  
356 **a four-fold increase in odds (OR=4.50, CI95%=1.16-17.43) of experiencing psychomotor**  
357 **issues when compared to top-level players.**

358

359

## Discussion

360 In this preliminary investigation, we aimed to complement previous research by  
361 exploring **the** overall prevalence of depressive symptoms, and **to** test potential differences  
362 across generic and sport-specific determinants in a large representative sample of Icelandic  
363 team sport athletes. Additionally, to further extend knowledge-advancement in the field, we  
364 explored the prevalence of specific **depressive** symptoms, and tested potential within factor

365 differences (**e.g. different age groups**) in the odds of experiencing different **types of**  
366 depressive symptoms.

367

### 368 **Sum-score Means and Prevalence across Determinants**

369 The overall prevalence of depressive symptoms in the sample **was** 8.1 % and 2.7%  
370 when applying a cut-off score  $\geq 10$  and  $\geq 15$ , respectively. **In comparison, Tahtinen and**  
371 **Kristjansdottir (2019) reported a 20.9% prevalence rate in Icelandic individual sport**  
372 **athletes using the PHQ-9 with a cut-off score of 10.** This supports some previous findings  
373 which have suggested that elevated depressive symptoms may be more prevalent in individual  
374 sport **athletes when compared to** team sport athletes (Beable et al., 2017; Nixdorf et al., 2013,  
375 2016). **Female athletes in our sample had a significantly higher prevalence of depressive**  
376 **symptoms than male athletes when a cut-off score of 10 was applied, which is in-line with**  
377 **previous findings on sex differences in athletes (Golding et al., 2020).** However, no sex  
378 differences were observed when **applying** a cut-off **score of 15**, suggesting that while female  
379 athletes may be more likely than males to experience moderate levels of depressive symptoms,  
380 **the rates of** more severe symptomology may be comparable between the sexes. Within female  
381 athletes, the only significant **mean** differences emerged between younger and older athletes,  
382 and in male athletes, the only difference was found between **different** sports. This latter  
383 finding is somewhat surprising considering that football, handball, and basketball are all team  
384 ball sports in which the nature of competition (**e.g. team-based with competition outcome**  
385 **evaluated objectively, i.e. scoring point/goals**) and related stressors such as public evaluation  
386 of performance (Doherty et al., 2016), could be expected to be somewhat similar. We did not,  
387 however, assess other factors that could have explained the observed differences, such as injury  
388 or concussion (Rice et al., 2018) overtraining (Peluso & Andrade, 2005) or burnout (Gerber et  
389 al., 2018), which have all shown to relate to higher depressive symptoms. Nevertheless, our  
390 findings highlight that while the broader sports categories such as individual and team sports  
391 have shown to differ in rates of depressive symptoms (Beable et al., 2017; Nixdorf et al.,

392 2016); there may also be important differences across different sports within these broader  
393 categories (Rice et al., 2016). In line with recent research (Golding et al., 2020; Junge &  
394 Feddermann-Demont, 2016; Junge & Prinz, 2018; Nixdorf et al., 2013; Wolanin et al., 2016),  
395 **our study emphasizes the need for more fine-grained analyses across different sports to**  
396 **better understand factors that may contribute to elevated depressive symptoms in**  
397 **athletes.**

398

### 399 **Prevalence of Specific Symptomology**

400 **In the current sample**, the prevalence of specific depressive symptoms (**symptom**  
401 **present at least most of the days in the past two weeks**) ranged from 1.6 % for suicidal  
402 ideation to 12.2 % for fatigue. As shown in our data and previous research, fatigue (low  
403 energy/tiredness) is a common symptom in athletes (Birrer et al., 2013; Matos et al., 2011) and  
404 could therefore represent an important target for future prevention programs independent of the  
405 type of athletes the program is designed for.

