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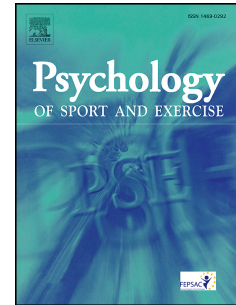
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Journal Pre-proof

Mental Health and Elite Female Athletes: A Scoping Review

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ABSTRACT

Objectives This article examines the current state of literature focusing exclusively on mental health and mental illness of elite female athletes. The scoping review aimed to (1) identify the methodology used in this research, (2) explore the use of theory in these studies, and (3) provide an overview of the research purposes to identify gaps in the literature and provide recommendations for future research.

Design Scoping Review

Method Following the methodological framework by Arksey and O'Malley (2005), four databases were searched for studies that fulfilled the inclusion criteria. Following the identification of studies using broad search criteria, specific exclusion criteria were applied.

Results Twenty-four studies met the review criteria, of which twenty studies (83.3%) used quantitative methods and a cross-sectional research design. Of these studies, the majority (95%) focused on eating disorders and/or disordered eating prevalence rates in elite female athletes who compete in 'lean-physique' or endurance sports (e.g., gymnastics, long-distance, running). The restricted sample population of USA collegiate athletes, overreliance on quantitative methods, and heavy focus on eating disorder prevalence rates demonstrates an ongoing need for sport scholars to expand their research samples, methods, and aims.

Conclusion Findings highlight the need for greater methodological diversity to advance our conceptual and theoretical understanding of elite female athletes' experiences of mental health and mental illness beyond numeric interpretations. Future research is needed to explore mental health in elite female athlete populations beyond 'lean-physique' athletes.

Keywords: mental health, mental illness, elite female athletes, sport, review

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51 **Mental health and Elite Female Athletes: A Scoping Review**

52 Since the turn of the decade, research into mental health and mental illness has
53 received increased attention in elite sport (Kuettel & Larsen, 2019; Poucher et al., 2021; Rice
54 et al., 2016). In the elite athlete population, the prevalence of mental illness ranges from 5-
55 35% annually, which is comparable to that of the general adult population (Castaldelli-Maia
56 et al., 2019; Gorczynski, Coyle, & Gibson, 2017). Rates of mental illness amongst elite
57 female athletes are, however, higher than their male counterparts and the general population
58 (Kuettel & Larsen, 2019). Despite the above suggestions, prevalence rates are difficult to
59 concretely establish and have been subject to debate among researchers due to limited
60 research, definitional issues, a lack of awareness and stigma, and inconsistent measures
61 (Gorczynski, Coyle, & Gibson, 2017; Kuettel & Larsen, 2019; Poucher et al., 2021).
62 Nonetheless, sport scholars agree that athletes who compete at the elite level are exposed to
63 unique mental health and mental illness risk factors such as intense performance demands,
64 rigorous training schedules, media attention, injury, and de-selection (Kuettel & Larsen,
65 2019; Rice et al., 2016). Moreover, improving the mental health of elite athletes is now a
66 priority for many sporting organisations and governing bodies, and is an area that warrants
67 further study (Henriksen et al., 2019).

68 Whilst ‘mental health’ has been defined and conceptualized in various ways, we (the
69 research team) utilized the definition of mental health presented in the International Society
70 of Sport Psychology consensus statement (Henriksen et al., 2019) “a state of well-being in
71 which every individual realizes his or her own potential, can cope with the normal stresses of
72 life, can work productively and fruitfully, and is able to make a contribution to his or her
73 community” (The World Health Organisation, 2014 pp. 231). Throughout our review, we
74 refer to ‘mental health’ and ‘mental illness’ as two distinct concepts (Henriksen et al., 2019).
75 Mental illness is usually perceived to be a diagnosable ‘condition’ or ‘disorder’ related to

76 experiences (such as depression, anxiety, addiction, obsessions, psychoses, etc.) that impact
77 an individual's thinking, feeling, mood, and behaviours (CDC, 2020). In contrast, mental
78 health is viewed more broadly as one component of a person's overall wellbeing (CDC,
79 2020). An elite athlete, for example, may suffer from poor mental health during injury, but
80 this does not necessarily mean that they would meet the criteria for diagnosable mental
81 illness.

82 Much of the current research and several systematic reviews in this area have
83 narrowly focused on identifying prevalence and incidence rates of mental illness amongst
84 elite (male) athletes (Bar & Markser, 2013; Gorczynski et al., 2017; Reardon & Factor,
85 2010). However, two reviews have explored both mental illness and mental health, for
86 example, Rice et al. (2016) conducted a narrative review to synthesise literature on both
87 mental illness and mental health amongst elite athletes, and Kuettel and Larsen (2019)
88 utilized a scoping review method to explore various risk and protective factors of mental
89 health in elite athletes. The work of Rice et al. (2016) and Kuettel and Larsen (2019)
90 enhanced our knowledge and understanding of mental health and mental illness in elite
91 athletes. For example, Kuettel and Larsen (2019) identified elite female athletes to be at an
92 increased risk for anxiety, depression, and disordered eating when compared to elite male
93 athletes. Using a holistic approach around mental health (Henriksen et al., 2019) to interpret
94 their findings, gender (female) emerged as a risk factor for poor mental health more broadly
95 amongst elite athletes (Kuettel & Larsen, 2019). This finding was an impetus of this review.

96 Kuettel and Larsen (2019) speculated that the increased rate of poor mental health and
97 mental illness in elite female athletes compared to elite male athletes is due to biological
98 differences. However, this speculation was not discussed in any further detail. We attribute
99 the lack of knowledge and understanding around why elite female athletes suffer from a
100 greater level of mental ill health to much of the existing research overlooking elite female

101 athletes meaning that causality cannot be appropriately identified (Kuettel & Larsen, 2019).
102 Subsequently, sports scholars are left to make (often) ill-informed assumptions regarding the
103 many possible risk factors contributing to mental health difficulties in elite female athletes.
104 For example, Castaldelli-Maia et al. (2019) hypothesised that the lack of acceptance of
105 female athletes in certain cultures, unequal training opportunities, limited financial support,
106 sexualisation, sexuality stereotypes, and societal and personal expectations around traditional
107 gender roles will likely negatively impact the mental health of this population. The
108 aforementioned unique psychosocial and contextual demands faced by elite female athletes
109 must be considered when designing and delivering strategies to support the mental health of
110 this population (e.g. gender and context specific interventions) (Foskett & Long-staff, 2018).

111 Research specific to elite female athletes is essential for creating effective mental
112 health programs and interventions. Relying on findings from predominantly male-focused
113 studies, such as Gouttebauge et al. (2015), to inform the design and implementation of mental
114 health interventions with elite female athletes is not appropriate due to the distinct differences
115 between males and females at a biological, psychological, and social level (Castaldelli-Maia
116 et al., 2019). Breslin et al. (2017) argues that gender-specific and sport-specific data should
117 be used to inform and design mental health interventions as neglecting such factors
118 substantially reduces the quality and efficacy of mental health interventions. Additionally,
119 utilising appropriate and well-aligned psychological theory when developing mental health
120 interventions has been evidenced to increase their quality (Breslin et al., 2017). Taken
121 together, the above findings highlight the importance of conducting further research on
122 mental health and elite female athletes before delving into the design of support programs and
123 interventions.

124 Prior to conducting mental health research with elite female athletes, it is important
125 for researchers to consider study design and use of theory to undertake research into mental

126 health with elite athletes (Poucher, Tamminen, Kerr & Carney, 2021). While several
127 recommendations are offered in a commentary by Poucher et al. (2021), our review offers a
128 systematic approach to the literature and focuses on the methods and theories used in research
129 conducted exclusively with elite female athletes to improve future research. Our review
130 differs from others conducted in this area due to our focus on methods, consideration of how
131 theory has been used, and our exclusive focus on elite female athletes.

132 A scoping review was deemed the most appropriate approach to identify knowledge
133 gaps in research concerning elite female athletes and mental health or mental illness and offer
134 informed suggestions relating to the future research that should be conducted to fill the
135 identified gaps. More specifically, the purpose of a scoping review is to summarise existing
136 research findings with the aim of systematically mapping implications for practice and
137 identifying research gaps (Arksey & O'Malley, 2005). Scoping reviews are currently
138 receiving substantial attention within sport and health research (Ross, Donaldson & Poulos,
139 2020) and have previously been used to address unexplored topics within mental health and
140 sport (see Kuettel & Larsen, 2019). Given the paucity of research regarding mental health and
141 elite female athletes, a systematic review or meta-analysis would not be appropriate in
142 yielding sufficient studies to assess study quality (Grant & Booth, 2009). Furthermore, while
143 narrative reviews are increasingly popular in sport and mental health research (see Rice et al.,
144 2016) and were recently used in a review exploring men, mental health, and elite sport (see
145 Souter, Lewis & Serrant, 2018), narrative reviews do not follow a strict research criteria and
146 risk missing studies.

147 To the best of our knowledge, our review is the first (of any kind) to explore the
148 way(s) that mental health or mental illness has been studied exclusively with elite female
149 athletes. We focused on (1) identifying the methodology used in research concerning mental
150 health or mental illness and elite female athletes, (2) exploring the use of theory in these

151 studies, and (3) providing an overview of the research purposes with the aim of identifying
152 gaps in the literature and providing recommendations for future research.

153 **Method**

154 In this review, we followed the methodological framework suggested by Arksey and
155 O'Malley (2005); (1) identifying the research question, (2) identifying relevant studies, (3)
156 selecting studies, (4) charting the data, and (5) summarizing and collating the data and
157 reporting the results. Additionally, this scoping review adhered to all items on the recently
158 developed PRISMA checklist for scoping reviews (Tricco et al., 2018).

159 *Identifying the research question*

160 Our overriding research question was 'how has mental health and mental illness
161 concerning elite female athletes been researched?' In order to answer this, we focused on
162 three underlying aims: (1) to identify the methodology used in research concerning mental
163 health or mental illness and elite female athletes, (2) to explore the use of theory in these
164 studies, and (3) to provide an overview of the research purposes with the goal of identifying
165 gaps in the literature and making recommendations for future research.

