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Journal Prevention

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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Mental health and Elite Female Athletes: A Scoping Review

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

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

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

82 Much of the current research and several systematic reviews in this area have narrowly focused on identifying prevalence and incidence rates of mental illness amongst 83 elite (male) athletes (Bar & Markser, 2013; Gorczynski et al., 2017; Reardon & Factor, 84 2010). However, two reviews have explored both mental illness and mental health, for 85 86 example, Rice et al. (2016) conducted a narrative review to synthesise literature on both mental illness and mental health amongst elite athletes, and Kuettel and Larsen (2019) 87 utilized a scoping review method to explore various risk and protective factors of mental 88 health in elite athletes. The work of Rice et al. (2016) and Kuettel and Larsen (2019) 89 90 enhanced our knowledge and understanding of mental health and mental illness in elite athletes. For example, Kuettel and Larsen (2019) identified elite female athletes to be at an 91 increased risk for anxiety, depression, and disordered eating when compared to elite male 92 athletes. Using a holistic approach around mental health (Henriksen et al., 2019) to interpret 93 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 90 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 female athletes in certain cultures, unequal training opportunities, limited financial support, 105 106 sexualisation, sexuality stereotypes, and societal and personal expectations around traditional gender roles will likely negatively impact the mental health of this population. The 107 108 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 this population (e.g. gender and context specific interventions) (Foskett & Long-staff, 2018). 110

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 studies, such as Gouttebarge et al. (2015), to inform the design and implementation of mental 113 health interventions with elite female athletes is not appropriate due to the distinct differences 114 115 between males and females at a biological, psychological, and social level (Castaldelli-Maia et al., 2019). Breslin et al. (2017) argues that gender-specific and sport-specific data should 116 be used to inform and design mental health interventions as neglecting such factors 117 substantially reduces the quality and efficacy of mental health interventions. Additionally, 118 utilising appropriate and well-aligned psychological theory when developing mental health 119 120 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 mental health and elite female athletes before delving into the design of support programs and 122 interventions. 123

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

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

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

To the best of our knowledge, our review is the first (of any kind) 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

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.

Method 153

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

159 Identifying the research question

Our overriding research question was 'how has mental health and mental illness 160 161 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 health or mental illness and elite female athletes, (2) to explore the use of theory in these 163 164 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

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

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

Study selection 199

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

The search terms spanned four core categories: gender (female or woman), mental 206 207 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 health disorders as search terms (depression, anxiety, eating disorders/disordered eating, and 209 210 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 the broad research question outlining this review, we included 'mental wellbeing' as a search 212 term as it sometimes used interchangeably with 'mental health' in the sport literature (see 213 214 Breslin et al., 2017; Kuettel & Larsen, 2019; Rice et al., 2018). For a full example of the search terms we used, please see the appendix. 215

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

design, measurements used, identification of theory, key findings, and limitations.

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Figure 1. Prisma Flow Diagram

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232 **Results**

The search yielded a total of 4.327 records. After removing the duplicates, 4.001 233 234 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, 201 articles were excluded leaving 24 to be included in this review. 236

237

[INSERT TABLE 1.]

Study characteristics 238

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

With regards to competition level, eleven studies (45.8%) included NCAA D1 246 student-athletes, and eleven studies (45.8%) included professional, national, international, 247 and provincial athletes. Only one study (4.2%) included elite athletes defined through 248 ambiguous terminology. Between one and fifty-eight different sports were explored across 249 250 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 (n=10), track and field (n=8), volleyball (n=8), basketball (n=8), gymnastics (n=9), and 253 254 running (n=8).