406 As most studies to-date have utilized questionnaires to assess depression in athletes –  
407 current knowledge of athletes' susceptibility to major depressive disorder (MDD) is largely  
408 unknown (for a notable exception see Schaal et al., 2011). Nonetheless, research in athletes has  
409 tended to utilize the terms depression and depressive symptoms interchangeably when  
410 **discussing** clinically significant depressive symptom sum-scores, potentially clouding the  
411 meaning and interpretation of findings across studies (Schuch, 2015). One of the aims of this  
412 study was therefore to explore sum-scores from the perspective of DSM criteria. Several  
413 studies in athletes have utilized PHQ-9 scores  $\geq 10$  as a cut-off for identifying clinically  
414 relevant cases and reporting prevalence rates (Bell et al., 2016; Du Preez et al., 2017; McGuire  
415 et al., 2017; Silva-Rocha et al., 2019; Tahtinen et al., 2020; Tahtinen & Kristjansdottir, 2019).  
416 **We, however, speculated that when applying this cut-off, athletes could attain clinically**  
417 **significant scores without exhibiting the core symptoms of depression (i.e. lack of interest**  
418 **and depressed mood). Indeed**, we found that 37.5% of all athletes who had clinically

419 significant sum-scores (PHQ-9  $\geq 10$ ) did not exhibit the core symptoms of depression.  
420 However, this was reduced to 12.5% among athletes with moderately severe to-severe sum-  
421 scores (PHQ-9  $\geq 15$ ). Furthermore, 45% of male and 53.6% of female athletes with moderate  
422 depressive symptoms (PHQ-9 scores 10-14) did not exhibit the core symptoms of depression.  
423 According to Kroenke et al. (2001), the PHQ-9 shows increasing **specificity (decrease in**  
424 **potential false-positive cases)** but attenuated **sensitivity (increase in potential false-negative**  
425 **cases) as cut-off scores increase in the moderate depressive symptom range** (scores 10-14)  
426 and hence, this range has also been identified as the “grey zone”. **Considering that**  
427 **approximately half of the athletes scoring within the “grey zone” did not exhibit the core**  
428 **symptoms of depression - it could have been deemed misleading to report our findings**  
429 **concerning prevalence rates as the proportion of “depressed” athletes when applying the**  
430 **cut-off  $\geq 10$ . On the other hand, using a higher cut-off point could potentially lead to**  
431 **increased risk of missing “true” cases. Although we did not conduct diagnostic interviews**  
432 **to test the sensitivity and specificity of the PHQ-9 scale in our athlete sample, our findings**  
433 **provide new insights into the underlying symptomology in athletes with clinically**  
434 **significant sum-scores.**

435 **We also speculated that it would be plausible for an athlete to report an elevated**  
436 **score merely on a single symptom, and still receive a clinically significant sum-score.**  
437 However, 90% of athletes who had clinically significant depressive symptoms exhibited at  
438 least three symptoms. To further understand clinically significant symptoms in our sample, we  
439 **applied** an algorithm method to explore the number of athletes that self-reportedly fulfilled the  
440 DSM criteria for **exhibiting a minimum** of five symptoms, of which at least one symptom **was**  
441 either depressed mood or lack of interest. We found that overall, 2.9% of athletes self-reported  
442 meeting these criteria, which is considerably lower than the 8.1% prevalence observed when  
443 cut-off score 10 was applied, and closer to the prevalence rate obtained by a cut-off 15 (2.7%).  
444 This is also similar to **the 3.6% prevalence reported in a study among French elite athletes**  
445 **who were assessed using semi-structured diagnostic interviews** (Schaal et al., 2011). We

446 only know of one study to-date that has reported prevalence rates in athletes using both self-  
447 report questionnaires and clinical interviews. In their study, Hammond et al. (2013) found that  
448 34% of elite swimmers met DSM criteria for a major depressive episode when assessed by  
449 clinical consultations, while 22% reported mild and only 4 % moderate levels of depressive  
450 symptoms when assessed by the Beck's Depression Inventory-II (BDI-II). Considering that  
451 screening tools are designed to over-estimate true cases (Manea et al., 2015), finding a higher  
452 number of cases by clinical interviews than questionnaires is surprising. **It has, however, been**  
453 **underlined that the optimal cut-off score may depend on the setting in which assessment**  
454 **is conducted, that is, the same cut-off score can result in many false-positives in one**  
455 **setting, while leading to more false-negatives in another (Manea et al., 2012). Hence,**  
456 **considering the findings in the current study and those reported by Hammond and**  
457 **colleagues (2013), future studies are needed to validate existing screening tools in the**  
458 **athlete populations.**