166 *Identifying relevant studies*

167 We included studies that: (a) *involved female athletes only*. This review included all
168 studies that exclusively sampled 'female athletes' according to the author(s) of each study. In
169 sport research, a binary approach (e.g. male or female) is most often utilized. Despite gender
170 and sex being far more complex, the elite sporting environment is predominantly structured
171 with reliance on gender binaries (Phipps, 2021). While there is a need for more inclusive
172 research in future studies in sport, we involved studies where 'female athletes' were the
173 identified population in order to report on the current state of knowledge. In this review, the
174 studies on 'female athletes' may have included athletes who do not identify themselves in
175 relation to this binary category, however, no studies raised or identified this. In contrast to

176 most previous reviews (e.g. Kuettel & Larsen, 2019; Rice et al., 2016), we excluded studies
177 involving both male and female athletes given the exclusive focus on female athletes and the
178 aims of this review; (b) *involved athletes competing at the elite sporting level*. In this review,
179 ‘elite athletes’ are defined as a population comprising high-performance, elite, or professional
180 athletes, and/or National Collegiate Athletic Association (NCAA) Division One (D1)
181 standard student-athletes (see Rice et al., 2018; Swann, Moran, & Piggott, 2015). Studies
182 including athletes competing at the provincial/regional/county level were included if defined
183 by the author as elite athletes. Additionally, studies comprising both elite and non-elite
184 athletes or junior and senior elite athletes were only included if we could distinguish between
185 the findings; (c) *involved current athletes*. Retired athletes were excluded unless we were
186 able to distinguish between athletes who were retired at the time of the study versus those still
187 competing; (d) *involved a focus on mental illness, mental health, or mental wellbeing as*
188 *defined by the authors of each individual study in their research aims*. Studies that indicated
189 the research purpose was to explore ‘mental illness,’ ‘mental health,’ or ‘mental wellbeing’
190 were included. Additionally, studies that aimed to explore a specific mental illness (e.g.
191 anxiety or depression) from an established criteria (e.g. DSM-IV (American psychiatric
192 Association, 2000) or ICD-10 (World Health Organisation, 1993) were included; (e) *were*
193 *published between 1996 and 2020*. In the development of women’s sport, 1996 was a pivotal
194 year as women were allowed to participate in football and softball at the summer Olympic
195 games for the first time, and the first International Olympic Committee (IOC) world
196 conference on ‘Women and Sport’ took place in Lausanne, Switzerland; (f) *were qualitative,*
197 *quantitative, or mixed method studies*. Systematic and scoping reviews, meta-analyses,
198 commentaries, grey literature, and dissertations were excluded from data analysis.

199 ***Study selection***

200 The search was initiated in March 2020 and ended in June 2020. The following
201 databases were searched: SPORTDiscus, PsychINFO, CINAHL, and MEDLINE. These
202 databases were chosen because their scopes were most closely aligned with the research
203 question and aims of this review and they have been used in recent reviews of a similar
204 nature (Kuettel & Larsen, 2019; Rice et al., 2016). In addition to the identified databases,
205 academic journals, reference lists, and previous reviews were manually searched.

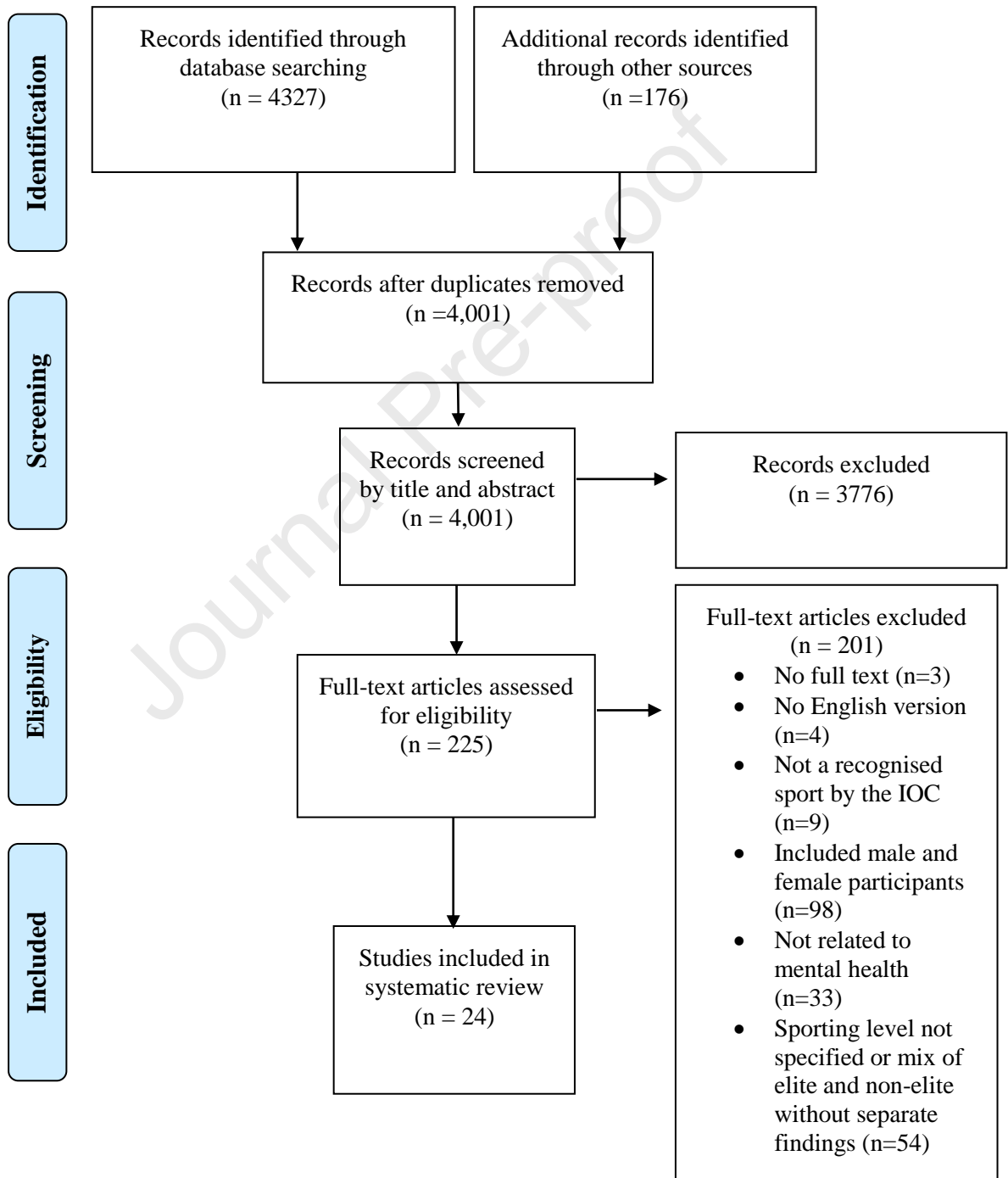
206 The search terms spanned four core categories: *gender* (female or woman), *mental*
207 *health* (e.g. mental health or mental illness or mental wellbeing), *competition level* (e.g. elite
208 or international) and *sport* (sport or athlete). We decided to include four specific mental
209 health disorders as search terms (depression, anxiety, eating disorders/disordered eating, and
210 substance abuse) given the focus on these disorders in past reviews (Rice et al., 2016). Due
211 to the ambiguous conceptualisation of mental illness and mental health in sport research, and
212 the broad research question outlining this review, we included ‘mental wellbeing’ as a search
213 term as it sometimes used interchangeably with ‘mental health’ in the sport literature (see
214 Breslin et al., 2017; Kuettel & Larsen, 2019; Rice et al., 2018). For a full example of the
215 search terms we used, please see the appendix.

216 Screenings of the four databases were performed in three phases, at the beginning,
217 middle and end of the process (see Levac et al., 2010). First, titles and abstracts of identified
218 articles were screened by the first author with the aim of eliminating those studies that did not
219 meet the predefined eligibility criteria. Following this, full texts of the potential studies for
220 inclusion in the review were screened for eligibility by the first and second author
221 independently. Following the completion of article screening, the co-authors came together to
222 critically discuss findings. Finally, the third author completed a full-text screening of those
223 articles that were deemed eligible. Following study selection, the research team mapped key
224 findings, identified gaps in existing literature, and charted the data. Data charting involved

225 recommendations from Arksey and O'Malley (2005) and included: year of publication, study
 226 aim/purpose, characteristics of study populations (e.g. sporting level, sport-type), type of
 227 design, measurements used, identification of theory, key findings, and limitations.

228 **Figure 1. Prisma Flow Diagram**

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232 **Results**

233 The search yielded a total of 4,327 records. After removing the duplicates, 4,001
 234 articles were screened for eligibility by title and abstract. Then, 3,776 were excluded and the
 235 remaining 225 full text articles were assessed for eligibility. Following the full text review,
 236 201 articles were excluded leaving 24 to be included in this review.

237 **[INSERT TABLE 1.]**

238 *Study characteristics*

239 Of the twenty-four studies, eleven (45.8%) were conducted in the United States, three
 240 (12.5%) in the United Kingdom, two (8.3%) in Australia, two (8.3%) in Norway, two (8.3%)
 241 in Germany and finally one (4.2%) study was conducted in Poland. The remaining three
 242 (12.5%) studies did not indicate a country. The participants ranged from thirteen to thirty
 243 years of age, with twenty-two (92%) of the studies including participants between the ages of
 244 sixteen and twenty-six, and the sample size varied from one participant (case study) to nine
 245 hundred and thirty-eight participants.

246 With regards to competition level, eleven studies (45.8%) included NCAA D1
 247 student-athletes, and eleven studies (45.8%) included professional, national, international,
 248 and provincial athletes. Only one study (4.2%) included elite athletes defined through
 249 ambiguous terminology. Between one and fifty-eight different sports were explored across
 250 the studies. More specifically, ten studies included only one sport, nine studies included two
 251 to ten sports, and four studies included ten or more sports. The most commonly studied sports
 252 were football (or ‘soccer’ if referring to studies in the USA) (n=11), swimming/diving
 253 (n=10), track and field (n=8), volleyball (n=8), basketball (n=8), gymnastics (n=9), and
 254 running (n=8).

255 *Study design and instrument*

256 In this review, a large proportion of the included studies (83.3%) used quantitative
257 methods and self-report measures. Moreover, nineteen (95.8%) of the quantitative studies
258 employed singular cross-sectional designs whereas only one study (4.2%) used a longitudinal
259 design (Anderson, Petrie, & Neumann, 2012). In using a longitudinal research design, the
260 researchers were able to examine the influence of sport pressures, body dissatisfaction, and
261 dietary restraint across a 5-month competitive season.

262 A total of four studies (16.6%) employed qualitative research methods. Two of which
263 used semi-structured interviews (Kroshus, Goldman, Zubzanksy, & Austin, 2014; Stirling &
264 Kerr, 2012), one used a life history approach (Papathomas & Lavalley, 2014), and the final
265 qualitative study utilized a mix of phenomenological interviews and ethnographic research
266 methods (de Bruin & Oudejans, 2018).

267 A total of thirty-four validated scales were used in the twenty quantitative studies (see
268 Table 2. for a list of the scales). Eighteen studies (75%) utilized scales to explore eating
269 disorders (ED)/disordered eating (DE), with three scales appearing frequently: the Bulimia
270 Test Revised (BULIT-R; Thelen et al., 1984) (included in four studies), the Eating Disorder
271 Inventory (EDI; Garner, 1982) (included in four studies) and the Eating Attitudes Test (EAT-
272 26; Garner, 1982) (included in six studies). Five studies used validated body satisfaction
273 measures, four of which used the Body Parts Satisfaction Scale–Revised (BPSS-R; Petrie &
274 Austin, 1997), and three studies used the Weight Pressures in Sport for Females (WPS-F;
275 Reel et al., 2010). Notably, the WPS-F was the only sport-specific measure used in the
276 studies included in this scoping review. In addition to body satisfaction measures, three
277 studies used the Social Physique Anxiety Scale (SPAS; Hart, Leary, and Rejeski, 1989). Two
278 studies explored depression and/or anxiety using the Centre for Epidemiologic Studies
279 Depression Scale (CES-D; Radloff, 1977), the General Anxiety Disorder scale (GAD-7;
280 Spitzer, 2006), or the Beck Depression Inventory (BDI; Beck et al., 1961).

