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Development and initial evaluation of the athlete eating psychopathology observation questionnaire for sport professionals

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1 **Development and Initial Evaluation of the Athlete Eating Psychopathology Observation**
2 **Questionnaire for Sport Professionals**

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23

24

25 **Development and Initial Evaluation of the Athlete Eating Psychopathology Observation**

26 **Questionnaire for Sport Professionals**

27 **Abstract**

28 Eating psychopathology symptoms are common in athletes, however, it is unknown
29 which symptoms are detected, and to what extent, by sport professionals. This study aimed to
30 develop and evaluate a self-report questionnaire to explore which features of eating
31 psychopathology in athletes are detected by sport professionals, and how observation of these
32 symptoms might vary. Thirty-one questions were developed, and 232 sport professionals
33 (56% male) participated in the study. Exploratory Factor Analysis revealed a 20-item, 5-
34 factor solution (Negative Affect, Dieting Practices, Fear of Eating in Social Contexts,
35 Bingeing and Purging, and Compulsive Exercise). Participants most frequently reported
36 observing athlete dieting practices, while symptoms of a fear of eating in social contexts were
37 observed least frequently. This study has developed and preliminarily tested the Athlete
38 Eating Psychopathology Observation Questionnaire (AEPOQ) which now requires further
39 validation. The findings provide important directions for education initiatives with sport
40 professionals regarding identification of eating psychopathology symptoms.

41 *Keywords:* disordered eating; eating disorders; sport; Athlete Eating Psychopathology
42 Observation Questionnaire.

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45 Athletes are at a heightened risk for the development of eating psychopathology,
46 including disordered eating and exercise (e.g., food restriction, occasional bingeing/purging,
47 compulsive exercise) and clinical eating disorders (e.g., bulimia nervosa; Joy et al., 2016).
48 Controlled studies have indicated that disordered eating occurs in 20–45% of female athletes
49 (Anderson & Petrie, 2012; Martinsen et al., 2010) and in 10–19% of male athletes (Greenleaf
50 et al., 2009; Martinsen et al., 2010). Additionally, athletes are suggested to be at more than
51 double the risk of developing an eating disorder compared to non-athletes (e.g., Sundgot-
52 Borgen & Torstveit, 2004). Risk factors for eating psychopathology among athletes include
53 weight, body image and exercise pressures (e.g., sport-body stereotypes), traumatic events
54 (e.g., injury, poor performance), personality (e.g., perfectionism), and early exposure to these
55 attitudes, behaviours and pressures (Bratland-Sanda & Sundgot-Borgen, 2013). Untreated
56 symptoms of eating psychopathology can lead to serious psychological and physiological
57 health and performance consequences in athletes (Mountjoy et al., 2014). It is therefore
58 important to identify and address symptoms of eating psychopathology in athletes early-on to
59 prevent the escalation of these symptoms (Giel et al., 2016).

60 Sport coaches and practitioners (e.g., sport nutritionists, sport psychologists, strength
61 and conditioning coaches, athletic trainers, sport physicians) have an important role in
62 detecting eating psychopathology symptoms in athletes and in signposting athletes to sources
63 of support (e.g., Biggin et al., 2017; Bratland-Sanda & Sundgot-Borgen, 2013; Quatromoni,
64 2008). Indeed, these sport professionals may be well placed to detect changes in athlete
65 wellbeing and symptoms of eating problems due to the closeness of their relationships and
66 the amount of time they spend with athletes (e.g., Nattiv et al., 2007; Neal et al., 2013).
67 However, many sport professionals lack knowledge and confidence in identifying and

68 supporting athletes with eating problems (e.g., Biggin et al., 2017; Nowicka et al., 2013;
69 Plateau et al., 2015), while denial and/or concealment of symptoms by athletes can make the
70 identification of at-risk individuals particularly difficult (e.g., McArdle et al., 2016).
71 Additionally, while some coaches report being aware of eating problems among their
72 athletes, some hold the view that eating disorders are not problematic or prevalent in their
73 sport (e.g., Nowicka et al., 2013), or that it is not part of their role to identify and support
74 athletes with eating-related concerns (e.g., Plateau et al., 2014a). Where coaches do report an
75 awareness of eating problems, more severe symptoms (e.g., vomiting) are viewed to be the
76 most concerning for athlete health and performance (Sherman et al., 2005). However, further
77 evidence for sport professionals' observations of, and concern for, the different patterns of
78 eating psychopathology symptoms seen among athletes is limited and requires further
79 investigation.

80 To date, only a small body of research has attempted to understand the signs and
81 symptoms of eating psychopathology that sport professionals observe among their athletes.
82 Qualitative research indicates that the symptoms identified the most by sport professionals
83 are those which are physically visible (e.g., weight change, physical fatigue; McArdle et al.,
84 2016; Plateau et al., 2014a). In contrast, psycho-behavioural and covert eating disorder
85 symptoms (e.g., bulimic-like behaviours, negative affect) are less likely to be detected by
86 sport professionals (Nowicka et al., 2013; Plateau et al., 2014a). Beyond one existing study
87 (Sherman et al., 2005), research has yet to adopt larger-scale quantitative approaches to
88 investigate the nature and frequency of eating psychopathology symptoms that sport
89 professionals observe in athletes. This information could help to inform the promotion of
90 educational interventions with sport professionals more widely.