459

#### 460 **Differences in the Odds of Experiencing Specific Depressive Symptoms across Selected** 461 **Determinants**

462

463 When compared to male athletes, female athletes showed significantly higher odds of  
464 exhibiting depressed mood, sleep problems, fatigue, problems relating to appetite, feelings of  
465 worthlessness/guilt, and problems with concentration. Furthermore, we found that **among**  
466 athletes with clinically significant sum-scores, females were more likely than males to  
467 experience fatigue, while males were more likely to experience psychomotor issues. Our  
468 findings are in-line with those reported by Lux and Kendler (2010), where females diagnosed  
469 with MDD were more likely than males to exhibit depressed mood, appetite/weight changes  
470 and fatigue, while males were more likely to experience psychomotor issues. Our symptom-  
471 specific analyses extend current knowledge and suggests that **the** higher overall depressive  
472 symptom severity identified in females is reflected in several specific symptoms. It is  
473 interesting to note, however, that while the key symptoms differing within the male sample

474 were related to neurovegetative symptoms (sleep and appetite), within female athletes,  
475 variability was more prominent in cognitive symptoms. For example, when compared to older  
476 female athletes the youngest female athletes in our sample **had** significantly **higher** odds of  
477 **exhibiting a** lack of interest, depressed mood, worthlessness/guilt, as well as concentration  
478 problems. Most notably, younger female athletes (18-20 years) had almost a five-fold increase  
479 in odds of **experiencing** depressed mood compared to female athletes 24 years and older.  
480 Relatively few studies in athletes have, however, explored depression, or other mental health  
481 issues, specifically in female athletes (Golding et al., 2020; Küttel & Larsen, 2019).  
482 Considering that female athletes exhibited higher prevalence **rates across** several **specific**  
483 symptoms **when compared to** male athletes, attention in future research, prevention, and  
484 applied efforts **should be** directed at this population. Furthermore, although sex differences  
485 have been noted in previous research, there is a gap in our knowledge **concerning the factors**  
486 **that could potentially explain these differences**. In this context, and as has been voiced by  
487 Nixdorf et al. (2020), **future research could benefit from exploring cognitive mechanisms**  
488 **to identify factors that may be especially relevant for targeted prevention and treatment**  
489 **among in-risk athletes**.

490 While our sum-score analyses identified overall differences between football players  
491 and handball players, symptom specific analyses revealed additional findings. Both handball  
492 and basketball players were more likely to report issues with sleep and appetite in comparison  
493 to football players. **Also**, handball players were more likely than football players to report  
494 experiencing depressed mood. Depressed mood, and issues with sleep and appetite were also  
495 the key symptoms in males when age differences were compared between older and younger  
496 athletes. The odds of experiencing issues with appetite were notably high, with 21-23-year-old  
497 males showing almost five-fold, and 18-20-year-olds a seven-fold increase in odds compared  
498 to male athletes 27 years or older. While it is difficult to speculate as to why we found these  
499 differences, regulation of sleep and appetite has shown to be related to similar biomarkers  
500 among depressed patients (Caroleo et al., 2019). Based on our findings these specific

501 symptoms could provide an interesting avenue for further research in depression-related  
502 research in athletes.

503 Level of competition did not contribute to differences in **across** depressive symptoms  
504 within female athletes. Considering that our adjusted analyses demonstrated more variability  
505 across age than **the** level of competition, the higher susceptibility of lower-level athletes found  
506 in previous studies (Junge & Feddermann-Demont, 2016; Junge & Prinz, 2018; Nixdorf et al.,  
507 2013) **may be** better explained by age-related differences. Nevertheless, while controlling for  
508 the effects of age and type of sport, we found that male athletes competing **in first** division  
509 (second-highest level) had significantly higher odds of experiencing worthlessness/guilt and  
510 psychomotor issues than top-level players. **While the findings concerning differences in**  
511 **psychomotor issues may be difficult to interpret**, the observed difference in  
512 worthlessness/guilt could perhaps be understood through the lens of athletic identity (Brewer &  
513 Petitpas, 2017). As there may be similar physical and psychosocial demands (e.g. training and  
514 competition load) for **first** division and **top-league** players in Iceland, a strong identification  
515 with the athlete role may be comparable between these groups. However, the threats to athletic  
516 identity **may be** more pronounced for **the first** division players as the sport career prospects  
517 may be less secure than for **the top-level players**.

518 **Overall, our exploratory findings highlight the importance of applying an analysis**  
519 **of the underlying symptomology in parallel to reporting sum-scores when assessing**  
520 **depressive symptoms in athletes. If findings are interpreted only in terms of summed**  
521 **scores, important information may be lost, and interpretations may have limited utility in**  
522 **terms of knowledge advancement in the field. Applying a more detailed exploration of the**  
523 **underlying symptomology could also generate useful information for more theory-driven**  
524 **approaches to understanding depression and depressive symptoms in athletes – and**  
525 **therefore, the development of more targeted and tailor-made approaches to intervention**  
526 **in the future (Nixdorf et al., 2020). As noted by Purcell et al. (2019), it is also important to**  
527 **understand athlete mental health from a broader ecological perspective. We propose that**

528 **exploring individual symptoms, rather than only sum-scores, could significantly**  
529 **contribute to this understanding in future research. For example, by providing more**  
530 **detailed information about the specific symptoms that may be especially prevalent in**  
531 **different athlete populations, future research could more systematically map the relevant**  
532 **contextual risk factors that may contribute to these symptoms.**

533

#### 534 **Clinical Implications**

535 **Service provision for athletes can vary largely across different sport settings**  
536 **(Kroshus, 2016; Moesch et al., 2018). In Iceland there are currently no systematic**  
537 **protocols in place for the assessment or treatment of mental health issues in athletes.**  
538 **However, as the current and previous findings (e.g. Kristjánsdóttir et al., 2019; Tahtinen**  
539 **& Kristjansdottir, 2019) suggest, more systematic approaches to providing mental health**  
540 **support among the Icelandic athlete population may be warranted.**

541 **While systematic screening of depressive symptoms has been highlighted as an**  
542 **important objective for identifying and supporting in-risk athletes (Donohue et al., 2019;**  
543 **Wolanin et al., 2016), “routine” screening has also been questioned. Particularly, the**  
544 **potentially high number of false-positive cases identified by screening tools could lead to**  
545 **adverse consequences, such as over-diagnosis of depression, and increased risk of**  
546 **labelling and stigma among individuals screened with elevated symptom scores (He et al.,**  
547 **2020; Joffres et al., 2013; Mojtabai, 2017). This may be especially relevant in athletes**  
548 **considering that screening tools have not yet been properly validated in this population**  
549 **(Moesch et al., 2018). As shown in our study, while 90% of athletes with clinically**  
550 **significant sum-scores exhibited at least three different depressive symptoms, almost 40%**  
551 **of athletes with moderate symptom severity (clinically significant score 10-14), did not**  
552 **exhibit the core symptoms of depression (depressed mood and lack of interest).**

553 **If systematic screening is conducted in settings where there is already a suitable**  
554 **support infrastructure in place, it is important to determine which screening tool(s) and**

555 **cut-off score is utilized to identify athletes for a follow-up (Trojian, 2016). Considering**  
556 **that screening tools are designed to overestimate “true” clinical cases to minimize**  
557 **potential false-negative cases - rather than merely "red -flagging" athletes with clinically**  
558 **significant depressive symptom scores - exploring the specific symptomology could**  
559 **potentially improve the specificity of the screening results. For example, analysing scores**  
560 **specifically for symptoms such as depressed mood and/or lack of interest, insomnia or**  
561 **suicidal thoughts may be important when considering further follow-up (Joffres et al.,**  
562 **2013). Furthermore, it is important to determine how initial screening results are**  
563 **communicated to athletes, and that athletes are included in the process when determining**  
564 **potential mental health referrals (Donohue et al., 2018; Joffres et al., 2013; Trojian,**  
565 **2016). Considering our findings, discussing specific symptoms and related issues that are**  
566 **especially relevant for athletes could potentially improve this decision-making process.**

567 **As shown in a study by Kroshus (2016) there were on average one full-time**  
568 **physician for each NCAA division I sports medicine department, and 376.4 student-**  
569 **athletes per physician. Applying the 23.7% prevalence rate reported in college athletes by**  
570 **Wolanin et al. (2016) and the average number of students per physician reported by**  
571 **Kroshus (2016), at any given time there would be approximately 89 NCAA division I**  
572 **collegiate athletes per physician screened with clinically significant depressive symptoms.**  
573 **This underlines the importance of conducting an evidence-based assessment of the target**  
574 **population, and the resources required to assure that appropriate follow-up assessment**  
575 **and mental health support can be provided to athletes following the screening process. It**  
576 **must however be noted that our aim with this discussion is not to recommend for or**  
577 **against screening in athletes, but to highlight the potential utility of exploring individual**  
578 **depressive symptoms in settings where screening protocols are being planned or already**  
579 **in place.**

580 **In our sample, 17% (n=138) of athletes with non-clinically significant depressive**  
581 **symptom sum-scores, reported experiencing 1-2 depressive symptoms most of the days in**