281 *Use of theory*

282 The majority of studies did not specify whether a theoretical framework informed the
283 study objectives or the design, implementation or evaluation of programs or interventions.
284 One intervention, grounded in dissonance theory, featured in this review and aimed to reduce
285 eating disorder symptomology (Smith & Petrie, 2008). Of the studies that did specify the use
286 of theory in the rationale, two studies (Anderson, Petrie & Neumann, 2011; Anderson, Petrie,
287 & Neumann, 2012) employed and tested the Petrie and Greenleaf (2007) Sociocultural
288 Model. The sociocultural model was created by Petrie and Greenleaf (2007) to identify
289 potential mediators and moderators that shape an athlete's experiences of sport and non-sport
290 specific pressures regarding weight, body, appearance and eating, and the development of ED
291 symptoms.

292 One study (Wilinski, 2012) utilized two theories, the Gender Schema Theory (Bem,
293 1981) and the Body Conceptualization Theory (Franzoi, 1995) to explore the relationship
294 between gender identity and depression in female footballers. Torstveit, Rosenvinge, &
295 Sundgot-Borgen (2008) used the Female Athlete Triad (see Yeager et al., 1993) to explore
296 stress fractures and eating disorders in soccer players which allowed the researchers to show
297 female footballers were at more of a risk for stress fractures than previously believed.
298 Additionally, Papatomas and Lavallee (2014) used Narrative Theory to analyse and
299 understand the life experiences of an elite female athlete engaging in self-starvation.

300 One study used the Contextual Body Image Framework to inform their rationale (de
301 Bruin & Oudejans, 2018); the contextual framework perceives body image as a multifaceted
302 reactive concept (Loland, 1999). In this study they found that for some athletes' negative
303 body evaluations were only present in the sport context whereas in daily life they were
304 satisfied with their bodies and did not compare themselves with others. For other athletes, the
305 researchers found negative body evaluations existed in both their daily life and sport which

306 indicated that elite sport represented a “high-risk culture” that overemphasized body and
307 weight (de Bruin & Oudejans, 2018).

308 ***Research purpose***

309 The aim of each individual study is stated in Table 3. The studies in this scoping
310 review focused on: (1) *mental illness*, (2) *elite female athletes competing in ‘lean-physique’*
311 *sports*, (3) *the elite sporting environment and mental illness*, and (4) *intervention, theory,*
312 *measures, methods.*

313 **Mental illness.** The majority of studies were quantitative and focused on the presence
314 or absence of mental illness amongst elite female athletes. The qualitative publications
315 focused on female athletes’ subjective experiences of mental illness, specifically, ED/DE at a
316 personal, social and cultural level. There was a heavy focus on the prevalence of ED/DE
317 across the studies included in this review. Eighteen of the twenty quantitative studies (90%)
318 focused on ED/DE whereas only two of the twenty quantitative studies (10%) explored the
319 prevalence of depression and anxiety.

320 The majority of the quantitative studies also explored one of, or a combination of the
321 following factors; physique or social physique anxiety (Hasse, 2009; Hausenblas & Mack,
322 1999), pathogenic weight behaviours (Greenleaf et al., 2009; Torres-McGhee et al., 2011),
323 body image (Anderson, Petrie, & Neumann, 2012; Hulley & Hill, 2001; Torres-McGhee et
324 al., 2011), body (dis)satisfaction (Anderson, Petrie, & Neumann, 2011; Anderson, Petrie, &
325 Neumann, 2012; Brannan et al., 2009; Kong & Harris, 2015; Smith & Petrie, 2008), thin-
326 internalization (Smith & Petrie, 2008), sexual harassment (Sundgot-Borgen et al., 2003),
327 academic status (Torres-McGhee et al., 2011), personality traits/qualities (e.g. perfectionism)
328 (Brannan et al., 2009), psychosocial skills (e.g. emotional regulation) (Shriver, Wollnberg,
329 & Gates, 2016), stress fractures and menstrual dysfunction (Prather et al., 2016), societal

330 ideals (Anderson, Petrie, & Neumann, 2011; Anderson, Petrie, & Neumann, 2012; Kong &
331 Harris, 2015) and gender identity (Wilinski, 2012).

332 **Elite female athletes competing in ‘lean-physique’ sports.** Eleven studies (45.8%)
333 specifically explored ED/DE in elite female athletes competing in ‘at-risk’ sports such as
334 those that are ‘appearance-based’ or require a ‘lean-physique’ (e.g. gymnastics and running)
335 (Anderson, Petrie & Neumann, 2011; Anderson, Petrie, & Neumann, 2012; de Bruin &
336 Oudejans, 2018; Hulley & Hill, 2001; Kroshus et al., 2014; Kroshus, Kubzansky, Goldman,
337 & Austin, 2015; Klinkowski, et al., 2008; Kong & Harris, 2015; Shriver, Wollnberg &
338 Gates, 2016; Torres-McGhee et al., 2011; Torstveit et al., 2008). Three of the twelve studies
339 explored and compared the presence of ED symptomology in athletes who compete in
340 ‘leanness’ and ‘non-leanness’ sports (Kong & Harris, 2015; Shriver, Wollnberg, & Gates,
341 2016; Torstveit et al., 2008). A further study explored the prevalence of ED/DE in elite
342 female athletes competing in individual versus team sports (Hasse, 2009).

343 **The elite sporting environment and mental illness.** Three studies focused on
344 comparing the prevalence of mental illness between elite female athletes and various other
345 populations (e.g. recreational athletes or the general female population) to gain insight into
346 the elite sporting environment/culture (Hausenblas & Mack, 1999; Kong & Harris, 2015;
347 Sundgot-Borgen et al., 2003). For example, Kong and Harris (2015) investigated body image
348 perceptions of women in sporting and non-sporting contexts to explore how the sporting
349 environment may positively or negatively influence body image and mental health. In
350 relation to this, a further three studies explored the influence of the elite sport environment on
351 the development of eating disorders through lived experiences (de Bruin & Oudejans, 2018;
352 Papathomas & Lavallee, 2014; Stirling & Kerr, 2012).

353 **Intervention, theory, measures, methods.** One study extended the work of Stice et
354 al. (2000) and tested their three-session cognitive dissonance program among elite female

355 athletes to reduce the risk of disordered eating (Smith & Petrie, 2008). Another study aimed
356 to test and further develop a theory/model/framework to examine the appropriateness of the
357 Sociocultural Model of DE by Petrie and Greenleaf (2007) (Anderson, Petrie, & Neumann,
358 2011). A further study developed, proposed, and evaluated the reliability and validity of an
359 athletics-oriented measure of psychological predictors of DE (Hinton & Kubas, 2005). Two
360 studies aimed to highlight the importance of using qualitative methods to gain insight into
361 elite female athletes' subjective experiences of mental illness in elite sport (de Bruin &
362 Oudejans, 2018; Papathomas & Lavalley, 2014). For example, Papathomas and Lavalley
363 (2014) used a life history methodology to attain an in-depth understanding of how the
364 'performance narrative' shaped a female athlete's personal experiences of DE in sport.

365 **Discussion**

366 Our scoping review provides an overview of research aims, methods, and theories that
367 have been used in studies focused exclusively on elite female athletes and mental health or
368 mental illness. In this section the study characteristics, research purpose(s), study design,
369 methods, measurements, and use of theory are critically discussed and recommendations for
370 future research are presented. In the concluding section, several additional avenues for future
371 studies are offered. To guide this discussion and further interpret the findings, we used a
372 gender lens to highlight specific gender-related issues.

373 ***Study characteristics***

374 **Variety of sports.** A variety of sports were researched across the included studies
375 (see Table 4 for a full list of the sports that appeared in this review). Over half of the studies
376 (65%) involved more than two sports (e.g. gymnastics, swimming and athletics), allowing us
377 to attain a broad insight into mental health across a wide range of sports. Concurrently, the
378 breadth of sports explored in a number of the studies was also a methodological weakness
379 due to the limited sport-specific insight provided. Each sport contains its own unique risk

380 factors that impact mental health and mental illness (Castaldelli-Maia et al., 2019). However,
381 the vast majority of the studies in this review overlooked sport-specific risk factors. One
382 study provided insight into risk factors specific to gymnastics (Anderson, Petrie, & Neumann
383 2012) and findings revealed that the uniforms required for gymnasts heighten their
384 susceptibility for body image concerns. Beyond this, the included studies did not provide
385 insight into risk factors specific to any one sport. Since mental health interventions and
386 awareness/education programs should be tailored to sport-specific demands (Breslin et al.,
387 2017), future research is needed to explore the risk factors related to each individual sport.

388 **Competition level.** The study samples varied in competition level due to
389 inconsistencies in the definition of ‘elite’ athletes (Kuettel & Larsen, 2019; Swann et al.,
390 2015). For example, Prather et al. (2016) identified both professional female athletes and
391 NCAA D1 female student-athletes as ‘elite participants’. Findings suggested that NCAA D1
392 female soccer players were at a significantly higher risk for an eating disorder (17.4%) when
393 compared with professional players in the USA (6.1%), however, no further insight was
394 provided as to why there is a significant statistical difference between these two sub-
395 categories of ‘elite athletes’. This example demonstrates the need for more targeted research
396 to better understand an individual’s experiences of mental health and mental illness across
397 various competition levels and the elite athlete spectrum.

398 The definitional inconsistencies of ‘elite athlete’ made comparison between findings
399 difficult. If researchers could refer to a universal definition of ‘elite’, that accurately covers
400 all gender and sport types across the world, comparing findings would be made easier. This is
401 supported by Swann et al. (2015), however, significant economical, societal, sociocultural,
402 and environmental differences in sport across different continents present a significant barrier
403 to adopting such a universal definition. Perceptions of ‘elite’ are likely to be based on male
404 sport due to its hegemonic status thus, in research concerning elite female athletes, defining

405 'elite' is particularly important in order for accurate insight and comparisons to be made
406 (Schell & Rodriguez, 2000). We recommend that future researchers provide a clear rationale
407 and description of the competition level of their research subjects in the context of their
408 studied sport(s). This would allow for findings to be more easily compared and more accurate
409 conclusions to be drawn.

410 **Country.** The largest proportion of studies were conducted in the USA (45.8%),
411 which allowed insight into elite female athletes in the USA and particularly those competing
412 at the NCAA D1 level. However, more research is needed to explore mental health and
413 mental illness amongst elite female athletes in countries and cultures beyond the USA. More
414 specifically, it is necessary to explore the mental health or mental illness experiences of elite
415 female athletes living and competing in non-western societies given that different risk factors
416 are likely to exist (e.g. acceptance of women's sport) (Castaldelli-Maia et al., 2019).