91 Demographic factors may impact sport professionals' detection of eating
92 psychopathology symptoms. For example, evidence suggests that more experienced sport

93 professionals may be more likely to detect disordered eating symptoms among athletes (e.g.,
94 Kroshus et al., 2018). Moreover, male coaches report finding it difficult to detect symptoms,
95 with empirical evidence suggesting that female sport professionals detect more symptoms
96 (Kroshus et al., 2018; Nowicka et al., 2013). Notably, female sport professionals have been
97 found to regard certain symptoms (e.g., menstrual cycle irregularity) as more concerning in
98 comparison to their male colleagues (Sherman et al., 2005). Female sport professionals have
99 also been suggested to be better able to accurately identify symptoms (Kroshus et al., 2018).
100 Nevertheless, the literature is scarce and not sufficiently diverse. For instance, existing
101 studies are skewed towards coaches who work in the same sporting organisation and/or
102 association (Kroshus et al., 2018; Sherman et al., 2005), while female coaches, and those in
103 aesthetic, endurance and weight-class sports are largely under-represented (e.g., Nowicka et
104 al., 2013). Similarly, the tools used for measuring professionals' awareness of eating
105 psychopathology symptoms in these studies are variable and have yet to be psychometrically
106 tested, which makes drawing comparisons between studies difficult.

107 The lack of an existing assessment tool is potentially one key reason for the currently
108 limited evidence on sport professionals' observation of, and concern for, athlete eating
109 psychopathology symptoms. For example, Sherman and colleagues (2005) developed a
110 survey to assess the attitudes, beliefs, behaviours and concerns of coaches in relation to
111 symptoms of athlete eating psychopathology. However, the survey did not assess which
112 symptoms coaches had observed in athletes or the frequency with which they were observed.
113 In the broader eating disorder literature, tools have been developed and subsequently
114 validated for observers (e.g., parents, doctors, clinicians) to assess which symptoms they
115 observe in someone with an eating disorder. For example, the Anorectic Behaviour
116 Observation Scale (Vandereycken & Meerman, 1984) asks parents of an individual with an
117 eating disorder to indicate which of a range of symptoms they have or have not observed in

118 that person. Such information has been useful for clinicians, practitioners and relatives in the
119 evaluation of eating disorder symptoms and their severity, and also for researchers in the
120 identification of patterns of eating psychopathology observed by stakeholders which can
121 inform signposting procedures and treatment initiatives (e.g., Gísladóttir & Svavarsdóttir,
122 2011; Martin et al., 2014). It is critical to understand which symptoms and patterns of eating
123 psychopathology sport professionals recognise in athletes to facilitate the development of
124 targeted and relevant educational programmes and to promote early intervention more
125 effectively for athletes at risk.

126 In summary, athletes are at a heightened risk of eating psychopathology and sport
127 professionals (coaches and sport practitioners) hold an important role in identifying
128 symptoms and directing athletes to appropriate sources of support. However, the nature and
129 patterns of eating psychopathology symptoms frequently observed by sport professionals, and
130 their perspectives towards such symptoms, are poorly understood. This is likely in part due to
131 the absence of an effective tool to capture such information. Therefore, the aim of this study
132 is to develop and explore the psychometric properties of a self-report measure to assess which
133 symptomatic patterns of eating psychopathology are detected by sport professionals, and how
134 observation of these symptoms might vary across sport professionals.

135 **Method**

136 **Measure development**

137 *Athlete Eating Psychopathology Observation Questionnaire (AEPOQ)*

138 The AEPOQ was designed to assess which eating psychopathology symptoms sport
139 professionals observe among their athletes. Items were generated from reviewing the athlete
140 eating psychopathology literature, through discussions within the research team, and by
141 consulting eating psychopathology tools in the general and athlete populations. Items
142 included a wide range of eating psychopathology behaviours (ranging from food restriction,

143 dieting, compulsive exercise to self-induced vomiting) and symptomatic comorbidities (e.g.,
144 negative affect) which have been evidenced to be present in athletes with eating
145 psychopathology (e.g., Bratland-Sanda & Sundgot-Borgen, 2013; Mountjoy et al., 2014;
146 Plateau et al., 2014b). From this, 31 items were identified as theoretically important and these
147 were administered and subsequently subjected to analysis. Twenty-four items were devised
148 from reviewing the literature and included symptoms specific to athletes (e.g., ‘Avoids social
149 activities with team members’; ‘Takes supplements to promote muscle gain’) and general
150 symptoms (e.g., ‘Cuts out major food groups’). Seven items were included from the
151 Anorectic Behavior Observation Scale (Vandereycken & Meerman, 1984), to reflect broader
152 eating disorder symptoms (e.g., ‘Vomits after meals’).

153 The AEPOQ was constructed to include two distinct sections: *Section A* (symptom
154 observation) and *Section B* (concern over symptoms). In Section A, sport professionals
155 respond with either ‘No’ (0 points), ‘Not sure’ (0 points) or ‘Yes’ (1 point) to each of the
156 AEPOQ items to indicate whether they have ever observed that symptom or behaviour
157 among any of their current or previous athletes. In Section B, participants are asked to rate
158 their perceived level of concern for (i) athlete health and (ii) athlete performance for each
159 AEPOQ item on a Likert scale from 1 (*not at all concerned*) to 5 (*extremely concerned*),
160 irrespective of whether or not they have ever observed it. A copy of the AEPOQ is available
161 from the authors on request.