Study design and instrument 255

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

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

267 A total of thirty-four validated scales were used in the twenty quantitative studies (see Table 2. for a list of the scales). Eighteen studies (75%) utilized scales to explore eating 268 disorders (ED)/disordered eating (DE), with three scales appearing frequently: the Bulimia 269 270 Test Revised (BULIT-R; Thelen et al., 1984) (included in four studies), the Eating Disorder Inventory (EDI; Garner, 1982) (included in four studies) and the Eating Attitudes Test (EAT-271 26; Garner, 1982) (included in six studies). Five studies used validated body satisfaction 272 measures, four of which used the Body Parts Satisfaction Scale-Revised (BPSS-R; Petrie &. 273 Austin, 1997), and three studies used the Weight Pressures in Sport for Females (WPS-F; 274 275 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 studies used the Social Physique Anxiety Scale (SPAS; Hart, Leary, and Rejeski, 1989). Two 277 studies explored depression and/or anxiety using the Centre for Epidemiologic Studies 278 Depression Scale (CES-D; Radloff, 1977), the General Anxiety Disorder scale (GAD-7; 279 280 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 eating disorder symptomology (Smith & Petrie, 2008). Of the studies that did specify the use 285 286 of theory in the rationale, two studies (Anderson, Petrie & Neumann, 2011; Anderson, Petrie, & Neumann, 2012) employed and tested the Petrie and Greenleaf (2007) Sociocultural 287 288 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 specific pressures regarding weight, body, appearance and eating, and the development of ED 290 291 symptoms.

One study (Wilinski, 2012) utilized two theories, the Gender Schema Theory (Bem, 292 1981) and the Body Conceptualization Theory (Franzoi, 1995) to explore the relationship 293 between gender identity and depression in female footballers. Torstveit, Rosenvinge, & 294 295 Sundgot-Borgen (2008) used the Female Athlete Triad (see Yeager et al., 1993) to explore stress fractures and eating disorders in soccer players which allowed the researchers to show 296 female footballers were at more of a risk for stress fractures than previously believed. 297 298 Additionally, Papathomas 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 Bruin & Oudejans, 2018); the contextual framework perceives body image as a multifaceted 301 reactive concept (Loland, 1999). In this study they found that for some athletes' negative 302 body evaluations were only present in the sport context whereas in daily life they were 303 satisfied with their bodies and did not compare themselves with others. For other athletes, the 304 305 researchers found negative body evaluations existed in both their daily life and sport which indicated that elite sport represented a "high-risk culture" that overemphasized body andweight (de Bruin & Oudejans, 2018).

308 *Research purpose*

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

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

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

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

The elite sporting environment and mental illness. Three studies focused on 343 344 comparing the prevalence of mental illness between elite female athletes and various other populations (e.g. recreational athletes or the general female population) to gain insight into 345 the elite sporting environment/culture (Hausenblas & Mack, 1999; Kong & Harris, 2015; 346 Sundgot-Borgen et al., 2003). For example, Kong and Harris (2015) investigated body image 347 perceptions of women in sporting and non-sporting contexts to explore how the sporting 348 environment may positively or negatively influence body image and mental health. In 349 350 relation to this, a further three studies explored the influence of the elite sport environment on the development of eating disorders through lived experiences (de Bruin & Oudejans, 2018; 351 352 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 athletics-oriented measure of psychological predictors of DE (Hinton & Kubas, 2005). Two 359 360 studies aimed to highlight the importance of using qualitative methods to gain insight into elite female athletes' subjective experiences of mental illness in elite sport (de Bruin & 361 Oudejans, 2018; Papathomas & Lavallee, 2014). For example, Papathomas and Lavallee 362 363 (2014) used a life history methodology to attain an in-depth understanding of how the 'performance narrative' shaped a female athlete's personal experiences of DE in sport. 364

365 Discussion

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

373 *Study characteristics*

Variety of sports. A variety of sports were researched across the included studies (see Table 4 for a full list of the sports that appeared in this review). Over half of the studies (65%) involved more than two sports (e.g. gymnastics, swimming and athletics), allowing us to attain a broad insight into mental health across a wide range of sports. Concurrently, the breadth of sports explored in a number of the studies was also a methodological weakness 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 susceptibility for body image concerns. Beyond this, the included studies did not provide 384 385 insight into risk factors specific to any one sport. Since mental health interventions and awareness/education programs should be tailored to sport-specific demands (Breslin et al., 386 2017), future research is needed to explore the risk factors related to each individual sport. 387

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

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

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).