417 Differences in levels of professionalisation between countries will also likely result in
418 athletes having vastly different experiences of mental health (Castaldelli-Maia et al., 2019).
419 For instance, female athletes competing in countries and/or sports with lower levels of
420 professionalization are more likely to experience financial strain and encounter poorer injury
421 management, which may in turn negatively impact their mental health and increase risk of
422 mental illness (Castaldelli-Maia et al., 2019; Moesch, Mayer, & Elbe, 2012). Even in
423 countries where elite female athletes are relatively well-supported (e.g. USA), elite female
424 athletes receive substantially poorer quality training resources, lower pay, less mainstream
425 mass media attention, and fewer sponsorship opportunities in comparison to elite male
426 athletes (Allison, 2020). For example, in the USA, 5% to 8% of sport media coverage is
427 focused on women's sports even though women account for 40% of sports participation
428 (Hardin & Greer, 2009). The lack of media attention and subsequent sponsorship deals only
429 furthers the financial strain and disparity in pay that often accompanies being a professional

430 female athlete. This often forces these athletes to engage in some form of alternative paid
431 employment in addition to their elite sporting career and training (Allison, 2020; Culvin,
432 2019). These resource related factors may negatively impact mental health and warrant
433 consideration for future research (Castaldelli-Maia et al., 2019; Culvin, 2019). Taken
434 together, it is important for future research to explore the mental health experiences of
435 athletes in a range of cultural contexts to develop a more nuanced understanding of mental
436 health and deliver culturally informed mental health support services.

437 ***Research purpose(s)***

438 **A narrow focus on mental illness.** Twenty studies (83.3%) utilizing quantitative
439 methods explored the presence or absence of mental illness. More specifically, of the
440 quantitative studies, eighteen studies (90%) focused on assessing ED/DE prevalence. In the
441 qualitative studies, the focus was centred upon better understanding how contextual and
442 cultural influences shape elite female athletes' experiences of ED/DE. The narrow focus on
443 ED/DE is particularly surprising considering researchers have evidenced females are at a
444 heightened risk compared to males for all types of mental illness (Kuettel & Larsen, 2019;
445 Rice et al., 2016). Thus, we recommend more research is conducted with this population to
446 explore other types of mental illness.

447 **Limited risk factors explored.** In relation to the studies exploring ED/DE, the most
448 commonly explored risk factor was 'sport-type.' More specifically, twelve studies (50%)
449 focused on elite female athletes competing in 'aesthetic/appearance-based' or 'lean-physique'
450 sports (e.g. dance, figure skating, long-distance running). This sub-population of elite female
451 athletes is considered 'vulnerable' for ED/DE given the pressures they face around body,
452 weight, eating, and performance from coaches, teammates, judges, and the media (Anderson,
453 Petrie, & Neumann, 2011; Anderson, Petrie, & Neumann, 2012; Kong & Harris, 2012).
454 Additionally, researchers in the included studies claimed 'lean-physique' athletes are at a far

455 greater risk for ED/DE than elite female athletes who compete in power-based sports where
456 the focus tends to be on more masculine qualities such as strength and muscularity (e.g.,
457 football, field hockey, rugby). However, only one study showed ‘lean-physique’ athletes to
458 be at an increased risk for ED/DE when compared with elite female athletes who compete in
459 power-based sports (Kong & Harris, 2012).

460 Assumptions that elite female athletes competing in power-based sports are less
461 objectified or impacted by ideals of emphasized femininity are misguided and problematic
462 (Connell & Messerschmidt, 2005). The two studies (see de Bruin & Oudejans, 2018; Shriver,
463 Wollenberg, & Gates, 2016) that support this claim also suggested that females who compete
464 in non-traditionally gendered sports (power-based and/or contact sports) will face unique
465 challenges in relation to their body type/image and gender identity. Individuals who compete
466 in power-based sports are likely required to develop muscular bodies in pursuit of sporting
467 success. These body types may clash with societal determinations of the ‘feminine ideal’ and,
468 thus, related insecurities might influence the onset of ED/DE (de Bruin & Oudejans, 2018;
469 Krane, 2001). Elite female athletes competing in power-based sports (e.g. female footballers
470 in England) have reported feeling that their bodies are under constant scrutiny as they are
471 constantly tasked with the responsibility of promoting/conforming to a brand image that
472 emphasizes femininity (Culvin, 2019). We recommend future research specifically exploring
473 ED/DE with elite female athletes include sports beyond just ‘lean-physique’ athletes.

474 In addition to sport-type, several studies explored personality characteristics and/or
475 social physique anxiety (SPA) as risk factors for ED/DE (Brannan, Petrie, Greenleaf, Reel, &
476 Carter, 2009; Hausenblas & Mack, 1999; Haase, 2009; Klinkowski, Korte, Pfeiffer,
477 Lehmkuhl, & Salbach-Andrae, 2007). Sport scholars have found that certain personality
478 characteristics (e.g. perfectionism) might lead to an obsessive focus on improving personal
479 eating habits which in turn might result in the onset of ED/DE (Klinkowski, Korte, Pfeiffer,

480 Lehmkuhl, & Salbach-Andrae, 2007). Person-specific risk factors such as personality traits
481 can contribute to disordered eating behaviours. This viewpoint, however, is overly simplistic
482 and constitutes ED/DE as an individual pathology whilst neglecting various social, cultural,
483 and environmental factors that are also likely to contribute to an athlete's experiences of
484 ED/DE (Busanich, McGannon, & Schinke, 2012; Papathomas & Lavallee, 2012; Papathomas
485 & Lavallee, 2014). Moreover, the literature concerning ED/DE and elite female athletes is
486 almost entirely made up of prevalence studies and focused on person-specific risk factors.
487 Consequently, current insight and future advances in this area of research is severely limited
488 (Papathomas & Lavallee, 2012).

489 The over-exploration of person-specific risk factors in the ED/DE literature and the
490 overuse of prevalence studies is limiting given eating disorders are a consequence of various
491 combinations of biopsychosocial factors which are not easily, or appropriately, explored
492 using quantitative methods (Breuner, 2010; Papathomas & Lavallee, 2012). To address this
493 limitation, experts in sport and eating disorder research have suggested a focus on individual
494 circumstances and real experiences of elite female athletes to obtain a deeper insight
495 (Papathomas & Lavallee, 2012). To this end, researchers should diversify their methodology
496 by utilising qualitative methods, such as narrative inquiry, to allow for interpretive insight
497 (Papathomas & Lavallee, 2012; Papathomas & Lavallee, 2014). Taken together, we
498 recommend future studies exploring ED/DE with elite female athletes explore a variety of
499 psychosocial risk factors and transition periods (e.g. caring responsibilities, injury, financial
500 strain, de-selection) and/or utilize different methodological approaches to gather insight into
501 elite female athletes personal experiences.

502 *Study design, methods & measurements*

503 **Study design.** Twenty-three studies (95.8%) used a cross-sectional research design
504 and twenty studies (83.3%) used self-report data collection. A cross-sectional research design

505 is valuable for gathering insights into athletes' mental health at one moment in time. Several
506 studies have suggested a longitudinal research design would be advantageous for future
507 research as it would allow for a deeper understanding of existing patterns and insight into
508 sociocultural and contextual factors that influence elite female athletes' experience with
509 mental health and mental illness (Anderson, Petrie, & Neumann, 2011; Brannan, et al., 2009;
510 Haase, 2009; Torstveit, Rosenvinge, & Sundgot-borgen, 2008). Yet, only one study used a
511 longitudinal research design (Anderson, Petrie, & Neumann, 2012; Haase, 2009). Anderson
512 et al. (2012) assessed the stability and influence of sport pressures, body satisfaction, and
513 dietary restraint over a 5-month season, findings demonstrated that athletes' body satisfaction
514 stayed stable over the entire season. We recommend that future studies employ longitudinal
515 research design when possible as it provides insight into the progression and stability of
516 various risk factors that influence elite female athletes' experiences with mental health and
517 mental illness.

518 **Methods.** Twenty studies (83.3%) utilized quantitative methods and only four studies
519 (16.6%) utilized qualitative methods. The studies that employed qualitative methods allowed
520 for a more holistic understanding of the sociocultural and environmental factors of the
521 sporting environment that impacted the elite female athletes' experience of mental health or
522 mental illness (e.g. de Bruin & Oudejans, 2018; Papathomas & Lavaelle, 2014). For example,
523 all participants in the qualitative study conducted by de Bruin and Oudejans (2018) believed
524 the sporting environment was a 'high risk' culture and it influenced their susceptibility to
525 poor mental health. Peer influence was noted as a factor influencing many athletes'
526 experiences of body dissatisfaction and DE behaviours (de Bruin & Oudejans, 2018). These
527 insights illuminated the importance of conducting future research that aims to better
528 understand the role of macro and micro stakeholders in shaping athletes' experiences of
529 mental health and mental illness. This holistic understanding will enable applied practitioners

530 to create mental health programs and/or interventions that target influential others (e.g.
531 teammates and coaches). We suggest that studies exploring highly personal topics such as
532 mental health and ED/DE are best explored through qualitative methods such as unstructured
533 interviews (Papathomas & Lavaelle, 2014). Such methods provide athletes with the
534 opportunity to talk freely about their unique and deeply personal experiences as opposed to
535 restricting them to Likert scale type questions (Eklund et al., 2011; Papathomas & Lavelle,
536 2012). Additionally, depending on the research question, we propose that mixed-method or
537 multi-method approaches will allow for numeric interpretation and a more holistic
538 understanding than would be possible through using quantitative methods alone (Papathomas,
539 Petrie, & Plateau, 2018).

540 **Measurements and screening tools.** There is general uncertainty around the most
541 appropriate measures to use when exploring mental health and mental illness within the elite
542 female athlete population. We found thirty-four validated measures employed in this review
543 alone (see table 3 for a list of the screening tools that were used). Researchers often used
544 different measures to identify the prevalence of the same disorders. For example, eight
545 different measures were used to explore ED/DE prevalence. The use of different measures to
546 study the same phenomenon can make accurate comparisons across different research studies
547 more difficult than necessary (Poucher et al., 2021). The most commonly used measure was
548 EAT-26 (Garner, 1982) which was used in five studies. Torres-McGhee et al. (2011)
549 identified their use of EAT-26 as a limitation given this measure often results in false-positive
550 high EAT-26 scores and does not allow for any contextual insight. Overall, the large variety
551 of screening tools found in this review and the lack of consistent measures evidences the
552 difficulties in choosing appropriate mental health screening instruments to use with elite
553 female athletes (Pope et al., 2015). Due to the unique psychological, social, and biological
554 demands placed on athletes, it may be more appropriate to utilize questionnaires that are

555 tailored towards athletes and validated for different competition levels (e.g. grassroots,
556 recreational, sub-elite, elite) (Knapp, Aerni, & Anderson, 2014).