162 **Participants and procedure**

163 Participants had to be aged 18 years or older and currently working with athletes in a
164 sport practitioner or coaching role. Following institutional ethical approval, participants were
165 recruited in 2019 from UK sport clubs and organisations, universities, or via social media
166 (Twitter, Facebook, Reddit) and were invited to provide some background information (e.g.,
167 sex, age, job role, experience in role, details of their athletes) and complete the AEPOQ

168 online. In total, 232 sport professionals (male: $n = 130$; female: $n = 102$) provided informed
169 consent and participated in the study ($M_{\text{age}} = 30.3$, $SD = 11.8$, range: 18–83 years).
170 Participants were sport coaches ($n = 132$; 57%) or sport practitioners ($n = 100$; 43%; i.e., in
171 strength and conditioning/fitness [$n = 27$], sport psychology [$n = 21$], physical therapy [$n =$
172 20; e.g., physiotherapy, sports massage therapy], and sport nutrition [$n = 16$], with the
173 remainder working in sport science, sport management, performance lifestyle or as a sport
174 performance lead [$n = 13$]). Participants were either employed (70%) or volunteers (30%) and
175 had worked with athletes across a wide range of sports for an average of 7.2 years ($SD = 8.2$,
176 range 0.3–43 years). Most participants worked with both male and female athletes of all ages
177 at club (35%), university (25%) or national and international levels (15%), with the
178 remainder working at regional, county and school levels (25%).

179 **Data analysis**

180 All statistical analyses were conducted in IBM SPSS version 25.0. Missing data were
181 minimal (< 2%). Where data were missing, Little's MCAR test revealed that this was
182 completely at random ($p > .05$) and missing values were therefore replaced using the
183 Expectation-Maximization algorithm (Schafer & Olsen, 1998). A Shapiro-Wilk test revealed
184 that the data were not normally distributed ($p < .05$). To investigate the factor structure of the
185 AEPOQ, and the patterns of eating psychopathology symptoms observed (Section A),
186 Exploratory Factor Analysis (EFA) was performed. EFA is suitable when evaluating ordinal
187 data (e.g., Baglin, 2014; Hurley et al., 1997) and a minimum of 200 participants is typically
188 required for EFA (e.g., Jung & Lee, 2011; Kyriazos, 2018). The KMO test for sampling
189 adequacy and Bartlett's test of sphericity were measured to assess the suitability of data
190 reduction.

191 EFA was performed using a Pearson correlation matrix with the Principal Axis
192 Factoring extraction method, which has been recommended with non-normally distributed

193 data (e.g., Costello & Osborne, 2005; Fabrigar et al., 1999). The number of factors to extract
194 was determined using the Eigenvalue method (i.e., Eigenvalues greater than 1) in conjunction
195 with scree plot analysis (Yong & Pearce, 2013). The Oblique Promax rotation was used on
196 the assumption that factors would correlate (Floyd & Widaman, 1995). A minimum item
197 loading of .32 was employed (Tabachnick & Fidell, 2001) and items loading at $\geq .32$ onto
198 two or more factors, or within .15 of each other, were considered to significantly cross-load
199 and so were removed (Costello & Osborne, 2005). Factors with just one or two items were
200 considered unstable and consequently removed (e.g., Yong & Pearce, 2013). The EFA
201 procedure was re-run until an appropriate factor solution was achieved. Given the exploratory
202 nature of this study, the internal consistency of retained factors was assessed using
203 Cronbach's α and was considered acceptable if $\alpha = 0.5-0.7$ (Hinton et al., 2004; Ursachi et
204 al., 2015) together with inspecting the face value of factor items (e.g., Taber, 2018).

205 To investigate relationships between AEPOQ factor scores (Sections A and B) and
206 participants' years of experience working with athletes, two-tailed Spearman's rho (r_s)
207 correlations were run. To examine any differences between AEPOQ factor scores for levels
208 of concern over health and performance (Section B), a paired-samples Wilcoxon signed-rank
209 test was performed. To examine any differences between male and female participants on the
210 AEPOQ factor scores (Sections A and B), independent samples Mann-Whitney U analysis
211 was performed. The level of statistical significance was set to $p < .05$ for all analysis.

212 **Results**

213 **Psychometric properties of the AEPOQ**

214 *Factor structure*

215 The KMO test for the AEPOQ was 0.87 (very good) and Bartlett's test was significant
216 ($p < .001$). Eleven items were removed from the initial pool of 31 items: nine due to low
217 factor loadings ($< .32$) and a further two due to cross-loading and forming an unstable factor

218 (fewer than 3 items; Yong & Pearce, 2013). A subsequent EFA revealed a 5-factor structure
219 with 20 items retained. The scree plot confirmed the final 5-factor solution. All five factors
220 extracted had Eigenvalues above 1, accounting for 52.6% of the total variance in the items'
221 variance-covariance matrix (see Table 1).

222 *[Table 1 near here]*

223 ***AEPOQ factor labels***

224 A review of the items within each factor was conducted to determine appropriate
225 factor labels. Factor 1 was labelled *Negative Affect*, as items within this factor ($n = 5$) refer to
226 low psychological wellbeing, physical fatigue, lack of motivation and concentration, and
227 social withdrawal. Factor 2 was labelled *Dieting Practices*, as its items ($n = 5$) refer to food
228 restriction, low-calorie dieting and dieting for muscle gain. Factor 3 was labelled *Fear of*
229 *Eating in Social Contexts*, as items within this factor ($n = 3$) refer to tension and lack of
230 hunger around mealtimes. Factor 4 was labelled *Bingeing and Purging*, as its items ($n = 4$)
231 refer to serious overeating and purging behaviours. Factor 5 was labelled *Compulsive*
232 *Exercise*, as items within this factor ($n = 3$) refer to rigid and excessive exercise practices and
233 avoidance of medical care.