Differences in levels of professionalisation between countries will also likely result in 417 418 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 professionalization are more likely to experience financial strain and encounter poorer injury 420 management, which may in turn negatively impact their mental health and increase risk of 421 422 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 athletes (Allison, 2020). For example, in the USA, 5% to 8% of sport media coverage is 426 focused on women's sports even though women account for 40% of sports participation 427 (Hardin & Greer, 2009). The lack of media attention and subsequent sponsorship deals only 428 furthers the financial strain and disparity in pay that often accompanies being a professional 429

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

437 *Research purpose(s)*

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

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

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

In addition to sport-type, several studies explored personality characteristics and/or
social physique anxiety (SPA) as risk factors for ED/DE (Brannan, Petrie, Greenleaf, Reel, &
Carter, 2009; Hausenblas & Mack, 1999; Haase, 2009; Klinkowski, Korte, Pfeiffer,
Lehmkuhl, & Salbach-Andrae, 2007). Sport scholars have found that certain personality
characteristics (e.g. perfectionism) might lead to an obsessive focus on improving personal
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 and constitutes ED/DE as an individual pathology whilst neglecting various social, cultural, 482 483 and environmental factors that are also likely to contribute to an athlete's experiences of ED/DE (Busanich, McGannon, & Schinke, 2012; Papathomas & Lavallee, 2012; Papathomas 484 485 & Lavallee, 2014). Moreover, the literature concerning ED/DE and elite female athletes is almost entirely made up of prevalence studies and focused on person-specific risk factors. 486 Consequently, current insight and future advances in this area of research is severely limited 487 488 (Papathomas & Lavallee, 2012).

The over-exploration of person-specific risk factors in the ED/DE literature and the 489 490 overuse of prevalence studies is limiting given eating disorders are a consequence of various combinations of biopsychosocial factors which are not easily, or appropriately, explored 491 using quantitative methods (Breuner, 2010; Papathomas & Lavallee, 2012). To address this 492 493 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 (Papathomas & Lavallee, 2012). To this end, researchers should diversify their methodology 495 by utilising qualitative methods, such as narrative inquiry, to allow for interpretive insight 496 (Papathomas & Lavalle, 2012; Papathomas & Lavallee, 2014). Taken together, we 497 498 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 strain, de-selection) and/or utilize different methodological approaches to gather insight into 500 elite female athletes personal experiences. 501

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 research as it would allow for a deeper understanding of existing patterns and insight into 507 508 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, Rosenvingee, & Sundgot-borgen, 2008). Yet, only one study used a longitudinal research design (Anderson, Petrie, & Neumann, 2012; Haase, 2009). Anderson 511 et al. (2012) assessed the stability and influence of sport pressures, body satisfaction, and 512 513 dietary restraint over a 5-month season, findings demonstrated that athletes' body satisfaction stayed stable over the entire season. We recommend that future studies employ longitudinal 514 515 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 mental illness. 517

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

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 opportunity to talk freely about their unique and deeply personal experiences as opposed to 534 535 restricting them to Likert scale type questions (Eklund et al., 2011; Papathomas & Lavelle, 2012). Additionally, depending on the research question, we propose that mixed-method or 536 multi-method approaches will allow for numeric interpretation and a more holistic 537 538 understanding than would be possible through using quantitative methods alone (Papathomas, Petrie, & Plateau, 2018). 539