557 The Weight Pressures in Sport Questionnaire (WPS-F), one such validated athlete-
558 specific questionnaire, was used in three of the studies. The findings from the three studies
559 that utilized the WPS-F identified female athletes felt the most pressures around weight from
560 teammates (36.8%), uniforms (34.3%), and coaches (33.8%) (Reel, Soohoo, Petrie, et al.,
561 2010). The use of the WPS-F in three studies allowed us to draw links between these findings
562 and the qualitative findings whereas the other screening tools featured did not allow for the
563 same level of insight. For example, the results from the WPS-F are similar to the qualitative
564 findings in the study by de Bruin and Oudejans (2018). In that study, participants indicated
565 that weight-pressures were most heavily influenced by their coach, teammates, and other
566 sport-specific environmental factors (e.g. sports attire) (de Bruin & Oudejans, 2018). Thus,
567 we argue it is critical that coaches recognize the power they have over athletes and remain
568 aware of their possible impact on elite female athletes' experiences with ED/DE (de Bruin &
569 Oudejans, 2018). Two additional studies indicated that the way in which coaches verbally
570 communicate about food impacts how team members communicate about the same topics
571 amongst one another. Depending on how such topics are communicated within a team, this in
572 turn impact how an elite female athlete experiences ED/DE (Kroshus, Goldman, Zubzansky,
573 & Austin, 2014; Kroshus, Kubzansky, Goldman, & Austin, 2015). Given the impact coaches
574 have on athletes' experiences with ED/DE, there is a need for future research to design and
575 evaluate mental health education programs for coaches and teammates.

576 Measurements suggested by the International Olympic Committee (IOC) in their
577 Sport Mental Health Assessment Tool 1 (SMHAT-1) and Sport Mental Health Recognition
578 Tool 1 (SMHRT-1) (Gouttebauge et al., 2020) should be considered in future research.
579 Several of the measurements provided in these tools are specifically designed for the athlete

580 population (e.g. 'Brief Eating Disorder in Athletes Questionnaire'). This has the potential to
581 elicit valuable insight that could not be discovered in questionnaires made for the general
582 population. Another questionnaire that might be considered in future research is the Athlete
583 Psychological Strain Questionnaire (APSQ) designed by Rice et al. (2019) to measure
584 psychological stress amongst elite athletes (Rice et al., 2020). This has been validated
585 amongst 1,093 elite athletes, yet only eighty-four were females (Rice et al., 2020).

586 *Theory*

587 We charted the use of theory to rationalise and inform study objectives, and in
588 designing, implementing, and evaluating programs or interventions. As a result, the studies in
589 this review rarely mentioned theory in their rationale, which is unsurprising given much of
590 the research in sport is atheoretical (Sabiston et al., 2019). Theory is more likely to be utilized
591 in designing mental health interventions than in prevalence studies, therefore the lack of
592 theory included in this review may be a result of the lack of interventions included (Smith &
593 Petrie, 2008). The intervention by Smith & Petrie (2008) showed that cognitive-based
594 interventions may be useful in reducing DE symptomology, however, such interventions will
595 need to be redesigned to address important issues and factors that are unique to female
596 athletes and the elite sport environment. In order to effectively design and then evaluate
597 future mental health interventions in relation to their planned outcomes, researchers should be
598 able to refer back to the underpinning theory (Breslin et al., 2017).

599 *Future directions*

600 Expanding on the recommendations made in the aforementioned sub-sections, there
601 are several considerations for future research concerning mental health in elite female
602 athletes. These considerations emerged as a direct consequence of the results in this scoping
603 review and focus primarily on research aims to be explored. In addressing each of these

604 considerations we believe that a more holistic and detailed understanding of the mental health
605 of elite female athletes will be attained.

606 Researchers looking to explore elite female athletes and mental illness, particularly
607 ED/DE, should look to diversify their research methodology and extend their population
608 beyond ‘lean-physique’ athletes. Currently there is a narrow focus on ‘lean-physique’
609 athletes, body image and personal risk factors within ED/DE research. The assumption that
610 elite female athletes only suffer from ED/DE due to internalized pressures from society
611 around what they ‘should’ look like and personal risk-factors (e.g. personality traits) is overly
612 simplistic. Instead, a deeper understanding of elite female athletes’ experiences with ED/DE
613 is needed. Elite female athletes are susceptible to other types of mental illness beyond
614 ED/DE. Future research should explore elite female athletes’ experiences of different mental
615 illnesses (e.g. depression, anxiety, addiction) both as distinct entities but also in tandem as
616 mental illnesses are often comorbid (Wells et al., 2020).

617 Studies in this review identified the positive and negative role coaches and teammates
618 can play in elite female athletes’ experiences with ED/DE. Researchers should consider
619 exploring how support and performance staff and teammates can positively influence mental
620 health and better support athletes with mental illness. Researchers may first look to explore
621 mental health literacy, stigma, and help-seeking behaviours amongst elite female athletes
622 before designing programs and interventions targeted at coaches and teammates (Junge &
623 Prinz, 2017). As noted by Castaldelli-Maia et al. (2019), help-seeking behaviours may be
624 impacted by cultural factors including gender norms, sexuality, country, and age. However,
625 the included studies rarely focused on cultural factors and no studies directly explored mental
626 health help-seeking behaviours among elite female athletes. As identified by Castaldelli-Maia
627 et al. (2019), elite female athletes are often stereotyped as lesbian which may negatively
628 impact mental health and influence help-seeking behaviours. Exploring elite female athletes’

629 experience of sexuality and the possible mental health implications is a novel place to start.
630 This is especially important given research into the general population demonstrates that
631 individuals identifying as lesbian can experience higher rates of poor mental health and
632 mental illness (Herek & Garnets, 2007; Meyer, 2003). Taken together, more research into
633 elite female athletes and their experiences of mental health and mental illness are needed
634 before we can properly provide support for this vastly under researched population.

635 **Strengths and Limitations**

636 We believe that the following four limitations are appropriate given the objectives of
637 this scoping review. Firstly, the broad nature of the research question resulted in a wide scope
638 of studies incorporating elite female athletes to be included. Secondly, although all
639 participants fell within the blanket term ‘elite’, their level of competition varied due to
640 definitional inconsistencies. From the findings, we suggest that there are different risk factors
641 for poor mental health and mental illness across the spectrum of ‘elite’ competitors. Thirdly,
642 we did not include studies that involved males and females given our exclusive focus on elite
643 female athletes. Inclusion of studies with both genders may have allowed for a more balanced
644 view, however, that was not the intention of this review. Often research that includes both
645 male and female respondents tends not to draw out the specificities of women’s experiences.
646 Consequently, female-specific data can get subsumed under men’s which further limits the
647 already scarce insight that is available. Further, given the way that sport tends to be organised
648 separately, along binary lines (male or female), female athletes will likely have specific
649 issues and difficulties that may differ from those of male athletes. Finally, the quality of
650 study design was not assessed as the purpose of such a review is breadth opposed to depth of
651 information on a specific topic (Tricco et al., 2016).

652 **Conclusion**

653 The main findings from this scoping review highlight the need for greater
654 methodological diversity to advance our conceptual and theoretical understanding of elite
655 female athletes' experiences of mental health and mental illness. The restricted sample
656 population of USA collegiate athletes, overreliance on quantitative methods, and heavy focus
657 on ED/DE prevalence demonstrates an ongoing need for sport scholars to expand their
658 research samples, methods, and aims. More specifically, our scoping review highlights the
659 narrow focus on aesthetics, body satisfaction, and personal-risk factors used in determining
660 the nature of the research questions explored in elite female athlete populations. Further, the
661 almost exclusive use of quantitative methods and screening tools has restricted insight into
662 mental health and mental illness amongst this population to numeric interpretations and
663 prevalence rates. In order to better support this population, in-depth longitudinal research
664 exploring the social, cultural, and environmental factors that contribute to athletes'
665 experiences of poor mental health and mental illness is warranted. Designing appropriate
666 support programs for elite female athletes requires utilising qualitative research methods in
667 future studies. In adopting such methods, a more holistic understanding of the lived
668 experiences of elite female athletes in relation to mental illness and mental health will be
669 attained. Such a holistic understanding will allow for effective interventions and education
670 programs to be designed for coaches, teammates, other members of the sporting environment,
671 and athletes themselves.

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- 933
- 934

Appendix

Example of Search 1: SPORTDiscus (EBSCO) (Conducted 03/2020)

1. clinical OR counsel* OR help-seeking OR help seeking OR mental health care OR mental health disorder* OR mental health service* OR mental health stigma* OR mental health sympt* or mental* ill* OR mental* tough* OR mental well* OR psyc* assistance OR psych* help OR psych issue* OR psych* support* OR psych* service* OR psych* therap* OR psych* well* OR depression OR anxiety OR disordered eating OR eating disorder OR substance abuse

AND

2. elite OR elite-level OR elite level OR high level OR high-level OR professional OR national OR international

AND

3. sport* OR athlete*

AND

4. female* OR wom?

Figure 1. Prisma flow Diagram (This has been moved to the manuscript and numbers are updated)

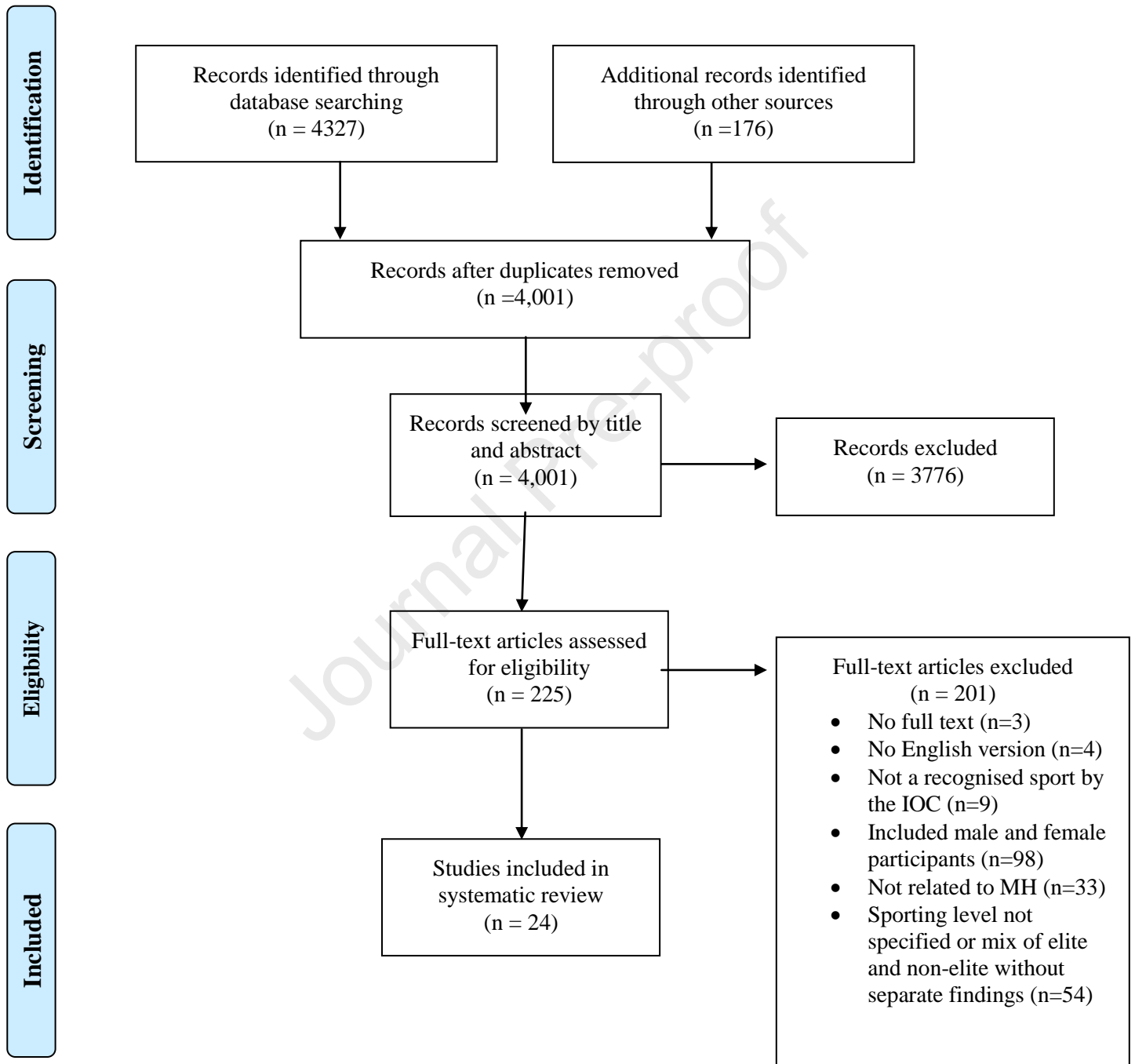


Table 1. Scoping review included articles *(Chart is updated to include study #13)

Author & year of publication	Aim/Purpose	Participant demographics, sporting level, sport-type, and country	Study design & Measurers and/or Interview style	Use of Theory	Key Findings	Limitations
Anderson, Petrie, & Neuman (2011)	Examine Petrie and Greenleaf's model in a large diverse sample of female collegiate swimmers and gymnasts.	414 <i>M</i> =19.14 NCAA D1 Swimmers & Gymnasts United States	Quantitative Cross-sectional Demographics (age, race, height, weight, ideal weight, year in school, current/past ED, menstrual history, Sport and Weight Pressures (WPS), General Sociocultural Pressures (PSPS), Internalization (SATAQ-3), Body Satisfaction BPSS-RR & BSQ-10), Dietary restraint (DIS), Negative affect (PANAS-X), Modelled Behaviours, Bulimic Symptoms (BULIT-R), Social Desirability (MCSD)	Petrie and Greenleaf (2007) model.	Initial test of the Petrie & Geenelaf 2007, model revealed poor fit, but once pathways from sport pressures to body satisfaction, sport pressures to dietary restraint and from body satisfaction to bulimic symptomology, model's fit greatly improved. Model showed sport pressures were directly related to body dissatisfaction and dietary restraint. Negative affect, body dissatisfaction and restrained eating explained 55-58% of the variance in the athlete's bulimic symptoms.	-Self-report. -Cross-sectional - Generalizability: limited to similar groups of athletes (gymnasts and swimmers and divers).
Anderson, Petrie, & Neuman (2012)	Longitudinally explore, using a cross lagged model, the pathways between sport	325 <i>M</i> =19.24 <i>SD</i> =1.14 NCAA D1 Gymnast &	Quantitative Longitudinal Demographics, Sport Pressures (WPS), Body Satisfaction	Petrie & Greenleaf's sociocultural	All variables were stable across the 5-month season; DR r and BD are the best predictors	-No limitations mentioned in this study.

	environment pressures about appearance, body and weight in female athletes' body satisfaction and self-reported intentions	Swimmers/ Divers United States	(BPSS-R) Dietary restraint (DIS & 10-item DRES)	model of disordered eating.	of future. Variability stability suggests female athletes train and compete in an environment where they are constantly forced to focus on their bodies, eating and weight. Findings sport pressures from coaches and teammates may influence the athletes body satisfaction.	
Brannan, Petrie, Greenleaf, Reel, & Carter (2009)	Explore and extend past research exploring weather perfectionism, optimism, self-esteem and reason for exercise moderated the relationship between body dissatisfaction and bulimic symptoms among female athletes.	204 <i>M</i> = 20.16 <i>SD</i> =1.31 NCAA Division 1 Various Sports United States	Quantitative. Cross-sectional Demographics (age, race/ethnicity, class rank, height weight) BMI, Disordered eating (BULIT-R), Body dissatisfaction (BPSS-R), Perfectionism (MPS), Optimism (LOT-R), Self-esteem (RSE), Reasons for exercise (REI), Social Desirability (12-item Marlow-Crowe).	No theory mentioned	Higher levels of body dissatisfaction were associated with high BULIT-R score; body dissatisfaction accounted for 24% of the variance.	Generalizability. -BULIT-R has been found to be a valid measure of bulimic attitudes and behaviours, however results should be interpreted in terms of symptoms not DSM-IV criteria for diagnosis.
de Bruin & Oudejans (2018)	Explore the role of contextual body image in the development of ED in female athletes participating in at-risk sports i.e.	8 (currently competing=4; retired=4) <i>Age</i> = 18-33 (inter)national level in	Qualitative Phenomenological interviews	Contextual body image framework: poses that athletes	Relationship between ED symptomology and sports environment was recognized by all elite athletes.	Only athletes who had received ED treatment were included.

	aesthetic, endurance and weight-class sports.	their respected sport. Various Sports Country not specified		measure themselves in relation to both the predominant athletic body ideals and the body ideals in general society (Loland, 1999)	Athletes indicated sport as “high risk” culture. Contextual body image appeared to influence development EDs thus confirming quantitative studies from prior research pointing towards the athletic body image as in important factors in athletes disordered eating.	Researcher bias as they were a former sport psychologist to some of the athletes
Greenleaf, Petrie, Carter & Reel (2009)	Examine the prevalence of clinical and subclinical levels of eating disorders as well as healthy/asymptomatic eating among female college athletes and examine the prevalence of pathogenic eating and weight control behaviours.	204 $M=20.16$; $SD=1.31$ NCAA D1 Various Sports United States	Quantitative Cross-sectional Demographics and weight (height, BMI, grade level, sport and years participating in sport), Disordered Eating (QEDD, BULIT-R)	No theory mentioned.	54.4% reported being dissatisfied with their bodies and 88.2% believed they were overweight. QEDD showed 2% symptomatic, 25.5% symptomatic and 72.5% asymptomatic. 15% reported binge eating and 25.5% reported they exercised for two hours specifically to burn calories.	-Self-report. -Small number of women classified as ED which did not allow for examining differences between disordered and symptomatic individuals.
Haase (2009)	Examine social physique anxiety (SPA) and disordered eating correlates in two sport types	137 $M=19.50$ $SD=3.69$ National or International level Various sports Australia	Quantitative Cross-sectional Social Physique Anxiety (SPAS), Disordered Eating (EAT-26), Body mass index (self-report weight and height measures)	No theory mentioned.	Females in individual sports reported higher SPA, dieting and bulimic behaviours than in team sports.	Possible sample bias as recruitment was done through training sessions

Hausenblas & Mack (1999)	Examine the self-presentational concerns related to physique (i.e. social physique anxiety) and eating disorder correlates.	114 (Elite swimmers=36; Athletic control group=39; nonathletic control group=39) <i>M</i> =16.33 <i>SD</i> =2.44 Various sports National or Provincial level Country not specified	Quantitative Cross-sectional Eating disorder inventory (EDI-2), Social Physique Anxiety Scale (SPAS), Body mass index (BMI) and Demographic information.		Female divers reported significantly less SPA than the athletic control group and nonathletic control group. No differences were found between the divers, athletic control group and nonathletic control group regarding correlates associated with eating disorders. Results showed dissatisfaction with body and extreme concern with dieting and thinness were strong predictors of SPA	-Self-report
Hinton & Kubas (2005)	The objective of this study was to develop an athletics-oriented measure of psychological predictors of disordered eating (ie, the ATHLETE) and to test its initial reliability and validity.	167 <i>Age</i> =18 to 22 NCAA D1 Various sports United States	Quantitative Cross-sectional Disordered eating (ATHLETE subscale against external criteria derived from the Q-EDD)	No theory mentioned.	16% had disordered eating. ATHLETE is a reliable and valid measure of the psychological factors associated with disordered eating in athletes. ATHLETE psychological correlates of disordered eating in the context of athletics.	Self-reported attitudes. Additionally, ATHLETE does not represent a comprehensive sampling of the psychological dimensions associated

						with disordered eating behaviours in female athletes (e.g. Other personality characteristics, such as obsessiveness, need for excessive control)
Hulley & Hill (2001)	Explore eating disorder syndromes in elite women distance runners in the United Kingdom	181 <i>M</i> =28.5 Elite (as defined by the author) Running UK	Quantitative Cross sectional	No theory mentioned.	Over 50% of total participants were either dieting when they completed the questionnaire or had dieted recently. Dieting was significant more present in eating disorder group. 16% had an eating disorder at the time of the study	-Self-report measures.
Junge & Prinz (2017)	Determine prevalence and risk factors of depression and anxiety symptoms in high-level female football players	290 (first league=184; lower league=106) <i>M</i> =21.5 <i>SD</i> =4.2 Professional /semi-professional Football Germany	Quantitative Cross-sectional Personal and player characteristics (need and use of psychotherapeutic support, current injury and current general health), depression (CES-D) Anxiety (GAD-7), match experience and level of play was also assessed.	No theory mentioned.	First league female footballers had a similar prevalence of depression symptoms and generalised as females in general population of similar age. Second league players had higher prevalence depression symptoms than first league	No limitations were mentioned.

					players and then a female general population of similar age. 16% stated they currently wanted/needed psychotherapeutic support.	
Klinkowski, Korte, Pfeiffer, Lehmkuhl & Salbach-Andrae (2008)	Explore psychopathology in elite rhythmic gymnasts and anorexia nervosa patients	159 <i>M</i> = 15.2 (gymnasts); 15.7 (AN patients); 15.9 (High school group) National or International level Gymnastics Germany	Quantitative Cross-sectional Symptom Checklist (SCL-90-R) body height, weight, Body Mass Index (BMI) and the presence of amenorrhea were assessed.	No theory mentioned	Rhythmic gymnasts show different profiles in psychopathology from those with diagnosed AN, however the need to maintain a specific weight may lead to weight regulating behaviour and increase the likelihood of an eating disorder in the gymnasts.	Use of a self-report questionnaire and age of the participants.
Kong & Harris (2015)	Investigate the role of body image in sport and non-sport contexts, pressures from coaches, influences from sport that emphasise learner body shapes and the role of competition in motivating efforts to maintain specific body weights or shapes.	320 (elite level=128, recreational level =112 and non-competitive level =80 <i>M</i> =21.7 Various sports Australia	Quantitative Cross-sectional Demographic questions, Eating Attitudes Test (EAT-26), Figure Rating Scale (FRS)	No theory mentioned.	Elite athletes had highest level of eating disorder symptomatology and experienced the most pressures from coaches to maintain a low body weight, or lean physiques compared to other two groups. Of the 23% of the total athletes that scored high on EAT-26 indicating high risk of clinical eating disorder,	-Online surveys (due to anonymity it is not possible to identify how the participants became aware of the study).