234 ***Internal consistency and factor inter-correlations***

235 The internal consistency for all factors were acceptable ($\alpha = .52-.73$; Table 1), and
236 very good for the AEPOQ overall ($\alpha = .86$). All five factors were moderately to strongly
237 significantly positively correlated (Table 2).

238 ***AEPOQ factor scoring and scores***

239 ***Section A (symptom observation)***

240 Mean scores were calculated for each factor; higher mean scores indicate higher
241 frequency of eating psychopathology symptoms observed. The Global Score is the mean of

242 all five factor scores. The score range for all factors and the Global Score for this sample
243 together with mean scores and standard deviations are presented in Table 2.

244 *[Table 2 near here]*

245 ***Section B (concern over symptoms)***

246 Mean scores for concern over athlete health and performance in each factor are shown
247 in Table 3. Higher scores indicate higher levels of concern. Bingeing and Purging (Factor 4)
248 had the highest mean score for concern over athlete health and performance. Participants
249 reported significantly higher levels of concern for athlete health compared to athlete
250 performance for the symptoms in Factors 2–5 and on the Global Score (small to large
251 differences). Significantly higher levels of concern were detected for athlete performance
252 compared to athlete health for symptoms of negative affect (Factor 1; medium difference;
253 Table 3).

254 *[Table 3 near here]*

255 **Frequency of symptoms observed (Section A)**

256 Two items in Factor 1 (items 18 and 19) and three items in Factor 2 (items 2, 3 and
257 15) had been observed in at least one athlete by over half of participants (50–67%), whilst the
258 remaining 15 items had been observed by fewer than half of participants (9–48%). Item 15
259 (‘Takes supplements to promote muscle gain’) was the symptom most sport professionals
260 (67%) had detected in at least one athlete, and item 29 (‘Vomits after meals’) was found to be
261 the least frequently observed by sport professionals (9%). On average, Factor 2 (Dieting
262 Practices) had the highest percentage of sport professionals (55%) who observed symptoms
263 in that factor, while Factor 3 (Fear of Eating in Social Contexts) had the lowest percentage of
264 sport professionals (25%) observing its symptoms. For Factors 1 (Negative Affect), 4
265 (Bingeing and Purging) and 5 (Compulsive Exercise), an average of 45%, 32% and 38% of
266 sport professionals observed its symptoms, respectively.

267 **Correlations between sport professionals' years of experience working with athletes and**
268 **AEPOQ mean scores (Sections A and B)**

269 In Section A, small positive significant correlations were detected between sport
270 professionals' years of experience working with athletes and mean observation scores on both
271 Factor 2 (Dieting Practices) and the Global Score. Years of experience did not significantly
272 correlate with any of the other factors in Section A (Table 4). In Section B, small positive
273 significant correlations were detected between sport professionals' years of experience
274 working with athletes and concern over athlete *health* for Factor 1 (Negative Affect), Factor 2
275 (Dieting Practices), Factor 4 (Bingeing and Purging), Factor 5 (Compulsive Exercise) and the
276 Global Score. Years of experience did not significantly correlate with concern over athlete
277 health with Factor 3 (Fear of Eating in Social Contexts). Furthermore, small positive
278 significant correlations were detected between sport professionals' years of experience
279 working with athletes and concern over athlete *performance* for Factor 3 (Fear of Eating in
280 Social Contexts), Factor 5 (Compulsive Exercise) and the Global Score. Years of experience
281 did not significantly correlate with concern over athlete performance on items in Factor 1
282 (Negative Affect), Factor 2 (Dieting Practices) or Factor 4 (Bingeing and Purging; Table 4).

283 **Differences between male and female sport professionals**

284 ***Demographics***

285 Of the male sport professionals, 62% were coaches and 38% were practitioners. Of
286 the female sport professionals, 53% were coaches and 47% were practitioners. There were no
287 significant differences in age between male ($M = 31.3$ years, $SD = 12.1$) and female ($M =$
288 29.1 years, $SD = 11.4$) sport professionals ($Z = 1.85$, $p = .06$, $r = .12$) or on years of
289 experience working with athletes between male ($M = 7.7$ years' experience, $SD = 8.2$) and
290 female ($M = 6.8$ years' experience, $SD = 8.1$) sport professionals ($Z = 1.37$, $p = .17$, $r = .08$),
291 so these were not controlled for in subsequent analyses.

292 *AEPOQ mean scores (Sections A and B)*

293 In Section A, no significant differences were detected between male and female sport
294 professionals for symptom observation scores on any of the factors or for the Global Score
295 (Table 4). In Section B, female sport professionals scored significantly higher than males on
296 concern over health for all factors and the Global Score, and for most factors and the Global
297 Score on concern over performance. In relation to concern over athlete *health*, small
298 significant differences were detected for Factor 1 (Negative Affect), Factor 3 (Fear of Eating
299 in Social Contexts) and Factor 4 (Bingeing and Purging). Medium significant differences
300 were detected for Factor 2 (Dieting Practices), Factor 5 (Compulsive Exercise) and the
301 Global Score. In relation to athlete *performance*, small significant differences were detected
302 for Factor 2 (Dieting Practices), Factor 4 (Bingeing and Purging), Factor 5 (Compulsive
303 Exercise) and the Global Score. Scores on Negative Affect (Factor 1) and Fear of Eating in
304 Social Contexts (Factor 3) were not significantly different between male and female sport
305 professionals for concern over athlete performance (Table 4).

306 *[Table 4 near here]*

307 **Discussion**

308 This study aimed to develop and explore the psychometric properties of a new self-
309 report questionnaire, the AEPOQ, to assess which symptoms of eating psychopathology are
310 detected by sport professionals and how observation of these symptoms might vary. Five
311 factors were identified following EFA of the AEPOQ: (1) Negative Affect, (2) Dieting
312 Practices, (3) Fear of Eating in Social Contexts, (4) Bingeing and Purging, and (5)
313 Compulsive Exercise. Sport professionals reported most frequently observing symptoms of
314 dieting practices, while symptoms of a fear of eating in social contexts were observed least
315 frequently. Participants reported higher levels of concern for athlete health than performance
316 for most symptoms of disordered eating in athletes. Sport professionals with more years of

317 experience reported observing greater instances of dieting behaviours and disordered eating
318 symptoms in athletes and reported higher levels of concern for athlete health compared to
319 athlete performance in relation to these symptoms. While there were no significant
320 differences in the number of disordered eating symptoms observed by male and female sport
321 professionals, females reported almost all symptoms to be significantly more concerning for
322 athlete health and/or performance compared to their male colleagues.

323 The development of the AEPOQ addresses the lack of existing tools for measuring
324 which symptoms of eating psychopathology sport professionals detect in athletes (e.g.,
325 Kroshus et al., 2018; Nowicka et al., 2013). The current study provides preliminary evidence
326 for the AEPOQ's factor structure and its psychometric properties. A five-factor structure was
327 identified, and all factors demonstrated acceptable levels of internal consistency concordant
328 with the study's exploratory nature (i.e., Cronbach's $\alpha \geq .05$; Hinton et al., 2004; Ursachi et
329 al., 2015). However, further research is required to determine whether item loadings can be
330 replicated and/or if any items should be omitted (e.g., items in Factor 5). Future research
331 should also determine if the internal consistency of some factors (e.g., Factors 3, 4 and 5)
332 improves in other samples to meet the standard acceptable alpha level ($\alpha \geq .07$). Additionally,
333 the construct and content validity of factors also needs to be examined in future. Nonetheless,
334 the internal consistency of the AEPOQ global score was very good ($\alpha = .86$) and we therefore
335 temporarily recommend researchers and practitioners to use the global score for reliability.

336 The AEPOQ assesses a range of eating and exercise psychopathology symptoms in
337 athletes (e.g., Gorrel et al., 2020; Mountjoy et al., 2014; Sundgot-Borgen & Torstveit, 2010)
338 and the present study is the first to identify that several constructs (patterns) of eating
339 psychopathology in athletes are observed by sport professionals, but to different degrees.
340 Specifically, dieting behaviours were most frequently detected by sport professionals, which
341 is arguably expected as such behaviours are common among athletes (e.g., taking

342 supplements to promote muscle gain) and can be perceived as helpful for improving sport
343 performance (e.g., Martinsen et al., 2010; Peos et al., 2019). This is also the first study to find
344 that about half of sport professionals report detecting unhealthy dieting symptoms in athletes
345 (e.g., skips meals, cuts out major food groups). It is meritorious that sport professionals can
346 detect these symptoms, but unfortunate as it suggests they are prevalent among athletes.
347 Athletes who engage in unhealthy dieting practices are more susceptible to the onset of
348 disordered eating behaviours (e.g., Kerr et al., 2006; Prnjak et al., 2019) or at risk of
349 developing an eating disorder (e.g., Joy et al., 2016). The frequent observation of dieting
350 behaviours in athletes by sport professionals detected in this study suggests that targeted
351 intervention for athletes engaging in dieting practices might be feasible, and potentially
352 important in mitigating against the development of more problematic eating behaviours.
353 Indeed, restrictive dietary practices have been shown to be reduced among athletes taking
354 part in interventions that target unhealthy dieting practices (e.g., Laramée et al., 2017).

355 In contrast to previous qualitative research which suggests that coaches have limited
356 capacity to detect symptoms of negative affect among athletes (e.g., Plateau et al., 2014a),
357 this study found that athletes' general complaints of fatigue, tiredness and poor concentration
358 were frequently observed by sport professionals. It is plausible to suggest that these broader
359 symptoms may be detectable due to the amount of time sport professionals spend with
360 athletes (e.g., Neal et al., 2013) and the impact that such symptoms may have on their
361 training and sport performance (e.g., Russell et al., 2019). These symptoms may also be a
362 result of physical fatigue (e.g., from excessive training) rather than necessarily signs of
363 negative affect (e.g., suggesting a potential mental health problem). However, it is
364 noteworthy that more specific symptoms of possible mental health issues, such as an
365 avoidance of social activities with team members, lack of motivation or interest in activities
366 and low mood and sadness, were less frequently observed by sport professionals in this study.

367 Such symptoms may be more likely to be more covert, making them more difficult to detect,
368 and may occur less frequently than general fatigue and tiredness. Nonetheless, these
369 symptoms may be indicative of serious mental health problems (e.g., depression, anxiety,
370 social withdrawal), which have been shown to be prevalent among athletes (e.g., Poucher et
371 al., 2019; Rice et al., 2016). The sport professionals in this study also reported symptoms of
372 negative affect to be more concerning for athlete performance as opposed to athlete health.
373 One explanation for this finding may be that sport professionals recognise the importance of
374 athletes' mental state for good performance and thus any symptoms of negative affect will
375 notably impair their performance (e.g., Lemyre et al., 2006). However, it will be helpful for
376 future research to explore sport professionals' knowledge and understanding of negative
377 affect symptoms and their wider impact on athlete health. Importantly, negative affect is a
378 significant risk and maintenance factor for disordered eating in athletes and may therefore be
379 a valuable construct to address in future interventions to support the health and performance
380 of athletes (e.g., Estanol et al., 2013).

381 Sport professionals reported being less likely to observe disordered eating symptoms
382 such as being fearful of eating in social contexts, bingeing, purging, and engaging in
383 compulsive exercise. This is consistent with previous qualitative evidence suggesting that
384 sport professionals less frequently detect more serious and covert symptoms of disordered
385 eating (e.g., McArdle et al., 2016; Nowicka et al., 2013; Plateau et al., 2014a). These
386 symptoms typically occur less frequently in athletes compared to, for example, dieting
387 behaviors or negative affect (e.g., Joy et al., 2016) which likely contributes to sport
388 professionals observing them less often. Despite low levels of observation, this is the first
389 known study to report that sport professionals perceive a range of serious disordered eating
390 symptoms to be highly concerning for both athlete health and performance. However, if these
391 symptoms are not identified at an early stage and appropriate referrals made, athletes can

392 become increasingly exposed to serious health and performance consequences (Giel et al.,
393 2016; Mountjoy et al., 2014), and so early detection is key in preventing these more serious
394 concerns (e.g., Bonci et al., 2008). Nevertheless, previous research has found that coaches
395 lack knowledge and awareness around severe eating disorder symptoms (e.g., Biggin et al.,
396 2017; Nowicka et al., 2013; Plateau et al., 2015). Additionally, detecting these symptoms can
397 be challenging because athletes often binge and purge in secret (DeFaciani, 2016) and
398 symptoms can be easily hidden in an environment that advocates leanness and endorses
399 compulsive exercise (e.g., McArdle et al., 2016; Sundgot-Borgen & Torstveit, 2004). To
400 improve the identification of, and subsequent signposting to support for disordered eating
401 symptoms in athletes, further education for sport professionals may be needed and
402 developing open and honest communication practices between them and athletes will be
403 important to facilitate greater symptom disclosure among athletes.

404 Participants' years of experience in their sport role was associated with some but not
405 all eating psychopathology constructs assessed in this study. Sport professionals with more
406 experience reported greater observation of dieting practices and disordered eating symptoms
407 overall. Given the high prevalence of eating psychopathology symptoms among athlete
408 populations (e.g., Joy et al., 2016), this finding suggests that more experienced sport
409 professionals may have had more opportunities to detect symptoms in athletes, and to learn
410 from such experiences. More experienced sport professionals in this study also reported
411 greater concern over athlete health for almost all eating psychopathology symptoms.
412 Additionally, they reported greater concern over athlete performance for a fear of eating in
413 social contexts, compulsive exercise, and disordered eating symptoms. One explanation may
414 be that experienced sport professionals, due to having had more opportunities to observe
415 symptoms, are more likely to have previously witnessed the negative health consequences in
416 athletes because of an eating problem (Kroshus et al., 2018; Mountjoy et al., 2014).

417 Consequently, sport professionals with more years of experience in their role may acquire a
418 greater awareness around disordered eating and may be more likely to detect symptoms and
419 recognise their seriousness in athletes.

420 No significant differences were detected in the number of symptoms observed by
421 male and female sport professionals. This suggests that the sex of sport professionals does not
422 impact the degree of observation of eating psychopathology symptoms in athletes, as has
423 been previously suggested (e.g., Kroshus et al., 2018; Nowicka et al., 2013). However, a
424 novel finding of this study was that female sport professionals reported significantly higher
425 levels of concern over athlete health for all symptoms compared to their male colleagues.
426 Females also reported significantly higher levels of concern over athlete performance for
427 bulimic-like symptoms, dieting and compulsive exercise compared to males. Beyond initial
428 evidence of female sport professionals perceiving athlete menstrual irregularity to be more
429 concerning than males (Sherman et al., 2005), this is the first known study to find that female
430 sport professionals are more concerned than males about a range of eating psychopathology
431 symptoms. A recent study found that psychologists' and fitness instructors' perceptions of,
432 and ability to detect, eating disorder symptoms in the general population was largely
433 influenced by their gender role identity (particularly masculine gender roles; Worsfold &
434 Sheffield, 2020). This was argued to be because practitioners high on masculine traits
435 perceived symptoms to be more normative and female congruent. It is plausible that the male
436 sport professionals in the current study identified with more masculine traits which then
437 influenced their perceived concern over the symptoms listed in AEPOQ; however, this
438 requires investigating in future. Eating disorders are still largely regarded a "female disorder"
439 (e.g., Schoen et al., 2019), so it seems timely for sport professionals to address any existing
440 gender-bias and stigma about eating disorders.

441 This study has successfully developed and tested a new, brief self-report measure of
442 sport professionals' detection of eating psychopathology symptoms in athletes, and their
443 levels of concern about these symptoms. A significant strength is the inclusion of a diverse
444 sample of male and female coaches and sport practitioners, ensuring the results are applicable
445 to a broad sport professional population. However, the sport practitioners (42%) worked
446 across a wide range of professions, with few representatives from some disciplines (e.g.,
447 sports nutrition), which meant that exploring differences in patterns of symptom observation
448 and levels of concern across disciplines was not feasible. Moreover, the proposed 5-factor
449 structure of the AEPOQ requires replication and confirmation across additional, larger sport
450 professional samples. Due to the stereotypical view that eating disorders is a female disorder
451 (e.g., Schoen et al., 2019), it will be important to determine if participants completing the
452 AEPOQ in future truly think about any athlete or predominantly female athletes. Moreover,
453 sport professionals in this study were asked to complete the AEPOQ in relation to their
454 *general* experiences with athletes. However, future validation of the measure may involve
455 investigating the psychometric properties when respondents consider *one* athlete (e.g., by
456 thinking specifically about an athlete who identifies as female or male), rather than *any*
457 athletes. This will be important for determining the clinical utility of the AEPOQ as a
458 screening tool to support sport professionals in identifying at-risk athletes.

459 Additionally, future research should measure the length of time for which the
460 symptoms are observed to better assess their severity and continuation. Future work may also
461 involve investigating whether symptoms that are *not* detected by sport professionals reflect a
462 lack of awareness or if sport professionals simply have not encountered any athletes with
463 these symptoms. It is also noted that this study did not control for any prior education around
464 disordered eating among sport professionals, which is a potentially important confound that
465 should be controlled for in future studies.

466 Clinical implications and recommendations

467 Using the AEPOQ may help to overcome issues with existing eating disorder
468 screening tools completed by athletes who may distort their responses due to concerns about
469 being prevented from training or competing (Bratland-Sanda & Sundgot-Borgen, 2013; Giel
470 et al., 2016). This could help practitioners to develop a clearer picture of the type of
471 symptoms they detect in athletes, which in turn may make offering targeted and specific
472 support more effective. The AEPOQ can also assist sport professionals in deciding whether
473 further input is needed in the evaluation of symptoms. For example, if several symptoms of
474 dieting practices, negative affect, and bingeing and purging are detected, the professional
475 may feel more confident that the athlete in question should be referred to a specialist for an
476 in-depth evaluation. Moreover, the findings of this study point towards some useful directions
477 for educational initiatives for sport professionals. Future education may need to focus on
478 supporting coaches and sport practitioners to identify the more critical and severe eating
479 disorder symptoms (e.g., bulimic-like behaviours) and their comorbidities (e.g., compulsive
480 exercise, negative affect). Early identification of these symptoms will be important to prevent
481 the escalation of serious health consequences for athletes (Giel et al., 2016; Mountjoy et al.,
482 2014). Developing awareness around the identification, health and performance
483 consequences of eating psychopathology may be needed by both early-career and more
484 experienced sport professionals. There may be significant value in incorporating disordered
485 eating education and training courses into the professional development requirements of sport
486 professionals, regardless of their experience in sport. Additionally, the findings from this
487 study suggest that it might be particularly valuable to target male coaches and sport
488 practitioners with such educational programmes. These recommendations build on the
489 broader suggestions of the need to develop and implement health-education interventions for
490 sport professionals to enhance their capacity and confidence to support athletes with eating

491 psychopathology symptoms and wider mental health concerns (e.g., Breslin et al., 2017;
492 Gorczynski et al., 2020).

493 **Conclusion**

494 Sport professionals hold an important role in detecting eating psychopathology
495 symptoms in athletes and the AEPOQ will ensure practitioners and researchers can
496 systematically and effectively capture this information in future. This is important given that
497 early identification of an eating disorder is generally associated with better prognosis (e.g.,
498 Bonci et al., 2008). The results show that sport professionals detect, and are concerned about,
499 a range of symptoms, albeit to differing degrees. The results also indicate that information
500 from the AEPOQ can help to identify which sport professionals, based on experience and/or
501 sex, might need specific education and support to expedite the identification of eating
502 psychopathology symptoms. By helping sport professionals more accurately and efficiently
503 detect symptoms, this in turn will promote a sport culture that is better informed about eating
504 psychopathology in athletes and may facilitate and improve early-identification and early-
505 signposting of at-risk athletes.

506

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670 **Table 1**671 *Pattern matrix with factor loadings, Eigenvalues, variance and internal consistency.*

Athlete Eating Psychopathology Observation Questionnaire (AEPOQ) Items	Factor				
	1	2	3	4	5
17. Persistent low mood and sadness	.87	–	–	–	–
16. Clear lack of motivation or interest in activities	.57	–	–	–	–
18. Persistent complaints of fatigue and tiredness	.49	–	–	–	–
19. Poor concentration	.39	–	–	–	–
23. Avoids social activities with team members	.39	–	–	–	–
3. Cuts out major food groups (e.g., carbohydrates, fat)	–	.70	–	–	–
2. Cuts out treat foods	–	.50	–	–	–
5. Prefers diet products (with low calorie content)	–	.48	–	–	–
15. Takes supplements to promote muscle gain	–	.44	–	–	–
6. Skips meals	–	.42	–	–	–
7. Shows obvious signs of tension at mealtimes	–	–	.83	–	–
1. Avoids eating with others	–	–	.60	–	–
9. Seldom mentions being hungry	–	–	.44	–	–
27. Noticeable weight gain	–	–	–	.60	–
26. Noticeable weight loss	–	–	–	.50	–
11. Has difficulties in stopping eating or eats unusually large amounts of food or sweets	–	–	–	.47	–
29. Vomits after meals	–	–	–	.42	–
31. Is reluctant to see a doctor or refuses medical examination	–	–	–	–	.45
20. Adopts rigid exercise practices (e.g., always running the same route; exercising for exact amounts of time)	–	–	–	–	.41
30. Is as active as possible (e.g., stands, walks or runs about whenever possible)	–	–	–	–	.38
Eigenvalue	5.81	1.60	1.33	1.19	1.09
Total variance (%)	27.65	7.64	6.36	5.69	5.23
Cronbach α	.73	.70	.69	.65	.52

672 *Note.* Factor loadings below .32 are not presented.

673 **Table 2**674 *Sample score range, mean scores, standard deviations and factor inter-correlation matrix*675 *(AEPOQ Section A; n = 232).*

	Range	<i>M</i>	<i>SD</i>	1	2	3	4	5
Factor 1. Negative affect (5 items)	0–5	2.25	1.68					
Factor 2. Dieting practices (5 items)	0–5	2.73	1.66	.43***				
Factor 3. Fear of eating in social contexts (3 items)	0–3	.76	1.02	.35***	.39***			
Factor 4. Bingeing and purging (4 items)	0–4	1.25	1.24	.44***	.50***	.31***		
Factor 5. Compulsive exercise (3 items)	0–3	1.09	1.00	.36***	.46***	.30***	.39***	
Global (20 items)	0–20	8.09	4.91	.76***	.81***	.57***	.71***	.64***

676 *Note.* Correlation coefficients are two-tailed Spearman's rho; *** $p < .001$.

677 **Table 3**

678 *Mean scores, standard deviations and differences in sport professionals' reports of concerns*
 679 *about athlete health and performance (AEPOQ Section B; n = 232).*

Factor	Concern for	Concern for	Z^a	r
	health	performance		
	$M (SD)$	$M (SD)$		
1. Negative affect	3.83 (.71)	3.96 (.67)	3.63***	.23
2. Dieting practices	3.24 (.71)	3.17 (.70)	2.11*	.13
3. Fear of eating in social contexts	3.29 (.79)	2.88 (.91)	7.88***	.51
4. Bingeing and purging	4.17 (.72)	4.02 (.81)	4.10***	.26
5. Compulsive exercise	3.48 (.87)	3.29 (.87)	4.48***	.29
Global	3.60 (.61)	3.46 (.62)	6.34***	.41

680 *Note.* * $p < .05$; ***; $p < .001$; ^a = Paired samples Wilcoxon signed-rank test; r = effect size.

681 **Table 4**

682 *Correlations between years of experience working with athletes and AEPOQ mean scores,*
 683 *and differences on AEPOQ scores between male and female sport professionals.*

Factor	r_s †	Sex differences			
		Males	Females	Z^a	r
		($n = 130$)	($n = 102$)		
		$M (SD)$	$M (SD)$		
Section A (symptom observation)					
1. Negative affect	.08	2.19 (1.57)	2.33 (1.81)	.45	.02
2. Dieting practices	.15*	2.65 (1.60)	2.83 (1.74)	.96	.06
3. Fear of eating in social contexts	.12	.71 (1.01)	.82 (1.04)	.82	.05
4. Bingeing and purging	.10	1.31 (1.21)	1.17 (1.28)	1.07	.07
5. Compulsive exercise	.05	1.16 (1.02)	1.00 (.98)	1.29	.08
Global	.14*	8.04 (4.67)	8.16 (5.21)	.02	.001
Section B (concern for health)					
1. Negative affect	.21**	3.73 (.75)	3.96 (.64)	2.25*	.14
2. Dieting practices	.13*	3.04 (.70)	3.50 (.64)	5.20***	.34
3. Fear of eating in social contexts	.07	3.13 (.85)	3.50 (.66)	3.19**	.20
4. Bingeing and purging	.17*	4.04 (.79)	4.34 (.57)	3.09**	.20
5. Compulsive exercise	.28***	3.22 (.84)	3.81 (.80)	5.31***	.34
Global	.24***	3.43 (.61)	3.82 (.54)	5.33***	.35
Section B (concern for performance)					
1. Negative affect	.09	3.90 (.70)	4.04 (.62)	1.62	.10
2. Dieting practices	.12	3.05 (.70)	3.33 (.68)	2.73**	.17
3. Fear of eating in social contexts	.13*	2.81 (.86)	2.97 (.96)	1.30	.08
4. Bingeing and purging	.07	3.90 (.83)	4.17 (.78)	2.88**	.18
5. Compulsive exercise	.22**	3.15 (.85)	3.47 (.86)	2.78**	.18
Global	.19**	3.36 (.59)	3.59 (.63)	3.12**	.20

684 *Note.* * $p < .05$; ** $p < .01$; *** $p < .001$; † = two-tailed Spearman's correlations with sport
 685 professionals' ($n = 232$) years of experience working with athletes; ^a = independent samples Mann-
 686 Whitney U test; r = effect size.