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 female athlete population. We found thirty-four validated measures employed in this review 542 543 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 different measures were used to explore ED/DE prevalence. The use of different measures to 545 546 study the same phenomenon can make accurate comparisons across different research studies more difficult than necessary (Poucher et al., 2021). The most commonly used measure was 547 548 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 of screening tools found in this review and the lack of consistent measures evidences the 551 552 difficulties in choosing appropriate mental health screening instruments to use with elite female athletes (Pope et al., 2015). Due to the unique psychological, social, and biological 553 demands placed on athletes, it may be more appropriate to utilize questionnaires that are 554

tailored towards athletes and validated for different competition levels (e.g. grassroots,
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 that utilized the WPS-F identified female athletes felt the most pressures around weight from 559 560 teammates (36.8%), uniforms (34.3%), and coaches (33.8%) (Reel, Soohoo, Petrie, et al., 2010). The use of the WPS-F in three studies allowed us to draw links between these findings 561 562 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 findings in the study by de Bruin and Oudejans (2018). In that study, participants indicated 564 565 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, we argue it is critical that coaches recognize the power they have over athletes and remain 567 568 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 communicate about food impacts how team members communicate about the same topics 570 amongst one another. Depending on how such topics are communicated within a team, this in 571 turn impact how an elite female athlete experiences ED/DE (Kroshus, Goldman, Zubzanksy, 572 573 & 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) (Gouttebarge et al., 2020) should be considered in future research. 579 Several of the measurements provided in these tools are specifically designed for the athlete

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

586 Theory

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

599 *Future directions*

Expanding on the recommendations made in the aforementioned sub-sections, there are several considerations for future research concerning mental health in elite female athletes. These considerations emerged as a direct consequence of the results in this scoping 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 health605 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 beyond 'lean-physique' athletes. Currently there is a narrow focus on 'lean-physique' 608 609 athletes, body image and personal risk factors within ED/DE research. The assumption that elite female athletes only suffer from ED/DE due to internalized pressures from society 610 around what they 'should' look like and personal risk-factors (e.g. personality traits) is overly 611 simplistic. Instead, a deeper understanding of elite female athletes' experiences with ED/DE 612 is needed. Elite female athletes are susceptible to other types of mental illness beyond 613 614 ED/DE. Future research should explore elite female athletes' experiences of different mental illnesses (e.g. depression, anxiety, addiction) both as distinct entities but also in tandem as 615 mental illnesses are often comorbid (Wells et al., 2020). 616

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

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

635 Strengths and Limitations

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

652 Conclusion

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

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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



Author	Aim/Purpose	Participant domograph	Study design & Mossurers and/or	Use of	Key Findings	Limitations
& year		ics.	Interview style	Theory		
publicati		sporting				
on		level, sport-				
		type, and				
		country				
Anderso	Examine Petrie and	414	Quantitative	Petrie	Initial test of the	-Self-report.
n, Petrie,	Greenleaf's model in	<i>M</i> =19.14	Cross-sectional	and	Petire & Geenelaf	-Cross-
&	a large diverse	NCAA D1	Demographics (age,	Greenlea	2007, model	sectional
Neuman	sample of female	Swimmers	race, height, weight,	f (2007)	revealed poor fit,	-
n (2011)	collegiate swimmers	&	ideal weight, year in	model.	but once	Generalizab
	and gymnasts.	Gymnasts	school, current/past	\mathbf{O}	pathways from	ility: limited
		United	ED, menstrual		sport pressures to	to similar
		States	nistory, Sport and		body satisfaction,	groups of
			(WDS) Conorol		sport pressures to	athletes
			(WPS), General Sociocultural		and from body	(gynnasts
			Pressures (PSPS)		satisfaction to	swimmers
			Internalization		bulimic	and divers)
			(SATAO-3) Body		symptomology	and drvers).
			Satisfaction BPSS-		model's fit	
			RR & BSO-10)		greatly improved	
			Dietary restraint		Model showed	
			(DIS). Negative		sport pressures	
			affect (PANAS-X).		were directly	
			Modelled		related to body	
)	Behaviours, Bulimic		dissatisfaction	
			Symptoms (BULIT-		and dietary	
			R), Social		restraint.	
			Desirability (MCSD)		Negative affect,	
					body	
					dissatisfaction	
					and restrained	
					eating explained	
					55-58% of the	
					variance in the	
					athlete's bulimic	
	* 1 11				symptoms.	
Anderso	Longitudinally	325	Quantitative	Petrie &	All variables were	-No
n, Petrie,	explore, using a	<i>M</i> =19.24	Longitudinal	Greenlea	stable across the	limitations
ά N	cross lagged model,	SD=1.14	Demographics, Sport	T´S	5-month season;	mentioned
Neuman	the pathways	NCAA DI	Pressures (WPS),	sociocult	DR r and BD are	in this
n (2012)	between sport	Gymnast &	Body Satisfaction	ural	the best predictors	study.