					two-thirds were at the elite level	
Kroshus, Goldman, Zubzank, & Austin (2014)	Explore two strategies used by two similarly competitive female collegiate cross-country running teams to address teammate eating behaviours perceived to be unhealthy and problematic	35 <i>M</i> =19.37 (Team 1) & 20.19 (Team 2) NCAA D1 Cross-country United States	Qualitative Cross-sectional Semi-structured interviews	Bronfenbrenner's ecological model & Social constructivist framework.	Notable between-team differences in communication about eating behaviours considered to be problematic and unhealthy among team members. Differences emerged in role of the teammates and coaches in communication around this topic.	-Cross-sectional.
Kroshus, Kubzansky, Goldman & Austin (2015)	Explore how anti-dieting advice from teammates is distributed by evaluating difference in severity of eating disorder symptomology and evaluating between-team and within team variability.	89 <i>M</i> =19.76 NCAA Division 1 Cross-country United States	Quantitative Cross-sectional Disordered eating (EAT-26), Perceived anti-dieting advice (Thompson et al.'s (2007) Friend Anti Dieting advice scale), BMI, height/weight, age, race	No theory	Significant between-team differences in the frequency of anti-dieting advice, controlling for team levels of disordered eating. Eating pathology and BMI were positively associated with anti-dieting advice received.	Self-report. Small sample size Cross-sectional. Anti-dieting measure not previously validated with athletes.
Papathomas & Lavalley (2014)	Explore and provide an alternative to medical understanding of disordered eating in sport through an emphasis on personal perspectives	1 <i>M</i> = 20 Basketball at the (elite level) UK	Qualitative 7 hours of life history data was gathered over a period of 8 months using unstructured interviews, or life history interviews, and narrative Inquiry.	Narrative theory	Holly's life is characterised by a struggle to align her life experiences with a culturally specified performance narrative. To fulfil her achievement narrative, she uses self-starvation as	No limitations mentioned by author.

					a means to achieve. Narrative as a method and theory allowed for an account of how an athlete lives through disordered eating.	
Prather et al. (2016)	Determine the prevalence of stress fractures, menstrual dysfunction, and disorder eating attitudes in female elite soccer players.	220 NCAA D1 Professional Soccer United States	Quantitative Cross-sectional Disordered eating (EAT-26), menstrual function and Body Mass Index (BMI)	Rationale for study was supported by the 'Female Athlete Triad'	17.9-19.4% professional soccer players and NCAA D1 athletes had menstrual dysfunction. And, 8.3-17.8% of that population had scores on EAT-26 suggesting they were at risk for ED.	-Self-report. -Imaging may not have diagnosed all stress factors. - Only region in USA explored thus does not consider differences.
Reel, SooHoo, Petrie, Greenleaf & Carter (2010)	Develop a reliability and validity measure to explore sport-related body image pressures across a variety of sports rather than a single sport.	204 $M=20.16$ Various sports (17+ represented) NCAA D1 USA	Quantitative Demographic information, weight pressures (WPS-F)	No theory mentioned	Results yielded a 16-item measure with four factors: weight pressures from coaches/team/sports self-consciousness of weight and appearance, important of weight and appearance, and weight limit Emergence of weight pressures from Coaches/team/sport explained 37.5% of variance; the second factors, self-consciousness of	-Self-report. -Sample size: not enough athletes represented in each sport to conduct a meaningful comparison analysis across all. Sports. - Social desirability bias - - Sample is Caucasian and lacked diversity to draw meaningful conclusions

					weight and appearance 8.7%, the third and fourth factors (Importance of weight and appearance, and weight limit) only yielded two items with significance; indicating weak factors.	regarding race/ethnicity.
Shriver, Wollenberg & Gates (2016)	Estimate the prevalence of DE among female college athletes using two validated assessment tools and to examine potential difference between athlete in weight sensitive and less sensitive sports, and examine the emotional regulation, body dissatisfaction, and sport type	151 <i>M</i> = 19.5 <i>SD</i> =1.2 Various sports NCAA D1 United States	Quantitative Cross-sectional Demographics, weight, height, Disordered eating (EAT-26 & MEBS), Emotional Regulation (DERS)	No theory mentioned	70% of the subjects desired to have a lower weight- highest desire in soccer players (81%) and lowest desire among cross-country runners (40%). Both the EAT-26 & MEBS did not differ statistically. The DE scores did not differ significantly between weight-sensitive and less weight sensitive, sports. The total DE scores positively associated with difficulties with emotional regulation.	-Self-report; Convenience sample; Geographical, cultural, ethnic and other differences not accounted for.
Smith & Petrie (2008)	Extend the work of Stice et al. (2000) by testing their three-session cognitive dissonance program among female athletes	29 <i>M</i> =19.32 <i>SD</i> =.94 Various sports NCAA D1 United States	Intervention Thin-ideal internalization (BAA-R), Body Image, Concerns (BPSS-R & BSQ-10-R), negative affect (PANAS-X),	The intervention is grounded within dissonance theory	No treatment effects were significant however, post-hoc analyses suggested that the cognitive-dissonance	-Facilitator error as a potential problem. -Time when measures were given

			Disordered eating (BULIT-R & DRES)		intervention provided some effects particularly with respect to decreases in sadness and depression. Overall the finding suggest a cognitive dissonance-based intervention may be useful but will need to be redesigned to address the factors unique to female athletes and the sporting environment.	before the intervention began might not have accurately reflected. -Length of intervention sessions.
Stirling & Kerr (2012)	Examine female athletes perceived vulnerabilities to the development of disordered eating.	17 Age= 18-25 Various sports Country not specified	Qualitative Cross sectional Semi-structured interview	No theory mentioned	Athletes from both aesthetic and non-aesthetic sports perceive that the vulnerabilities they experience stem from the sport environment; external risk factors like sports' focus on the body, appearance, weight monitoring and media influences and internal characteristics such as self-absorption, achievement-orientation, perfection-ism,	-All participants were currently competing athletes and therefore it is possible that athletes with more severe experiences of disordered eating had retired from sport prior to adulthood

					hyper-competitiveness, and self-control were reported to increase their susceptibility to disordered eating.	
Sundgot-Borgen, Fasting, Brackenridge, Torstveit & Berglund (2003)	First examine the percentage of female elite athletes and controls reporting sexual harassment and abuse (SHAB) and secondly, determine whether a higher percentage of female athletes with eating disorders (ED) had experienced SHAB	1069 (athletes=553; controls=516) Age=15-39 Norwegian national senior and junior Olympic teams Various Sports Norway	Quantitative Cross-sectional Phase 1: eating disorders (EDI), SHAB, pathogenic weight behaviors, Phase 2: (athletes that classified as ask by ED questionnaire) engaged in clinical interviews; symptoms according to DSM-5 criteria	No theory mentioned.	A significantly higher percentage of athletes (20%) compared with controls (9%) met the DSM-5 criteria for ED. A higher percentage of ED athletes (66%) compared to Non-ED athletes (48%) met reported experience of SHAB both inside and outside the sporting community. Opposed to previous findings, a significantly lower percentage of female athlete experienced SHAB opposed to non-athlete controls.	No limitations reported by author
Torstveit, Rosenvinge, Sundgot-borgen (2008)	Explore the percentage of female elite athletes and controls with disordered eating (DE) and clinical eating disorders (ED) to evaluate what characterised the athletes with ED.	1838 (athletes=938; non-athletes=900) Age=13-39 Elite athletes and Junior elite. Various Sports Norway	Quantitative Cross-sectional Part 1: Screening Questionnaire; menstrual cycle, self-reported ED, body dissatisfaction (BD), drive for thinness subscales (DT) from EDI. Part 2: Random selection from part 1	The female athlete triad'' (the triad) (Yeager et al., 1993) is mentioned.	A high percentage of both athletes and controls met the criteria for DE and clinical ED (e.g. 46.2% of the athletes and 51.7% of the controls reported one or more of the five indicators of DE). Higher	Cross-sectional design

			invited to clinical interview (EDE interview guide was used).		prevalence of EDs was found among athletes competing in leanness sport compared with athletes competing in non-leanness and controls.	
Torres-McGhee et al. (2011)	Explore prevalence and sources of eating disorder risk classification but academic status and riding discipline; and, examine riding style and academic status variations in body mass index.	211 <i>M</i> =19.8 English & Western Equestrian NCAA D1 United States	Quantitative Cross-sectional Demographic and anthropometric, academic status Eating Attitudes Test (EAT-26), Sex-specific BMI figural Stimuli Silhouette (The figural Stimuli Survey)	No theory mentioned.	On EAT-26, 38.5% of English riders scored in clinical range & 48.9% among western riders. No BMI or silhouette differences were found across academic status or disordered eating risk.	-Contextual factors (parental pressure, investment in sport) were not accounted for. -EAT-26 is psychometrically sound instrument but result in false-positive high.
Wilinski (2012)	Define the relationship between gender identity, the perception of the body, depressiveness, and aggression in female football players who represent different levels of competence (playing in premier league vs. second league) and seniority sport.	94 <i>M</i> = 20.77 Premier league and second league Football Poland	Quantitative Cross-sectional The Body Image Evaluation Questionnaire, the Bem Sex Role Inventory (BSRI), the Beck Depression Inventory, Buss-Durkee inventory	Gender schema theory & Franzoi's theory	Football does not deprive players of their femineity but it does protect a high level of femineity with masculinity. Female footballers have androgynous gender identities, a higher level of masculinity than among non-training women, a more favourable perception of body-as-process, a higher	-No limitations were mentioned

					evaluation of body-as-object, along with an increase of masculinity and a decrease in indirect aggression at higher competition levels	
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Table 2. Study Characteristics (Percentages changed due to study #13 being added)

Study Characteristics	Reference Number	<i>n</i>	%
Country of Study			
Australia	6, 12	2	8.3
Germany	10, 11	2	8.3
Norway	21, 22	2	8.3
Poland	24	1	4.2
UK	9, 14, 15	3	12.5
USA	1, 2, 3, 5, 8, 13, 16, 17, 18, 19, 20	11	45.8
Country not specified 12.5%	4, 7, 20	3	12.5
Number of Sports included			
1 sport	9, 10, 11, 13, 14, 15, 16, 23, 24	9	37.5
2-9 sports	1, 2, 4, 6, 7, 8, 18, 19, 20	9	37.5
10+ sports	3, 5, 12, 17, 21, 22	6	25
Study Design			
Quantitative	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19, 21, 22, 23, 24	20	83.3
Qualitative	4, 13, 15, 20	4	16.6
Mixed-method			
Cross-sectional	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24	21	
Longitudinal	2	1	4.2
Sample Size.			
1	15	1	4.2
1≤10	4	1	4.2
11–50	13, 19, 20	3	12.5
51–100	14, 24	2	8.3

101–300	3, 5, 6, 7, 8, 9, 10, 11, 16, 17, 18, 23	12	50
>300	1, 2, 12, 21, 22	5	20.8
Sporting Level			
NCAA D1	1, 2, 3, 5, 8, 13, 14, 17, 18, 19, 23	11	45.8
Professional	10, 12, 16, 24	4	16.6
(Inter)national	4, 6, 7, 15, 11, 12, 20, 21, 22	9	37.5
Elite as defined by author	9	1	4.1
Mixed Samples			
Elite and non-elite or general population	7, 11, 12, 16, 21	5	20.8
Athletic Status.			
Active	1, 2, 3, 5, 6, 7, 8, 9, 11, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24	23	95.8
Active & Retired	4	1	4.2
Mean Age.			
<16	11	1	4.2
16–26	1,2,3,4,5,6,7,8,10,12,13,14,15,16,17, 18,19,20,21,22,23,24	22	92
27–40	9	1	4.2
Use of Theory.			
Yes	1, 2, 4, 13, 15, 19, 24	7	29
No	3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 17, 18, 20, 21, 22, 23	17	70.8
NCAA D1: Number of Universities included per study			
1	18, 19	2	8.3
1≤3	3, 5, 13, 17	4	16.6
4≤	1, 2, 23, 14	4	16.6

Reference numbers: 1 = Anderson, Petrie & Neumann (2011); 2 = Anderson, Petrie & Neumann (2012); 3 = Brannan, Petrie, Greenleaf, Reel & Carter (2009); 4 = de Bruin & Oudejans (2018); 5 = Greenleaf, Petrie, Carter & Reel (2009); 6 = Haase (2009); 7 = Hausenblas & Mack (1999); 8 = Hinton & Kubas (2005); 9 = Hulley & Hill (2001); 10 = Junge & Prinz (2017); 11 = Klinkowski et al. (2008); 12 = Kong & Harris (2015); 13 = Kroshus, Goldman, Zubzanksy, Austin (2014); 14 = Kroshus, Kubzansky, Goldman & Austin (2015); 15 = Papatomas & Lavallee (2014); 16 = Prather et al (2016); 17 = Reel, SooHoo, Petrie, Greenleaf & Carter (2010); 18 = Shriver, Wollnberg & Gates (2016); 19 = Smith & Petrie (2008); 20 = Stirling & Kerr (2012); 21 = Sundgot-Borgen, Fasting, Brackenridge, Torstveit & Berglund (2003); 22 = Torstveit, rosenvingee, Sundgot-borgen (2008); 23 = Torres-McGhee et al, (2011); 24 = Wilinski (2012).

Table 3. Screening tools used

Screening tool purpose	Name	Reference number	<i>n</i>	%
Demographic/General information				

	Menstrual history or amenorrhea	1, 11, 16, 17, 18, 21, 22	7	29.2
	Use of Pathogenic weight	21, 22	2	8.3
	Past and current eating disorders	1, 3, 11, 16, 17, 18, 22	7	29.7
	Family eating disorder history	18	1	4.2
	Participants reported weight satisfaction (e.g. changes in weight experienced in season and out of season)	5, 17	2	8.3
	Injury Specifically stress fractures	9, 10, 21, 22 16	5	20.8
	Contraception use and pregnancy Breastfeeding	11, 22 12	3	12.5
	Illness	9, 16	2	8.3
	Wellbeing/	9	1	4.2
	Personal and player characteristics	10	1	4.2
	Current general health	10	1	4.2
	Need and use of psychotherapeutic support	10	1	4.2
	Match experience	10	1	4.2
	Starting Status	10, 17	2	8.3
	Ideal weight	12, 18, 23	3	12.5
	Coach required monitoring of weight	12	1	4.2
	Academic status	23	1	4.2
Mental health				
	Mental health inventory (Berwick et al, 1991)	9	1	4.2
Anxiety				
	GAD-7	10	1	4.2
Depression				
	CES-D	10	1	4.2
	Beck depression inventory	24	1	4.2
Psychopathology				
	Symptom Checklist-90 (SCL-90)	11	1	4.2
Sport weight Pressures				
	Weight pressure scale: WPS (Reel and Gill, 1996)	1, 2, 17	3	12.5

Body satisfaction/ dissatisfaction				
	BPSS-R (Petrie, Tripp & Harvey, 2002)	1, 2, 3, 19	4	16.6
	Single item about body satisfaction	2	1	4.2
Body/figure				
	Body Image Evaluation Questionnaire	24	1	4.2
	Body Cathexis Scale (Mintz & Betz, 1986)	9	1	4.2
	Figure Rating Scale- FRS (Stunkard et al 1983) The FRS was adapted to include an additional question concerning the figure the individual believed would be most suited to and athletically capable for sport (FRS-sport)	12	1	4.2
	Figural Stimuli Survey	12	1	4.2
Thin-Ideal Internalization				
	BAA-R (Petrie, 1996)	19	1	4.2
Eating disorder/ Disordered eating				
	BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria	1, 3, 5, 19	4	16.67
	QEDD -Measures symptoms on the bases of DSM-5	5, 8	2	8.3
	EAT-26 (Garner, 1982)	6, 12, 14, 16, 18, 21	6	25
	EDI-2 (Garner, 1991)	7, 8, 21, 22	4	16.6
	SCANS but SPA subscales only	8	1	4.2
	EDE-Q (Fairburn & Beglin, 1994)	9	1	4.2
	MEBS (Klump et al. 2000)	18	1	4.2
Dietary Restraint				
	DIS (Stice 1998)	1, 2	2	8.3
	DRES (Van Strien et al.	2, 19	2	8.3

	1986)			
Social Physique Anxiety				
	SPAS (Hart et al 1989)	6, 7	2	8.3
Negative Affect				
	PANAS-X (Watson & Clark, 1992)	1, 19	2	8.3
General sociocultural pressures				
	Sociocultural pressures scale-PSPS (Stice & Agras, 1998)	1	1	4.2
Internalization				
	SATAQ-3 (Thompson et al.)	1	1	4.2
Modeled Behavior				
	*Modeled Behavior designed for this study to asses to which individuals have seen others engaging in behaviors around disordered eating, body image etc	1	1	4.2
Social Desirability				
	MCSD (Reynolds, 1982	1, 3	2	8.3
Perfectionism				
	MPS (Frost et al 1990)	3	1	4.2
Optimism				
	LOT-R (Scheier, Carver, & Bridges, 1994)	3	1	4.2
Self-Esteem				
	RSE (Rosenberg, 1965)	3, 9	2	8.3
Reasons for Exercise				
	REI (Silberstein, 1988)	3	1	4.2
Perceived anti-dieting advice				
	Anti-dieting advice scale (Thompson et al. 2007) This item was developed for use with adolescent girls and has not been validated with athletes.	14	1	4.2
Emotional Regulation				
	DERS (Hans & Pistole, 2014; Gratz & Roemer, 2004)	18	1	4.2

SHAB				
	SHAB	20	1	4.2
Aggression.				
	Buss-Durkee Inventory	24	1	4.2
Bem sex role inventory		24	1	4.2
Clinical Interview		21, 22	2	8.3

Table 4. Sport type

Sport	Reference number
Alpine Skiing	3, 5, 17
Basketball	3, 5, 15, 17, 18, 19, 20
Cheer	10, 17
Cross country running - Running	3, 5, 13, 14, 17, 19 9
Cycling	4
Dance	4, 20
Diving only Divers and Swimmers	3, 5, 7, 6, 17 1, 2
Equestrian	23, 18
Field hockey	5
Figure skating	20
Golf	3, 5, 17, 18, 19
Gymnastics	1, 2, 3, 4, 5, 11, 17, 20
Ice Hockey	3, 17
Judo	4
Lacrosse	3, 5, 7, 17
Netball	6
No-sport clarified	21, 22
Soccer	3, 5, 7, 11, 16, 17, 18, 19, 20, 24
Softball	3, 5, 17, 18, 19
Swimming	3, 5, 17, 19, 20
Synchronized swimming	3, 5, 17
Rowing	3, 5, 17
Tennis	3, 5, 16, 17, 18
Track & Field	3, 4, 5, 17, 18, 19, 20
Volleyball	3, 5, 17, 18, 19, 20

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Title	1	The review title includes 'scoping review'	1
ABSTRACT			
Structured summary	2	Following the journal's guidelines, an unstructured abstract is provided. It includes objectives, amount of studies included, charting methods, results and conclusions	2
INTRODUCTION			
Rationale	3	Although there are existing reviews on mental health in elite sport, no review has systematically screened articles for methods and theory exclusive to elite female athletes	3
Objectives	4	To explore the way(s) that mental health or mental illness has been studied exclusively with elite female athletes. We focused on (1) identifying the methodology used in research concerning mental health or mental illness and elite female athletes, (2) exploring the use of theory in these studies, and (3) providing an overview of the research purposes with the aim of identifying gaps in the literature and providing recommendations for future research.	7
METHODS			
Protocol and registration	5	This study has not been officially registered	n/a
Eligibility criteria	6	Only English peer-reviewed articles were included in the present review. Elite athletes' mental health is an emerging and 1996 was a pivotal year specific to female athletes, therefore we limited the search to the last 24 years.	8-9
Information sources*	7	The search strategy was applied in the following databases: SPORTDiscus, PsychINFO, CINAHL, and MEDLINE	7
Search	8	Key terms of the database search are explained and an example for one database (SPORTDiscus) is provided	8
Selection of sources of evidence	9	Inclusion and exclusion criteria are described in detail	9

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Data charting process	10	Data charting process involved all members of the research team. The final chart included year of publication, study aim/purpose, characteristics of study populations (e.g. sporting level, sport-type), type of design, measurements used, identification of theory, key findings, and limitations.	9
Data items	11	The 24 included studies are presented and table 1. Even further insight into the studies is provided in table 2 and 3	9
Critical appraisal of individual sources of evidence	12	Not conducted in a systematic way	n/a
Synthesis of results	13	Not applicable for scoping reviews	n/a
RESULTS			
Selection of sources of evidence	14	We describe the selection process including the different stages (identification, screening, eligibility, and inclusion). Figure 1 presents the flow chart	11
Characteristics of sources of evidence	15	Characteristics are discussed extensively and an additional table (see Table 1) provides characteristics of each included study (e.g. authors, year, aims, sample, location, sport, methodology, use of theory and main findings and limitations)	11-16
Critical appraisal within sources of evidence	16	Not conducted in a systematic way	n/a
Results of individual sources of evidence	17	Table 1 provides an overview of all the study aims, methodology and theory of each individual article which relates to the rationale of the study	Table 1.
Synthesis of results	18	Table 2. provides study characteristics. Table 3. Screening tools used. Table 4 sport-type	Table 2,3,4
DISCUSSION			
Summary of evidence	19	The discussion, linked to the review questions and objectives, includes an overview of concepts, themes, and types of evidence	17-28

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Limitations	20	Discusses limitations of the scoping review process and the results.	28
Conclusions	21	Provides a general interpretation of the results with respect to the review questions and objectives, as well as provides potential implications for future research.	28
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	On credit author statement

Highlights

- First review to focus on mental health and elite female athletes only.
- Mental health research concerning elite female athletes has almost exclusively focused on eating disorders.
- Majority of studies focused only on lean-physique athletes and/or USA collegiate athletes.
- Recommendations are provided to enhance future mental health research with elite female athletes.

Declaration of interests

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

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Journal Pre-proof