582 **the past two weeks. It is therefore important for practitioners working with athletes to be**  
583 **mindful of the possibility that although an athlete does not present with clinically**  
584 **significant depressive symptom sum-scores, they may nevertheless experience significant**  
585 **distress and impairment in specific areas of functioning (e.g. issues with sleep/appetite,**  
586 **feelings of guilt). Therefore, independent of the sum-scores, it may be beneficial to discuss**  
587 **with the athlete about the individual symptoms on which they may exhibit elevated**  
588 **scores. This could also open new doors to identifying other potential mental health issues**  
589 **(Mummery, 2005; Trojian, 2016). For example, there is considerable overlap between**  
590 **symptoms of depression and other conditions highly relevant in the athlete population,**  
591 **such as overtraining syndrome (OTS) (Kreher, 2016), burnout (Nixdorf et al., 2020), and**  
592 **eating disorders (Kristjánsdóttir et al., 2019) and hence, a detailed analysis of the specific**  
593 **symptomology may provide the practitioner with additional road signs when**  
594 **conceptualizing potential issues that may need further assessment.**

595 **One of the interesting and perhaps surprising, findings in our study was that there**  
596 **were significant differences in the mean sum-scores and the prevalence of specific**  
597 **symptoms between the three team sports included in our study. This suggests that even**  
598 **across sports that could be considered similar in terms of the nature of the competition**  
599 **(e.g. team-based with competition outcome evaluated objectively, i.e. scoring point/goals)**  
600 **– there may be important contextual differences influencing athletes' mental health (Rice**  
601 **et al., 2016). Therefore, practitioners working in team-based settings could benefit from**  
602 **exploring specific symptoms to gain clues to the potential contextual factors that could**  
603 **undermine athletes' well-being and performance. For example, if issues with sleep seem**  
604 **to be highly prevalent in the team or within the organization, the practitioner could map**  
605 **potential risk factors (e.g. training times, logistic issues in relation to traveling etc.), and**  
606 **consequently plan targeted interventions to address these issues.**

607

608

## 609 **Limitations and Future Directions**

610           Some limitations to the current study should be noted. Firstly, the mean difference  
611 analyses did not consider potential differences emanating from unmeasured third variables and  
612 therefore, these unadjusted mean differences should be interpreted with this limitation in mind.  
613 This study was also cross-sectional and can only be considered descriptive of prevalence at one  
614 point in time. There is now evidence suggesting that prevalence rates may vary over a  
615 competitive season (Du Preez et al., 2017; McGuire et al., 2017) and hence, the reported rates  
616 should not be considered static. Furthermore, although we had large sample sizes across the  
617 included sports – almost 40% of football players and 30 % of handball players did not respond  
618 to the depression symptom items, and were therefore excluded from the current study.  
619 Consequently, the representativeness of our findings should be interpreted with this limitation  
620 in mind. In terms of our logistic regression analyses, the overall rates for some symptoms (e.g.  
621 psychomotor) were low, which may have biased the odds ratio estimates. Furthermore, it  
622 should be noted that several of the PHQ-9 items do not make a distinction between the  
623 direction of symptom presentation (e.g. eating too little or over-eating, sleeping too much/too  
624 little). Hence, we were not able to identify the exact nature of the issue relating to this  
625 symptom.

626           Despite the limitations our study offers an important addition to previous depression-  
627 related research in athletes. We utilized a large representative sample of team sport athletes  
628 from three popular team sports in Iceland. We also had sufficiently large sub-samples across  
629 the different sport and non-sport specific determinants, allowing us to conduct more specific  
630 (adjusted) analyses across these determinants. Our approach to exploring the prevalence of  
631 specific depressive symptoms was also novel in the athlete literature. Future research could  
632 take our analyses further and explore how different symptoms may relate to athlete  
633 functioning, in and out of sport, **and explore these relations within prospective research**  
634 **designs**. For example, in non-athletes, sad mood and concentration difficulties was shown to  
635 have the most severe influence on overall psychosocial functioning, whereas insomnia had a

636 strong influence on work life, self-blame on close relationships and loss of interest on social  
637 activities (Fried & Nesse, 2014).

638

### 639 **Conclusions**

640 While research in athletes often note that depression questionnaires are limited in their  
641 ability to provide a depression diagnosis, few have explored the opportunities that  
642 questionnaires can offer, over and beyond the more commonly utilized sum-scores. As our  
643 study shows, there is a wealth of information to be gleaned by analysing the specific symptoms  
644 of depression. The initial findings suggest that female athletes report more symptoms than  
645 male athletes. Younger female athletes (18-20 years) in comparison to older (24+) may be  
646 especially prone to exhibit cognitive symptoms of depression, while younger male athletes (18-  
647 20) in comparison to older males (27+) may be especially prone to experiencing issues with  
648 sleep and appetite. Our study also shows that when utilizing PHQ-9 cut-off 10 to identify  
649 clinically significant depressive symptoms, almost 40% of the identified cases did not exhibit  
650 depressed mood or lack of interest. Hence, referring to athletes with clinically significant  
651 depressive symptoms as “depressed” athletes, could have been misleading in the current study.  
652 It is, however, important to underline that 90% of athletes with clinically significant symptoms  
653 reported having experienced at least 3 different depressive symptoms most of the days in the  
654 past two weeks. Hence, although some athletes in this group did not experience the core  
655 symptoms of depression, they may have nevertheless experienced significant distress. With  
656 these considerations in mind, future studies are encouraged to further explore individual  
657 symptoms in addition to sum-scores, and to explore symptoms in relation to athletes’ overall  
658 psychosocial functioning.

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Table 1  
Sex Specific Sum-score Means and Prevalence Rates across Age, Competition Level, and Type of Sport

Factor	Sum-scores (male athletes)								Sum-scores (female athletes)							
	N	M	SD	Severity (cut-off)				N	M	SD	Severity (cut-off)					
				10-27 (≥10)		15-27 (≥15)					10-27 (≥10)		15-27 (≥15)			
				n	%	n	%				n	%	n	%		
<b>Total sample score</b>	565	<b>3.05</b>	3.70	33	<b>5.8</b>	13	2.30	320	<b>5.11</b>	4.38	39	<b>12.2</b>	11	3.4		
<b>Age</b>																
18-20	143	3.03	3.79	10	7.0	2	1.4	142	<b>6.02</b>	4.63	27	<b>19.0</b>	6	4.2		
21-23	146	3.47	4.02	10	6.8	5	3.4	84	4.68	4.14	7	<b>8.3</b>	3	3.6		
24-26	117	2.91	3.83	7	6.0	4	3.4	48	4.81	4.56	3	<b>6.3</b>	2	4.2		
27-29	76	2.61	3.20	2	2.6	1	1.3	26	3.81	2.82	1	<b>3.8</b>	0	.0		
30-42	83	2.94	3.13	4	4.8	1	1.2	20	<b>2.80</b>	3.29	1	5.0	0	.0		
<b>Competition level</b>																
Top level	179	2.97	3.67	8	4.5	3	1.7	142	4.73	4.36	16	11.3	4	2.8		
1st division	117	3.51	4.13	10	6.8	4	3.4	178	5.41	4.38	23	12.9	7	3.9		
2nd division	86	2.70	3.08	5	5.8	0	.0	-	-	-	-	-	-	-		
3rd division	72	2.74	4.00	3	4.2	0	.0	-	-	-	-	-	-	-		
4th division	111	3.16	4.04	7	6.3	6	5.4	-	-	-	-	-	-	-		
<b>Type of sport</b>																
Handball	109	<b>3.93</b>	3.82	9	8.3	3	2.8	103	5.42	3.65	13	12.6	1	1.0		
Basketball	149	2.99	4.18	11	7.4	4	2.7	89	5.52	5.54	14	15.7	7	7.9		
Football (soccer)	307	<b>2.77</b>	3.35	13	4.2	6	2.0	128	4.57	3.97	12	9.4	3	2.3		

Note. Sum-scores 10-27 = Moderate-severe, 15-27 = Moderately severe-severe. N = total number of athletes within factor level, n=number of athletes within severity. Scores ≥ 10 considered clinically significant according to Kroenke & Spitzer (2002). Levels 2<sup>nd</sup> -4<sup>th</sup> division includes only male athletes. Third division includes only male basketball and football players and 4<sup>th</sup> division includes only male football players. Bold numbers significant p< .05.

Table 2

Prevalence of Individual Depressive Symptoms for the Sample and for Athletes with and without Clinically Significant Sum-scores

Factor	Total sample		Symptom sum-score	
	N/n	%	≤ 9 (N=813) %	≥10 (N=72) %
<b>Type of symptom</b>				
lack of interest	894/61	6.8	2.3	55.6
Depressed mood	892/53	5.9	1.6	51.4
Sleep problems	894/71	7.9	3.9	51.4
Fatigue	894/109	12.2	6.9	66.7
Problems with appetite	894/62	6.9	2.0	59.7
Worthlessness/ Guilt	894/76	8.5	3.4	63.9
Concentration problems	894/58	6.5	2.5	50.0
Psychomotor problems	892/26	2.9	1.0	23.6
Suicidal thoughts	888/14	1.6	.0	19.4
<b>Number of Symptoms</b>				
None	885/670	75.7	82.4	.0
1-2	885/144	16.3	16.9	9.7
3-4	885/43	4.9	.7	51.4
≥ 5	885/28	3.2	.0	38.9

Note. N/n=total number of athletes/athletes exhibiting symptom. All symptoms scored 0-3. Symptoms considered present if scored ≥ 2 ("more than half the days" or "nearly every day").

Table 3  
Prevalence of the Core Symptoms of Depression across Sum-score Severity

Factor	Severity sum-score (male)						Severity sum-score (female)					
	0-9 (N=532)		10-14 (N=20)		15-27 (N=13)		0-9 (N=281)		10-14 (N=28)		15-27 (N=11)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Presence of defining symptoms</b>												
Neither	519	97.6	9	45.0	3	23.1	269	95.7	15	53.6	0	.0
Only decreased interest	8	1.5	4	20.0	0	.0	4	1.4	4	14.3	0	.0
Only <b>depressed</b> mood	2	.4	2	10.0	0	.0	4	1.4	2	7.1	1	9.1
Both symptoms	3	.6	5	25.0	10	76.9	4	1.4	7	25.0	10	90.9

*Note.* Sum scores 0-9=Minimal-mild, 10-14=Moderate, 15-27=Moderately severe-severe. N/n=Total number of athletes within severity category/number of athletes within factor. Scores  $\geq 2$  (“more than half the days” or “nearly every day”) indicating the presence of the core symptom. Highlighted cases represent athletes with clinically significant symptoms (PHQ-9  $\geq 10$ ), without exhibiting the symptoms depressed mood and lack of interest.

Table 4

Number of Additional Symptoms across Athletes without and with the Core Symptoms of Depression

Factor	Number of additional symptoms (excluding decreased interest and depressed mood)									
	0		1		2		3		≥ 4	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Presence of defining symptoms</b>										
Neither (N=815)	670	82.4	96	11.8	28	3.4	14	1.7	7	.9
Only decreased interest (N=20)	7	35.0	5	25.0	3	15.0	4	20.0	1	5.0
Only depressed mood (N=11)	1	9.1	4	36.4	4	36.4	1	9.1	1	9.1
Both symptoms (N=39)	3	7.7	4	10.3	8	20.5	6	15.4	18	46.2

*Note.* N/n=Total number of athletes within factor/frequency of athletes exhibiting number of symptoms. Scores  $\geq 2$  (“more than half the days” or “nearly every day”) indicating the presence of a symptom (for suicidal ideation scores  $\geq 1$  “several days” or higher indicated presence). Highlighted cases identified as clinically significant based on the algorithm method (Manea et al., 2015).

Table 5

## Binary Logistic Regression Models with Odds Ratios and 95% Confidence Intervals of Different Symptoms across Selected Determinants

		Interest	Depressed mood	Sleep	Fatigue	Appetite	Worthlessness/ Guilt	Concentration	Psychomotor	Suicidal thoughts
<b>Sex (reference male)</b>										
Female	OR (n)	1.44 (894)	<b>2.08 (892)</b>	<b>1.92 (894)</b>	<b>3.88 (894)</b>	<b>2.08 (894)</b>	<b>1.78 (894)</b>	<b>1.85 (894)</b>	.63 (892)	1.23 (888)
	CI	.80-2.60	<b>1.91-3.97</b>	<b>1.07-3.46</b>	<b>2.37-6.37</b>	<b>1.15-3.74</b>	<b>1.04-3.04</b>	<b>1.01-3.41</b>	.24-1.63	.69-2.20
<b>Type of sport (reference football)</b>										
Handball	OR (n)	1.15 (656)	<b>2.43 (654)</b>	<b>3.34 (656)</b>	1.53 (656)	<b>3.69</b>	1.33 (656)	1.76 (656)	1.69 (654)	1.05 (650)
	CI	.57-2.34	<b>1.08-5.46</b>	<b>1.57-7.12</b>	.88-2.67	<b>1.57-8.76</b>	.68-2.62	.83-3.73	.56-5.11	.51-2.13
Basketball	OR (n)	.98 (679)	2.11 (677)	<b>2.19 (679)</b>	1.47 (679)	<b>4.31 (679)</b>	1.67 (679)	1.54 (679)	.81 (678)	.90 (675)
	CI	.48-1.99	.96-4.67	<b>1.07-4.50</b>	.84-2.58	<b>2.03-9.18</b>	.88-3.14	.74-3.20	.25-2.61	.45-1.79
<u>Sex-specific analyses</u>										
<b>Age (male) (reference ≥ 27 years)</b>										
24-26 years	OR (n)	1.92 (277)	1.61 (277)	1.90 (277)	2.70 (277)	3.27 (277)	2.17 (277)	1.55 (277)	3.41 (277)	1.54 (276)
	CI	.58-6.31	.39-6.73	.65-5.54	.95-7.67	.57-18.75	.77-6.15	.52-4.62	.81-14.28	.54-4.44
21-23 years	OR (n)	2.16 (306)	<b>3.52 (306)</b>	<b>2.93 (305)</b>	2.37 (306)	<b>4.90 (306)</b>	2.40 (306)	.96 (305)	2.33 (306)	1.98 (305)
	CI	.67-6.95	<b>1.02-12.14</b>	<b>1.11-7.73</b>	.84-6.71	<b>1.01-23.90</b>	.91-6.32	.31-2.95	.56-9.63	.74-5.26
18-20 years	OR (n)	<b>3.03 (303)</b>	2.07 (303)	1.70 (302)	1.99 (303)	<b>7.06 (303)</b>	1.59 (303)	1.26 (302)	1.53 (303)	1.66 (302)
	CI	<b>1.01-9.07</b>	.58-7.43	.58-5.00	.69-5.74	<b>1.52-32.79</b>	.56-4.55	.44-3.62	.32-7.27	.60-4.56
<b>Age (female) (reference ≥ 24 years)</b>										
21-23 years	OR (n)	2.00 (179)	2.35 (179)	.61 (179)	1.62 (179)	1.83 (179)	2.76 (179)	1.48 (179)	0.00 (178)	1.11 (179)
	CI	.55-7.23	.56-9.85	.43-4.19	.75-3.50	.62-5.42	.91-8.35	.38-5.73	0.00 -	.31-4.01
18-20 years	OR (n)	<b>3.16 (241)</b>	<b>4.78 (239)</b>	2.22 (241)	1.92 (241)	2.37 (241)	<b>3.09 (241)</b>	<b>3.67 (241)</b>	4.14 (240)	2.30 (238)
	CI	<b>1.04-9.67</b>	<b>1.37-16.65</b>	.85-5.78	.97-3.82	.92-6.15	<b>1.12-8.47</b>	<b>1.22-11.09</b>	.49-35.04	.81-6.50
<b>Level (male) (reference top level)</b>										
1st division	OR (n)	1.24 (297)	2.29 (297)	2.11 (297)	1.42 (297)	2.79 (297)	<b>2.50 (297)</b>	.77 (297)	<b>4.50 (297)</b>	1.95 (296)
	CI	.47-3.28	.75-6.98	.80-5.57	.58-3.48	.98-8.00	<b>1.02-6.15</b>	.26-2.34	<b>1.16-17.43</b>	.78-4.88
2nd – 4 <sup>th</sup> division	OR (n)	.95 (450)	.85 (450)	2.50 (450)	.89 (450)	1.52 (450)	1.17 (450)	.90 (450)	1.89 (450)	.81 (448)
	CI	.33-2.72	.24-2.99	.85-7.31	.34-2.37	.40-5.70	.41-3.36	.31-2.61	.35-10.12	.30-2.19
<b>Level (female) (reference top level)</b>										
1st division	OR (n)	.76 (326)	.87 (324)	1.83 (326)	1.49 (326)	1.07 (326)	1.07 (326)	1.26 (326)	.50 (324)	1.68 (323)
	CI	.35-1.68	.40-1.91	.84-3.98	.86-2.59	.53-2.22	.53-2.17	.58-2.77	.11-2.37	.72-3.92

Note. Each symptom measured on a scale 0-3 with scores  $\geq 2$  indicating presence of the symptom. For suicidal thoughts scores  $\geq 1$  indicated the presence of the symptom. Bold numbers significant  $p < .05$ .