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

environment Swimmers/ (BPSS-R) Dietary model of of future.	
pressures about Divers restraint (DIS & 10- disordere Variability	
appearance, body United item DRES) d eating. stability suggests	
and weight in female States female athletes	
athletes' body train and compete	
satisfaction and self-	
reported intentions 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, Explore and extend 204 Quantitative. No Higher levels of Gen	eralizab
Petrie, past research $M=20.16$ Cross-sectional theory body ility	
Greenlea exploring weather SD=1.31 Demographics (age, mentione dissatisfaction	
f, Reel, perfectionism, NCAA race/ethnicity, class d were associated -BU	LIT-R
& Carter optimism, self- Division 1 rank, height weight) with high BULIT- has	been
(2009) esteem and reason Various BMI, Disordered R score; body four	d to be
for exercise Sports eating (BULIT-R), dissatisfaction a va	id
moderated thee United Body dissatisfaction accounted for mea	sure of
relationship between States (BPSS-R), 24% of the buli	nic
body dissatisfaction Perfectionism variance. attit	ıdes
and bulimic (MPS), Optimism and	
symptoms amount (LOT-R), Self-	viours.
female athletes. esteem (RSE), how	ever
Reasons for exercise resu	ts
(REI). Social shou	ld be
Desirability (12-item	preted
Marlow-Crowe).	rms of
svm	otoms
	DSM-
	riteria
for	
diag	nosis.
de Bruin Explore the role of 8 (currently Qualitative Contextu Relationship Only	
& contextual body competing= Phenomenological al body between ED athle	tes
Oudejans image in the 4; interviews image symptomology who	had
(2018) development of ED retired=4) framewo and sports rece	ved ED
	ment
in female athletes Age= 18-33 rk: poses environment was treat	
in female athletes $Age=18-33$ rk: poses environment was treat participating in at- (inter)nation that recognized by all were	

Greenlea f, Petrie, Carter & Reel	aesthetic, endurance and weight-class sports. Examine the prevalence of clinical and subclinical levels of	their respected sport. Various Sports Country not specified 204 <i>M</i> =20.16; <i>SD</i> =1.31 NCAA D1 Various	Quantitative Cross-sectional Demographics and weight (height, BMI,	measure themselv es in relation to both the predomi nant athletic body ideals and the body ideals in general society (Loland, 1999) No theory mentione d.	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. 54.4% reported being dissatisfied with their bodies and 88.2%	Researcher bias as the they were a former sport psychologis t to some of the athletes -Self-report. -Small number of women
(2009)	eating disorders as well as healthy/asymptomati c eating among female college athletes and examine the prevalence of pathogenic eating and weight control behaviours.	Various Sports United Sates	grade level, sport and years participating in sport), Disordered Eating (QEDD, BULIT-R)		believed they were overweight. QEDD showed 2% symptomatic, 25.5% symptomatic and 72.5% asymptomatic. 15% reported binge eating and 25.5% reported they exercises for two hours specifically to burn calories	classified as ED which did not allow for examining differences between disordered and symptomati c 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 Internationa 1 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 mentione d.	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

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Hausenbl as & 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;n onathleticon trol 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 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 Age=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 mentione d.	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. Additionall y, ATHLETE does not represent a comprehens ive sampling of the psychologic al dimensions associated

				~		with disordered eating behaviours in female athletes (e.g. Other personality characteristi cs, such as obsessivene ss, 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 mentione d.	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 l) M = 21.5 SD = 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 mentione d.	First league female footballers had a similar prevalence of depressions 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.

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					players and then a female general population of similar age. 16% stated they currently wanted/needed psychotherapeutic support.	
Klinkow ski, Korte, Pfeiffer, Lehmku hl & Salbach- Andrae (2008)	Explore psychopathology in elite rhythmic gymnasts and anorexia nervosa patients	159 M=15.2 (gymnasts); 15.7 (AN patients); 15.9 (High school group) National or Internationa 1 level Gymnastics Germany	Quantitative Cross-sectional Symptom Checklist (SCL-90-R) abody height, weight, Body Mass Index (BMI) and the presence of amenorrhea were assessed.	No theory mentione d	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 questionnair e 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 M=21.7 Various sports Australia	Quantitative Cross-sectional Demographic questions, Eating Attitudes Test (EAT- 26), Figure Rating Scale (FRS)	No theory mentione d.	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).

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					two-thirds were at the elite level	
Kroshus, Goldman , Zubzank sy, & 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 M=19.37 (Team 1) & 20.19 (Team 2) NCAA D1 Cross- country United States	Qualitative Cross-sectional Semi-structured interviews	Bronfenb renner's ecologic al model & Social construct ivist framewo rk.	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, Kubzans ky, 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.
Papatho mas & Lavallee (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.

y

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)	Rational e for study was supporte d by the 'Female Athlete Triad'	a means to achieve. Narrative as a method and theory allowed for an account of how an athlete lives through disordered eating. 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
Reel, SooHoo, Petrie, Greenlea f & 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 <i>M</i> =20.16 Various sports (17+ represented) NCAA D1 USA	Quantitative Demographic information, weight pressures (WPS-F)	No theory mentione d	Results yielded a 16-item measure with four factors: weight pressures from coaches/team/spo rts self- consciousness of weight and appearance, important of weight and appearance, and weight limit Emergence of weight pressures from Coaches/team/spo rt 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/ethnicit y.
Shriver, Wollenb ereg & 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,weigh t, height, Disordered eating (EAT-26 & MEBS), Emotional Regulation (DERS)	No theory mentione d	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; Convenienc e sample; Geographic al, cultural, ethnic and other differences not accounted for.
Smith &	Extend the work of	29	Intervention	The	No treatment	-Facilitator
Petrie	Stice et al. (2000) by	<i>M</i> =19.32	Thin-ideal	intervent	effects were	error as a
(2008)	testing their three-	<i>SD</i> =.94	internalization	ion is	significant	potential
	session cognitive	Various	(BAA-R), Body	grounded	however, post-	problem.
	dissonance program	sports	Image, Concerns	within	hoc analyses	
	among female	NCAA D1	(BPSS-R & BSQ-	dissonan	suggested that the	-Time when
	athletes	United	10-R), negative	ce theory	cognitive-	measures
		States	affect (PANAS-X),	ž	dissonance	were given

			D's sud sus d's stime		·	1 f
			Disordered eating		intervention	before the
			(BULIT-R & DRES		provided some	intervention
					effects	began might
					particularly with	not have
					respect to	accurately
					deceases in	reflected.
					sadness and	
					depression.	-Length of
					Overall the	intervention
					finding suggest a	sessions.
					cognitive	
					dissonance-based	
				<u> </u>	intervention may	
					be useful but will	
					need to be	
				\mathbf{O}	redesigned to	
					address the	
					factors unique to	
					female athletes	
					and the sporting	
					environment.	
Stirling	Examine female	17	Qualitative	No	Athletes from	-A11
& Kerr	athletes perceived	$A_{PP} = 18-25$	Cross sectional	theory	both aesthetic and	participants
(2012)	vulnerabilities to the	Various	Semi-structured	mentione	non-aesthetic	were
(2012)	development of	sports	interview	d	sports perceive	currently
	disordered esting	Sports Country not		u	that the	competing
	uisoidered eating.	country not			undi une vulnorabilitios	athletes and
		specified			they experience	therefore it
					stem from the	
					stem from the	is possible
					sport	that athletes
					environment;	with more
					external risk	severe
					factors like	experiences
					sports' focus on	of
					the body,	disordered
					appearance,	eating had
					weight	retired from
					monitoring and	sport prior
					media influences	to
					and internal	adulthood
					characteristics	
					such as self-	
					absorption,	
					achievement-	
					orientation,	
					perfection- ism,	

					hyper- competitiveness, and self-control	
					were reported to	
					increase their	
					susceptibility to	
G 1 (10.00		NT	disordered eating.	N
Sundgot-	First examine the	1069 (athlatag 55	Quantitative	NO theory	A significantly	NO
Dorgen, Easting	olite athlates and	(attracted = 33)	Cross-sectional Dhase 1: eating	montiono	of athlatas (20%)	reported by
Brackenr	controls reporting	5,	disorders (FDI)	d	compared with	author
idge.	sexual harassment	6)	SHAB, pathogenic	u.	controls (9%) met	uution
Torstveit	and abuse (SHAB)	Age = 15-39	weight behaviors,	C.	the DSM-5	
&	and secondly,	Norwegian	Phase 2: (athletes		criteria for ED. A	
Berglund	determine whether a	national	that classified at ask		higher percentage	
(2003)	higher percentage of	senior and	by ED	\mathbf{O}	of ED athletes	
	female athletes with	junior	questionnaire)		(66%) compared	
	eating disorders	Olympic	engaged in clinical		to Non-ED	
	(ED) had	teams	interviews;		athletes (48%)	
	experienced SHAB	Various	symptoms according		met reported	
		Sports	to DSM-5 criteria		SUAR both inside	
		Norway			and outside the	
					sporting	
			0		community.	
					Opposed to	
					previous findings,	
					a significantly	
					lower percentage	
					of female athlete	
					experienced	
					SHAB opposed to	
					non-athlete	
Torstvait	Explore the	1838	Quantitativa	The	Δ high perceptage	Cross-
TOISIVEIL	percentage of female	(athletes-03	Cross-sectional	female	of both athletes	sectional
, Rosenvin	elite athletes and	8. non-	Part 1. Screening	athlete	and controls met	design
gee.	controls with	athletes=	Ouestionnaire:	triad''	the criteria for DE	uesign
Sundgot-	disordered eating	900)	menstrual cycle,	(the	and clinical ED	
borgen	(DE) and clinical	Age=13-39	self-reported ED,	triad)	(e.g. 46.2% of the	
(2008)	eating disorders	Elite	body dissatisfaction	(Yeager	athletes and	
	(ED) to evaluate	athletes and	(BD), drive for	et al.,	51.7% of the	
	what characterised	Junior elite.	thinness subscales	1993) is	controls reported	
	the athletes with ED.	Various	(DT) from EDI.	mentione	one or more of	
		Sports	Part 2: Random	d.	the five indicators	
		Norway	selection from part 1		of DE). Higher	

			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 mentione d.	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 psychometri cally 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	n	%
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	4, 7, 20	3	12.5
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 = Papathomas & Lavallee (2014); 16 = Prather et al (2016); 17 = Reel, SooHoo, Petrie, Greenleaf & Carter (2010); 18 = Shriver, Wollnbereg & 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	Name	Reference	п	%
purpose		number		
Demographic/General				
information				

	Menstrual history or	1, 11, 16, 17,	7	29.2
	amenorrhea	18, 21, 22		
	Use of Pathogenic weight	21, 22	2	8.3
	Past and current eating	1, 3, 11, 16,	7	29.7
	disorders	17, 18, 22		
	Family eating disorder	18	1	4.2
	history			
	Participants reported weight	5, 17	2	8.3
	satisfaction (e.g. changes in			
	weight experienced in season			
	and out of season			
	Injury	9, 10, 21, 22	5	20.8
	Specifically stress fractures	16		
	Contraception use and	11, 22	3	12.5
	pregnancy	12		
	Breastfeeding			
	Illness	9, 16	2	8.3
	Wellbeing/	9	1	4.2
	Personal and player	10	1	4.2
	characteristics			
	Current general health	10	1	4.2
	Need and use of	10	1	4.2
	psychotherapeutic support			
	Match experience	10	1	4.2
	Starting Status	10, 17	2	8.3
	Ideal weight	12, 18, 23	3	12.5
	Coach required monitoring	12	1	4.2
	of weight			
	Academic status	23	1	4.2
Mental health				
	Mental health inventory	9	1	4.2
	(Berwick et al, 1991)			
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

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DOUY SAUSIACTION/				
uissausiacuon		1 2 2 10		1.6.6
	Harvey, 2002)	1, 2, 3, 19	4	16.6
	Single item about body	2	1	4.2
	satisfaction			
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)		1	4.2
	(IRS-sport)			
	Figural Stimuli Survey	12	1	4.2
Thin-Ideal				
Internalization				
	$\mathbf{D} \mathbf{A} \mathbf{A} \mathbf{B} \left(\mathbf{D} \right)^{1} = 100 \left(\mathbf{C} \right)$	10		
	BAA-R (Petrie, 1996)	19	1	4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996)	19	1	4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria	19	4	4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5	19 1, 3, 5, 19 5, 8	1 4 2	4.2 16.67 8.3
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21	1 4 2 6	4.2 16.67 8.3 25
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22	1 4 2 6 4	 4.2 16.67 8.3 25 16.6
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991) SCANS but SPA subcales only	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22 8	1 4 2 6 4 1	4.2 16.67 8.3 25 16.6 4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991) SCANS but SPA subcales only EDE-Q (Fairburn & Beglin, 1994)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22 8 9	1 4 2 6 4 1 1	 4.2 16.67 8.3 25 16.6 4.2 4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991) SCANS but SPA subcales only EDE-Q (Fairburn & Beglin, 1994) MEBS (Klump et al. 2000)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22 8 9 18	1 4 2 6 4 1 1 1	 4.2 16.67 8.3 25 16.6 4.2 4.2 4.2 4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991) SCANS but SPA subcales only EDE-Q (Fairburn & Beglin, 1994) MEBS (Klump et al. 2000)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22 8 9 18	1 4 2 6 4 1 1 1	 4.2 16.67 8.3 25 16.6 4.2 4.2 4.2 4.2
Eating disorder/ Disordered eating	BAA-R (Petrie, 1996) BULTIR (Thelen et al, 1996) -The BULTIR assesses bulimic symptoms based on the DSM-IV criteria QEDD -Measures symptoms on the bases of DSM-5 EAT-26 (Garner, 1982) EDI-2 (Garner, 1991) SCANS but SPA subcales only EDE-Q (Fairburn & Beglin, 1994) MEBS (Klump et al. 2000) DIS (Stice 1998)	19 1, 3, 5, 19 5, 8 6, 12, 14, 16, 18, 21 7, 8, 21, 22 8 9 18 1, 2	1 4 2 6 4 1 1 1 2	 4.2 16.67 8.3 25 16.6 4.2 4.2 4.2 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	1	1	4.2
	(Stice & Agras, 1998)			
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	20			
	MPS (Frost et al 1990)	3	1	4.2
Optimism				
C	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		24	1	4.2
inventory				
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	3, 5, 13, 14, 17, 19
- Running	9
Cycling	4
Dance	4, 20
Diving only	3, 5, 7, 6, 17
Divers and Swimmers	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	1		
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	5	This study has not been officially	n/0
registration	3	registered	11/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	

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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

 \boxtimes 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: