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Body image concerns across different sports and sporting levels: A systematic review and meta-analysis

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ABSTRACT

Mixed findings exist regarding whether athletes have different levels of body image concerns to non-athletes. Such body image concerns have not been reviewed recently, meaning that new findings need to be incorporated into our understanding of the adult sporting population. This systematic review and meta-analysis aimed first to characterise body image in adult athletes versus non-athletes, and second to explore whether specific sub-groups of athletes report different body image concerns. Impact of gender and competition level were considered. A systematic search identified 21 relevant papers, mostly rated moderate quality. Following a narrative review, a meta-analysis was conducted to quantify the outcomes. While the narrative synthesis indicated possible differences between types of sport, the meta-analysis demonstrated that athletes in general reported lower body image concerns than non-athletes. In general, athletes had a better body image than non-athletes, with no reliable differences between different type of sport. A combination of prevention and intervention strategies might assist athletes in focusing on the benefits to their body image without encouraging restriction/compensation or overeating. Future research should define comparison groups clearly, along with attending to training background/intensity, external pressures, gender and gender identity.

Contents

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1. Introduction

Body image is an individual's subjective evaluation of their own physical appearance (Thompson et al., 1999). Negative body image is common amongst men and women in the general population (Tiggemann, 2004). Body concerns impact general wellbeing, including greater psychological distress (Coco et al., 2014) and symptoms of depression (Puccio et al., 2016). Such concerns are also associated with disordered eating behaviours and are a critical element of eating disorders (Menzel et al., 2010; Peat et al., 2008; Waller & Mountford, 2015).

Several theories have been developed to explain the acquisition and maintenance of body image disturbance (Thompson et al., 1999). Sociocultural theory contends that body image concerns stem from aspiring to a thin ideal promoted in Western societies that is difficult to achieve (Morrison et al., 2004). Awareness of the thin ideal, internalisation of the thin ideal and the perceived pressures to be thin all contribute to body image concerns (Stice, 2002; Thompson & Stice, 2001). Family, peers and the media may reinforce the thin ideal through comments that support and perpetuate the internalisation of the ideal (e.g., criticism, teasing regarding weight) (Levine & Harrison, 2004; Thompson & Stice, 2001).

1.1. Body image in athletes

Despite the fact that there are many beneficial mental health effects from being physically active (World Health Organization, 2019), some risk factors increase the likelihood of body image concerns among athletes. For example, social pressures from coaches to attain a particular physique can promote such concerns (Beckner & Record, 2016). Athletes may also experience performance-related factors that increase their desire for a specific body ideal and subsequent body dissatisfaction (e.g., enhanced performance due to body type; weight requirements for their sport) (Sundgot-Borgen & Torstveit, 2004, 2010). On the contrary, engaging in sports can increase body appreciation and body functionality (and improve body image), since individuals appreciate their own bodies for how they function, rather than how they look (Souilliard et al., 2019).

Other factors may account for differences in body image concerns in athletes, including: background of sport training; intensity of training and training regime; sports uniforms and regular weight/composition measurements (Beckner & Record, 2016; Budzisz & Sas-Nowosielski, 2021; Coppola et al., 2014; Hausenblas & Fallon, 2006; Petrie & Greenleaf, 2012; Reel et al., 2013; Steinfeldt et al., 2013; Stoyel et al., 2021). Gender differences may also exist, with male athletes tending to strive for muscularity and women tending to strive for leanness (Cordes et al., 2016).

Body image in athletes can also differ according to the context (e.g., social or athletic setting) – a phenomenon that De Bruin et al. (2011) have labelled 'contextual body image'. Qualitative studies have since confirmed this, showing that athletes have multiple body images, particularly an athletic and a social body image (Follo, 2007; Russell, 2004). For instance, women rugby players positively interpreted their body shape (strong, muscular) during matches as a tool for performance (athletic body image) (Russell, 2004). However, they felt their athletic bodies failed to meet feminine beauty standards of western society (social body image). Conversely, aesthetic and endurance athletes may experience more positive body image in daily life since their lean bodies fit cultural ideals (Torstveit et al., 2008). Thus, some athletes may be at less risk of body image concerns due to better resembling the societal ideal body image (Egan, 2019).

Recent reviews have compared body image across athletes and non-athletes. However, this is more generally under the umbrella of 'disordered eating' or 'eating disorder psychopathology', and thus relevant papers on body image may have been missed (Chapa et al., 2022; Karrer et al., 2020; Stoyel et al., 2019). Two systematic reviews have focused specifically on body image in athletes versus non-athletes. However, the former is outdated and the latter only focused on female adolescents (Hausenblas & Symons Downs, 2001; Varnes et al., 2013).

Across the majority of all relevant reviews, athletes report lower body dissatisfaction than non-athletes (Chapa et al., 2022; Hausenblas & Symons Downs, 2001; Karrer et al., 2020; Varnes et al., 2013). However, those findings may be impacted by moderating factors, such as gender, sport type and competition level (Benau et al., 2020; Stoyel et al., 2019).

1.2. Gender differences

Hausenblas and Symons Downs (2001) is the only review to date that explores body image across both male and female athletes. They found no differences between genders regarding body dissatisfaction. However, only 19.2 % of the comparisons involved in their review included male athletes. Over the past two decades, there has been more such research, showing higher body satisfaction in athletes versus non-athletes in both females and males (Chapa et al., 2022; Karrer et al., 2020; Varnes et al., 2013). However, research directly comparing males and females has been contradictory. Some have found both male and female athletes feel pressured to be thin (Francisco et al., 2012), while other authors have found that female athletes felt more pressurised to fit a lean ideal, and experience higher body dissatisfaction and lower positive body image (Byrne & McLean, 2002; Gapin & Kearns, 2013; Giel et al., 2016; Reel et al., 2010; Soulliard et al., 2019). Conversely, Bratland-Sanda and Sundgot-Borgen (2012) outline specific risk factors

for poor body image in male athletes, including drive for muscularity and anabolic androgenic steroid use.

There also remains a considerable gap in the body image literature for trans athletes (Varnes et al., 2013). These mixed findings indicate the need for a review that considers the potential impact of gender and gender identity on body image in athletes.

1.3. Sporting type

Sports can be divided into those that are 'nonaesthetic/non-lean' and those that are 'aesthetic/lean' (Chapa et al., 2022). Lean sports rely on a thin physique to maximise sport performance (e.g., running, gymnastics), whilst non-lean sports (e.g., ball sports, strength activities) do not emphasise leanness for aesthetics or performance (Chapa et al., 2022; McFee, 2013).

Although Hausenblas and Symons Downs (2001) found that sport type failed to moderate body image concerns in athletes versus controls, other systematic reviews have since consistently found athletes in lean sports report more body dissatisfaction versus those in non-lean sports (Chapa et al., 2022; Stoyel et al., 2019; Swami et al., 2009; Teixidor-Batlle et al., 2021; Varnes et al., 2013). Specifically, poor body image has been found in lean sport populations, including gymnasts, dancers, long distance runners, ice skaters and swimmers (Kong & Harris, 2015; Krentz & Warschburger, 2011; Steinfeldt et al., 2013; Sundgot-Borgen, 1994).

1.4. Competition level

Some reviews have found that more competitive athletes experience less body dissatisfaction than non-athletes and club/recreational athletes (Hausenblas & Symons Downs, 2001; Karrer et al., 2020). However, other researchers have found more body image concerns with increasing competition level (DiBartolo & Shaffer, 2002; Hoag, 2012; Kato et al., 2011; Robinson & Ferraro, 2004). It may be that differences in body image across competition levels vary depending on other factors mentioned above (e.g., coaching pressures, sport type, body ideals). To summarise, research findings on body image across competition levels are contradictory and warrant further research.

1.5. Rationale for this systematic review and meta-analysis

The last systematic review focusing on body image across genders was conducted 22 years ago by Hausenblas and Symons Downs (2001). Since then, the field of body image research has grown and has included more male participants. Whilst Varnes et al. (2013) provided an update on body image research up to 2012, they only included young female college athletes. Since there are many confounding variables (such as puberty; differences in child development) that impact body image in children (de Bruin & Oudejans, 2018; Kantanista et al., 2018), a review focusing on adults is warranted. Moreover, since Varnes et al. (2013) review, there has been a shift in the body image literature to focus on positive body image and protective factors (e.g. exercise and sports participation). Therefore, an update on the literature on body image in athletes is warranted across all genders and on adults, and a meta-analysis will allow for quantification of the effects found in that literature. This literature review will consider the impact of competition level, sport type and gender, due to their potential impact on body image. Whilst a qualitative appraisal reduces bias by using pre-specified eligibility criteria and search terms, a quantitative meta-analysis supplements this by more precisely characterising the strength and direction of relationships between sports and body image (Higgins & Green, 2011). A quantitative meta-analysis also enables the opportunity to clarify potential inconsistencies within the literature.

1.6. Aims

The current systematic review and meta-analysis has the primary aim of characterising body image in adult athletes versus adult non-athletes, across all genders. The secondary aim is to explore whether specific sub-groups of athletes report higher levels of body image concerns by considering sport type (lean/non-lean), competition level and gender.

2. Method

2.1. Preparatory planning

This systematic review and meta-analysis was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. These aim to improve the quality of systematic reviews (Moher et al., 2015). Prior to the main literature search, scoping searches were conducted on 28/06/22 using Scopus and Google Scholar, to determine whether there was sufficient literature on body image in sports populations to merit such a review. PROSPERO (international register of systematic reviews) was consulted, and confirmed no systematic reviews have been registered on this topic. The protocol was preregistered on Open Science Framework prior to the full search (https://osf.io/8e5bg/?view_only=6a1e0093823548efb65dd2c59cc0c27a).

Two alterations from the registered protocol were made. First, in the terminology in the title and aims of the initial protocol, 'body dissatisfaction' was replaced with 'body image concerns', to capture the different constructs of body image used in the research field. Second, in light of the number of papers found, meta-analyses were added to further analyse the data gathered more quantitatively.

2.2. Search strategy

The literature search was initially conducted by the first author on 1st August 2022, and then updated on 22nd March 2023. The second author screened 10 % of the overall search results to check agreement between the authors regarding the papers deemed suitable for inclusion against our inclusion/exclusion criteria. There was 100 % agreement level between the two authors. For this full systematic review, three electronic databases were searched since inception (Scopus, PsycINFO, and PubMed). The search terms (Table 1) were used in a two-component strategy (Body Image Terms; Sporting Terms) across article titles, abstracts and key words. These search terms were based on those used in previous systematic reviews on body image measures (Kling et al., 2019) and body image in athletes (Hausenblas & Symons Downs, 2001; Karrer et al., 2020).

'Grey literature' (materials that have not been peer-reviewed, such as dissertations, conference materials and self-posted materials) was eligible for inclusion. However, we excluded papers that were not in English, and papers where no primary effect size could be calculated. Backward searching was conducted on identified studies by searching reference lists. Previous reviews of body image in the context of sports were also searched to identify any other relevant studies.

Papers were imported into Mendeley reference management software. Duplicates were removed. Studies were then hierarchically screened against the inclusion/exclusion criteria, according to title, abstract and then full text. Papers were included if they met all inclusion criteria. The information extracted included author(s), publication year, study location, study aims, study design, sample and methodology. Primary outcome measures of body image and the measure used were obtained. Effect sizes for the body image outcomes were also extracted. Key discussion points and limitations were recorded. The first and second authors independently

Table 1
Search terms.

Terms	Search Terms
Term A	"negative body image* " OR "positive body image* " OR "body dissatisfaction" OR "body satisfaction" OR "body ideal* " OR "weight concern* " OR "shape concern* " OR "body esteem" OR "appearance concern* " OR "social avoidance" OR "body image avoidance" OR "appearance anxiet* " OR "appearance-related anxiet* " OR "appearance-related concern* " OR "muscularity satisfaction" OR "muscularity dissatisfaction" OR "body shape satisfaction" OR "body shape dissatisfaction" OR "weight satisfaction" OR "weight dissatisfaction" OR "appearance satisfaction" OR "appearance dissatisfaction" OR "body image satisfaction" OR "body image dissatisfaction" OR "body checking behav* " OR "body shame" OR "appearance comparison* "
Term B	"athlete* " OR "sport" OR "competitive versus non-competitive" OR "competitive or non-competitive" OR "competition level* " OR "sporting level* " OR "aesthetic sport* " OR "nonaesthetic sport* " OR "lean sport* " OR "non-lean sport* " OR "endurance sport* " OR "combat sport* " OR "team sport* " OR "racket sport* " OR "ball sport* " OR "weight* sport* " OR "run* " OR "hiking" OR "cycling" OR "swim* " OR "crossfit"

Note. Term A and Term B were combined using the 'AND' operator.

conducted data extraction for all studies that met the inclusion criteria, and agreed in all cases.

2.3. Inclusion and exclusion criteria

The inclusion criteria were guided by the PICOS framework (Table 2), as recommended by the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2019). Table 2 shows the inclusion/exclusion criteria. All studies were required to be of quantitative design. The search was restricted to adults, defined as individuals aged 17 and above. We excluded children and younger adolescents because of the many confounding impacts of puberty on body image and sports involvement. Most students start college/university aged 18 years, but some start as they approach that age and some students routinely start at 17 years (e.g., in Scotland). Therefore, as many studies are based on college/university students, it was important not to miss those who were 17 years old. If a study did not include a minimum age, it was included in the analysis if the mean age minus the *SD* was at least 17 years. Studies recruiting university students were included on the assumption that the minimum age requirement for university is 17 years and above.

To explore body image across sporting levels, studies had to include participants from at least two of the following three groups: competitive athletes, non-competitive athletes, and/or non-athletes. An 'athlete' is considered "an individual who by virtue of special training or natural talent, is fit to compete in a physically demanding sport", as defined by the Oxford Dictionary of Sports Science and Medicine (Kent, 2006). In line with previous reviews (Chapman & Woodman, 2016; Varnes et al., 2013), this systematic review defined 'competitive athletes' as individuals who compete in competitive sports competitions for their sport (e.g., Olympians, National Collegiate Athletic Association Divisions). They are described by terms such as, 'competitive athlete', 'professional' and/or 'elite''. Non-competitive athletes are described by words such as, 'non-competitive', 'recreational', and/or words relating to their sport who were not competing (e.g. 'runners', 'cyclists'). 'Non-athletes' are described as 'non-athletes', 'controls' and/or 'sedentary'. Regarding sport type, this systematic review was guided by previous reviews (Hausenblas & Symons Downs, 2001) and thus included sports such as bodybuilding. Participants whose sports are considered outside the aforementioned definition of athlete will also be considered as 'non-athletes'. For example, individuals engaging in sports such as chess would not be considered athletes since chess is not considered physically demanding (Parry, 2019). Any uncertainties were discussed between the researchers.

Papers had to be written in English. They had to include a clear, quantifiable measure of body image specific to either athletes or non-athletes. Tools that measured an individual's subjective evaluation of their own physical appearance were considered as body image measures (Thompson et al., 1999). Various search terms relating to the different constructs of 'body image' (both negative and positive facets of body image) were used to capture all relevant papers. Body image can be measured using a number of validated tools whereby high scores reflect higher body image concerns (e.g., Eating Disorder Inventory; Garner et al., 1983). Other tools may assess positive body image, where high scores reflect lower body image concerns (e.g. Body Appreciation Scale; Tylka & Wood-Barcalow, 2015b). Where there were multiple outcome measures, we used the primary outcome measure of body image as identified by the authors. If the authors did not explicitly state a primary outcome measure, then we identified the measure that was most prominently used by the authors in their analyses (as listed in Table 4).

2.4. Quality assessment

Study quality was assessed to ascertain methodological quality and risk of bias and to inform areas for future directions. A scoping search revealed the majority of studies were cross-sectional designs. Whilst Berra et al. (2008) developed the STROBE (STrengthening the Reporting of Observational Studies in Epidemiology) tool for cross-sectional designs, it only appraises the quality of cross-sectional studies and does not address risk of bias or other aspects of quality. Instead, the Critical Appraisal Skills Programme. (2018) Cohort Study checklist enables review of a range of components (selection bias,

Table 2
Inclusion/Exclusion Criteria.

Inclusion	Exclusion
• Samples must be above 17 + years of age • Samples must include athletes • Studies must be written in the English language • Quantitative study design • The study includes a sample of two or more of the following comparison groups: competitive athletes and/or non-competitive athletes and/or non-athletes (see text for definition of 'athlete') • Must include a quantifiable body image measure • Sufficient information to compute effect size	• Participants below 17 years • Samples that do not include athletes (as defined above) • Studies written in a language other than English • Qualitative studies, single case experimental designs, case studies, commentaries, and protocols • Studies without a focus on body image

study design, outcome bias, confounders, attrition, implications for practice). The CASP (2018) Cohort Study checklist was slightly altered to make it more applicable to cross-sectional studies. Specifically, the question: "Was the exposure accurately measured to minimise bias?" was altered to, "Were the comparator groups accurately categorised to minimise bias?".

All studies were evaluated against the checklist by the lead author. This consisted of 12 questions divided into three sections (Are the results of the study valid?; What are the results?; Will the results help locally?). Ratings are either 'yes', 'no' or 'cannot tell'. CASP does not provide a total score. However, the number of 'yes' responses were totalled to assist in consideration of study quality when synthesising the findings. Two of the questions consisted of two parts and thus a total score of 14 could be obtained. Studies were placed into low (0–5 'yes'), moderate (6–10 'yes') and high-quality categories (11–14 'yes'), created by the authors.

2.5. Planned analysis

2.5.1. Data selection and extraction

Fig. 1 shows the search process in a PRISMA diagram (Moher et al., 2009). 1866 papers were identified from database searching. Papers were imported into Mendeley reference management software. After removing duplicates, 1531 records remained and were screened by title and abstract against the inclusion/exclusion criteria. Of these, 137 studies were eligible for full-text screening, and 116 of those studies were excluded for not fulfilling the inclusion/exclusion criteria (Fig. 1). Thus, 21 studies were identified as meeting the inclusion criteria. No additional papers were identified through reference scanning of the identified papers.

2.5.2. Meta-analyses

In addition to the narrative synthesis of all reviewed studies, five random effects meta-analyses were conducted. These were conducted with and without the weaker quality papers and with and without any outliers, to determine whether inclusion of those papers influenced the outcome. As noted above, these meta-analyses were not part of the pre-registration, so should be noted as a deviation from the original plan. They were included because the number of papers discovered was higher than originally expected, allowing more definitive quantitative conclusions to be reached.

The statistical package used was MAVIS v1.1.3 (Meta-Analysis via Shiny; http://kylehamilton.net/shiny/MAVIS/). Random effects models were used, due to the variation across study characteristics meaning that no single effect size could be assumed (Borenstein et al., 2009). The meta-analyses compared: i) competitive athletes and non-athletes; ii) competitive and non-competitive athletes; iii) lean and non-lean athletes; iv) lean athletes and non-athletes; and v) non-lean athletes and non-athletes. No meta-analysis was conducted on non-competitive athletes versus non-athletes due to no papers being found that compared these populations. Within each meta-analysis, studies using the same sample for multiple comparisons were combined using the formula recommended by Cochrane (Higgins & Green, 2011). For example, basketballers, volleyballers, and softballers were combined into one sample of non-lean athletes and compared to the control group (non-athletes).

2.5.2.1. Effect size calculations. Effect sizes (Cohen's *d*) were directly obtained from studies (Cohen, 1988). If Cohen's *d* was unavailable, the mean and standard deviation were obtained and the effect size

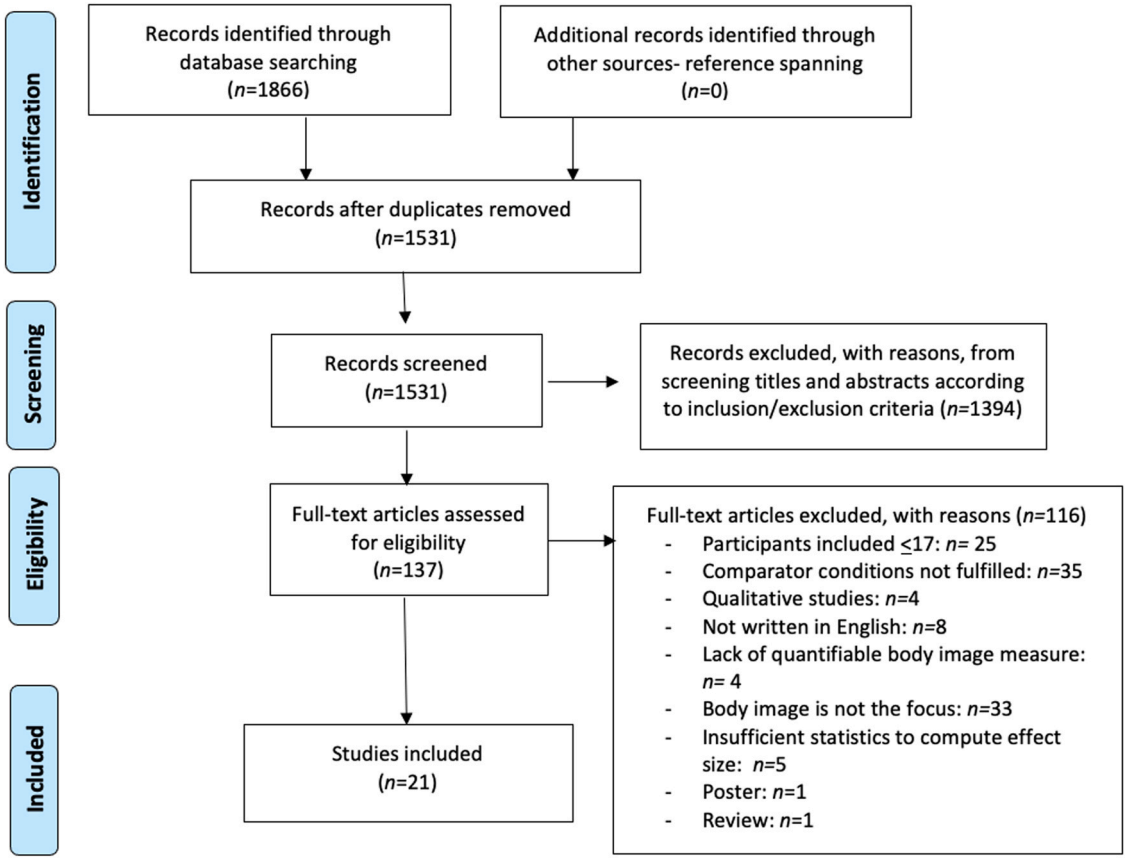

Fig. 1. PRISMA (Moher et al., 2009) diagram of search strategy.

(Cohen's *d*) was calculated using the Campbell Collaboration effect size calculator (Wilson, 2022). If means and SDs were not available, then effect sizes other than Cohen's *d* were converted to Cohen's *d* using the Campbell Collaboration effect size calculator (Wilson, 2022). Separate effect size comparisons were made across different i) competition levels and ii) sport types. An effect size of 0.2 was considered small, 0.5 medium and 0.8 large (Cohen, 1988). This process enabled clearer comparison across studies.

Hedges' *g* was calculated to adjust for unequal sample sizes across groups. Heterogeneity was examined using the I^2 and Cochran's *Q* statistics (Higgins et al., 2003). In general, I^2 values of 25 % reflect low heterogeneity, 50 % moderate heterogeneity and 75 % or more indicate high heterogeneity (Higgins et al., 2003). The *Q*-statistic is the weighted sum of squared differences between observed effects and *weighted* average effect. Significance of *Q* statistic indicates heterogeneity.

Publication bias was examined using funnel plots to visualise standard errors vs effect sizes, with trim-and-fill used where the funnel plot was asymmetrical (Quintana, 2015). Egger's regression test examined publication bias (Egger et al., 1997).

Table 3
Categorisation of studies according to athletic status (non-athletes, non-competitive athletes, competitive athletes).

Non-athletes (*N* = 16)			
Non-athletes	Further information on non-athletes	Number of studies	Researchers (date)
By definition (*n* = 13)	'Non-athlete' term used	*n* = 11	Aşçi (2004) Benau et al. (2020) Di Bartolo and Shaffer (2002)* Dinucci et al. (1994) Hoag (2012) Reinking and Alexander (2005)* Robinson and Ferraro (2004) Soulliard et al. (2019) Soulliard et al. (2021) Warren et al. (1990)* Wiggins and Moode (2000)*
	'Non-exerciser' term used	*n* = 1	Furnham et al. (1994)
	'Non-sporting' term used	*n* = 1	Iacolino et al. (2017)*
Using the term 'control' or 'comparison group'	'Control'	*n* = 2	Arroyo et al. (2008)* Filaire et al. (2007)*
	'Comparison group- classroom subjects'	*n* = 1	Loosemore et al. (1989) [b]*
Non-competitive Athletes (n = 6)			
Non-competitive level	Further information on non-competitiveness	Number of studies	Researchers (date)
Explicitly stating participants as not competing (*n* = 4)	'Non-competitive' term used	*n* = 2	Goldfield et al. (2006) Goldfield (2009)
	Never competed and no plans to compete in the next 12 months	*n* = 2	Kong and Harris (2015) Smith et al. (2010)
Terminology alluding to non-competitiveness (*n* = 2)	Regularly worked out in the gym	*n* = 1	Loosemore et al. (1989)[b]*
	Fitness lifters with 6 months minimum experience	*n* = 1	Hale et al. (2013)
Competitive Athletes (n = 21)			
Competition level (least to most competitive) (number of studies)	Further competition level information (least to most competitive)	Number of studies	Researchers (date)
Collegiate (*n* = 12)	Division not specified	*n* = 2	Loosemore et al. (1989)[b] Wiggins and Moode (2000)
	Division III	*n* = 1	Di Bartolo & Shaffer (2002)
	Division II	*n* = 1	Robinson and Ferraro (2004)
	Division I	*n* = 5	Kong and Harris (2015)[a] Reinking and Alexander (2005) Soulliard et al. (2019) Soulliard et al. (2021) Warren et al. (1990)
	First university team	*n* = 1	Furnham et al. (1994)
	Across competition levels (recreational, club, collegiate, elite)	*n* = 2	Benau et al. (2020)[a] Hoag (2012)
Competition participation/training (*n* = 5)	Recently trained for a competition or in training for a competition	*n* = 2	Iacolino et al. (2017)* Smith et al. (2010)
	Actively training for a competition	*n* = 2	Goldfield et al. (2006) Goldfield (2009)
	Competed in $\leq$ 3 competitions (expert bodybuilders)	*n* = 1	Hale et al. (2013)[a]*
	Competed in $\geq$ 10 competitions (expert bodybuilders)	*n* = 1	Hale et al. (2013)[a]
Elite (*n* = 6)	'Elite' or synonym 'Semi-pro/pro'	*n* = 2	Arroyo et al. (2008) Kong and Harris (2015)[a] Benau et al. (2020)[a]
	National teams	*n* = 3	Aşçi (2004) Dinucci et al. (1994) Filaire et al. (2007)

Note. * denotes a study with poorly defined criteria of competitive/non-competitive/non-athlete. [a] indicates studies recruiting more than one group of competitive athletes. [b]denotes the study that recruited across all three conditions.

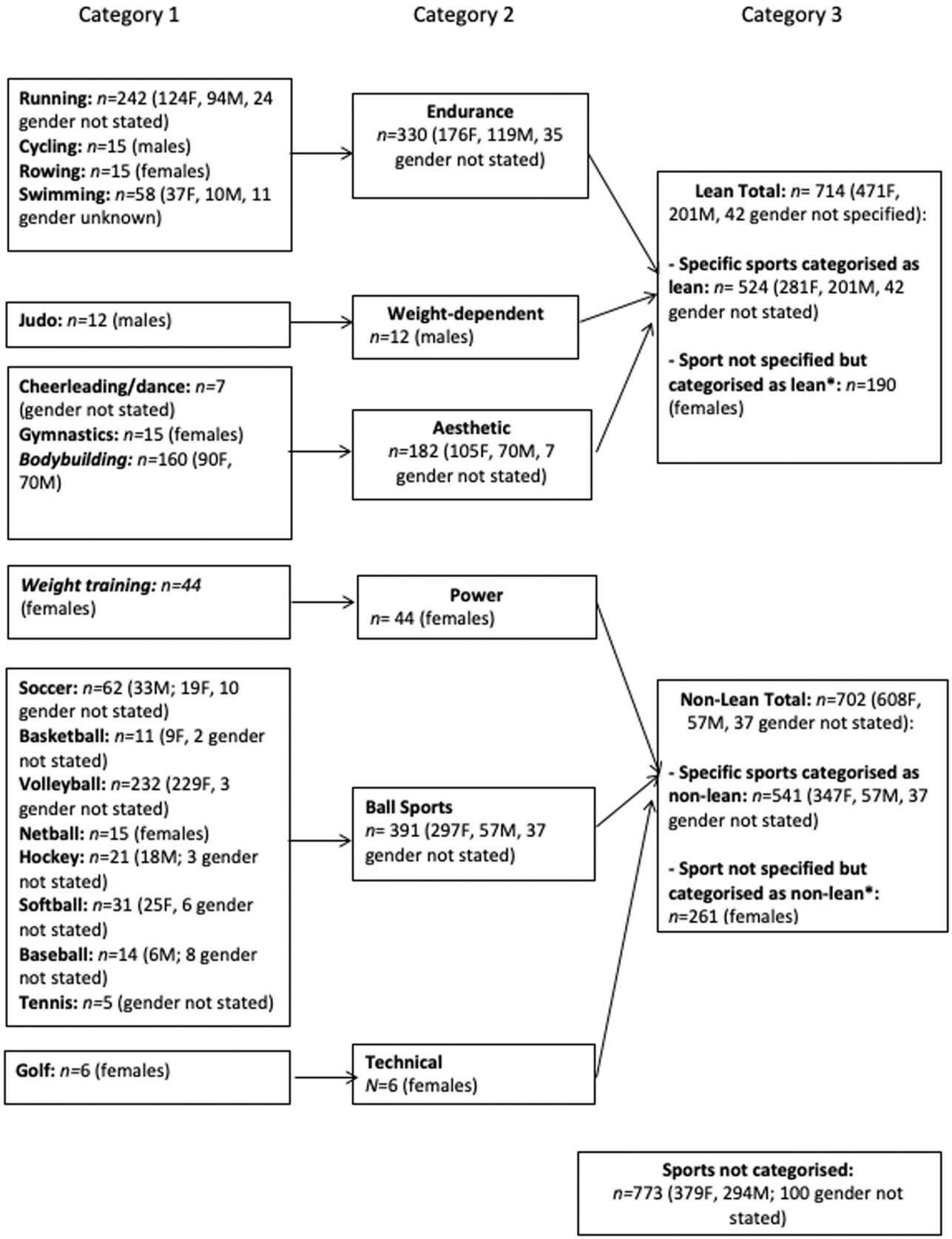

Fig. 2. Diagram showing the number of participants across different sport types, based on Murphy (2005).

3. Results

3.1. Study characteristics

Key characteristics are outlined in Appendix A. The majority of studies were conducted in the USA (*N* = 11), followed by Canada (*N* = 3), United Kingdom (*N* = 2), Australia (*N* = 1), Spain (*N* = 1), Turkey (*N* = 1), France (*N* = 1) and Italy (*N* = 1). All studies were cross-sectional. A total sample of 3827 participants were recruited across all of the studies within this review. Individual study sample sizes ranged from 44 to 798. The majority of studies included university students (*N* = 17).

Table 3 shows how participant groups were categorised into competitive athletes, non-competitive athletes, and non-athletes. Most studies recruited two or more of these samples from the offset (*N* = 18), whilst three studies stratified their sample into these categories using their own questionnaires (Benau et al., 2020; Iacolino et al., 2017; Smith et al., 2010).

Sixteen of the 21 studies provided sufficient information to sort research according to sport type (lean/non-lean). This division into lean and non-lean sports was based on previous research on eating disorders in athletes (Chapman & Woodman, 2016; Mancine et al., 2020; Sundgot-Borgen & Torstveit, 2004). Across all studies, 714 participants were considered lean athletes and 702 participants non-lean (Fig. 2).

Eleven studies recruited females only and four studies recruited only males. The remaining studies included a roughly equal gender ratio (i.e., 50–60 %) (*N* = 2) or were predominantly female (*N* = 4). Across all study samples, females were most represented (*n* = 2593), followed by males (*N* = 1116). Only two studies (Soulliard et al., 2019; Souilliard et al., 2021) considered gender identity other than the sex assigned at birth. One participant across all studies was a trans-woman (Soulliard et al., 2019). See Fig. 2 for the gender split across sport types.

3.2. Quality assessment

All studies passed the screening questions and were therefore quality assessed using the CASP Cohort Checklist. Most studies were rated moderate (*N* = 12), followed by high (*N* = 5) or low (*N* = 4) in methodological quality. Further information on quality assessment is available in the Supplementary material 1.

A strength of the studies was that they all addressed a clearly focused issue (body image) and recruited participants in an acceptable way. However, ten studies had unclear definitions of groups. 'Non-athletes' were the poorest defined group, which was problematic for comparisons since there is a possibility that they included athletes (*N* = 9).

Whilst 18 studies included reliability and/or validity data on the measure used, only 12 received a 'yes' rating on the accuracy of outcome measure used. This is because six did not using the most up-to-date version of the Eating Disorders Inventory (EDI) (see Appendix A). Three studies received a 'can't tell' since they did not provide reliability or validity data on the measure used (Arroyo et al., 2008; Filaire et al., 2007; Furnham et al., 1994).

The majority of studies controlled for confounding variables and took this into account in their analysis (*N* = 15). However, a weakness of all studies was that they were not longitudinal. Other flaws included small sample sizes, unequal sample size comparisons, and minimal consideration of confounding variables.

3.3. Body image measures used

Studies varied on the primary body image measure administered (Appendix A). The most common measure of body image disturbance was the body dissatisfaction subscale of the Eating Disorders Inventory (EDI-BD) (*N* = 9). Four studies used questionnaires that required participants to rate the figures that best represented their body.

Other studies measured muscularity body dissatisfaction (*N* = 4). Two of these adapted the EDI-BD to create a Drive for Bulk Scale. Specifically, the direction of items was reversed (e.g., 'too big' to 'too small') and references to body parts were altered to the more mesomorphic bodybuilding ideal. One study used the Muscle Dysmorphia Inventory (MDI) (Rhea et al., 2004). The Size Symmetry subscale was extracted as a measure of body image disturbance. One study measured muscular body dissatisfaction as the difference between actual and ideal figure ratings using the Somatomorphic Matrix Test (Pope et al., 2000).

Six studies used measures where higher scores reflected positive body image. To avoid confusion in collating all the different measures to ascertain body image concerns, the current review describes those with more positive body image as having 'fewer body image concerns'. The most commonly used measure was the Body Esteem Scale (*N* = 3). However, two researchers used another measure (developed by Franzoi & Shields, 1984), whilst Filaire et al. (2007) created a French-Canadian version based on a different Body Esteem Scale (Leichner et al., 1994). Other positive body image measures included the Body Appreciation Scale 2 (Tylka & Wood-Barcalow, 2015b; *N* = 1) the State-based Body Appreciation Scale (Homan, 2016; *N* = 1), and the Physical Self-Perception Profile body attractiveness subscale (Fox & Corbin, 1989; *N* = 1).

3.4. Qualitative findings: narrative review

Tables 4–8 summarise the papers that were used in the narrative review. These are divided into studies that compare body image by competition level and sport type.

3.4.1. Review findings I: competition level

To accomplish the first aim of this review, comparisons between non-athletes and athletes were made whilst also considering competition level (Table 4). Most studies compared competitive athletes with non-athletes (*N* = 15). Only one study compared non-competitive athletes with non-athletes (Loosemore et al., 1989). Five studies compared competitive and non-competitive athletes. Of note is the fact that nine studies had unclear definitions of non-athletes. All 21 studies recruited competitive athletes. Most studies recruited competitive athletes from collegiate sports (university sports) teams (*N* = 12) and non-athletes from university courses (*N* = 9). Collegiate sports were part of the National Collegiate Athletic Association (NCAA), which ranges from division I (most competitive) to division III (least competitive).

3.4.1.1. Athletes vs non-athletes. Considering body image in adult athletes versus adult non-athletes, the majority of papers showed that athletes had lower body image concerns than non-athletes (*N* = 11) (Table 4). Four reported no significant differences, but three of those were of low quality and so should be interpreted with

Table 4
Summarised results of the studies comparing athletes versus non-athletes.

Paper	Comparison groups: athletes vs non-athletes [Gender]	Body image measure (interpretation)	Outcome	Interpretation
Arroyo et al. (2008)	Competitive (Soccer players) vs non-athletes [all males]	Somatomorphic Matrix Test	There were no body-dissatisfaction differences between the soccer players and controls for both muscularity (78.5 % players and 82.2 % controls were dissatisfied) and % body fat (64.3 % players and 64.3 % controls dissatisfied)	No significant difference between competitive soccer players and non-athletes.
Aşçi (2004)	Competitive (elite athletes of different sports) [207 M; 122 F] vs non-athletes [275 M; 194 F]	The Physical Self-Perception profile- Body attractiveness subscale (higher scores indicate more positive body image attractiveness)	Athletes scored higher than non-athletes on the body attractiveness subscale ($p < .01$) No significant main effect of sex on body attractiveness ratings.	Athletes scored significantly higher than non-athletes on body attractiveness, indicating fewer body image concerns No effect of gender.
Benau et al. (2020)	Competitive athletes [87 M;96 F] of different sports vs non-athletes [15 M; 81 F]	EDI3-BD*	Male athletes vs female athletes were defined by greater body dissatisfaction (Welch's $t(263.83) = 10.65$, $p < 0.001$, $d = 1.27$). Omnibus MANOVA revealed the main effect of athletics was not significant, $F(8, 268) = 1.06$, $p = 0.389$, $\eta p^2 = 0.031$. However, the gender × athletics interaction was significant $F(8, 268) = 2.16$, $p = 0.031$, $\eta p2 = 0.061$.	Male athletes had significantly higher body dissatisfaction than female athletes No difference on body dissatisfaction between competitive and non-athletes.
Di Bartolo & Shaffer (2002)	Competitive athletes of different sports vs non-athletes [all females]	EDI1-BD* BIS (greater scores indicate higher body dissatisfaction)	Athletes scored significantly lower on body dissatisfaction than non-athletes on the: EDI: $F(1207) = 20.71$, $p < .001$, $np^2 = 0.09$) BIS: $F(1207) = 7.59$, $p < .01$, $np^2 = 0.04$)	Athletes reported significantly lower body dissatisfaction than non-athletes both the BDI and BIS.
Dinucci et al. (1994)	Competitive athletes (basketballers, volleyballers, softballers) vs non-athletes [all females]	Body Esteem Scale (Weight Concern subscale) (higher scores indicate more positive body esteem).	For weight concern, Duncan's multiple-range test (alpha=.05) indicated the mean of controls was significantly lower than mean of each of the three athletic groups (basketball, volleyball, softball).	Non-athletes reported significantly lower body esteem than athletes (basketball, volleyball, softball) and thus had more body image concerns.
Filaire et al. (2007)	Competitive athletes (Judoists; Cyclists) vs non-athletes [all males]	Body Esteem Scale Canadian-French version (Weight satisfaction)= higher scores represent higher body-esteem.	ANOVA revealed significantly higher Body-esteem Weight Satisfaction for non-athletes as compared to the athletes (Judoists; Cyclists), $p < .05$.	Nonathletes had significantly higher body esteem than athletes (Body esteem scale).
Furnham et al. (1994)	Competitive athletes (netballers, rowers, bodybuilders) vs non-athletes [all females]	Body Shape Selection (attractiveness subscale)- higher scores indicate more positive body image	One-Way ANCOVAs revealed exercisers perceived themselves as significantly more attractive than non-exercisers ($p < .05$).	Exercisers perceived their body as significantly more attractive than non-exercisers
Hoag (2012)	Competitive volleyballers vs non-athletes [all females]	EDI1-BD	MANOVA (BMI as covariate) Volleyball players scored significantly higher on the body dissatisfaction subscale [Mean = 10.00 (+ 2.25)] compared with non-athletes [Mean = 9.14 (+2.32)]. $F(1322) = 10.09$, $p = .002$, $\eta p^2 = .030$.	Athletes had significantly higher body image concerns than non-athletes.
Iacolino et al. (2017)	Competitive athletes of different sports vs non-athletes (70 M, 125 F)	Body Uneasiness Test (Body Image Concern) (higher scores indicate more body image concerns)	Athletes scored significantly lower on body image concern than non-athletes ($p < .05$).	Athletes had significantly lower body image concern than non-athletes
Loosemore et al. (1989)	Competitive hockey players vs non-athletes [all male]	EDI1-BD*	ANOVA between all comparison groups (competitive, non-competitive, non-athlete) revealed a significant difference among the three groups ($p < .0001$). Duncan's Multiple Range indicated no significant difference between hockey players and non-athletes.	No significant difference on body dissatisfaction.
Reinking and Alexander (2005)	Competitive athletes of different sports vs non-athletes [all females]	EDI2- BD*	Athletes had significantly lower scores in body dissatisfaction than non-athletes ($p = .01$).	Athletes had significantly lower body dissatisfaction than non-athletes.
Robinson and Ferraro (2004)	Competitive athletes (Speed; Technique) vs non-athletes [all females]	EDI1-BD*	Nonathletes expressed more dissatisfaction than both technique and speed focussed athlete groups ($p < .05$)	Nonathletes had significantly higher dissatisfaction than technique and speed focussed athletes.
Soulliard et al. (2021)	Competitive athletes of different sports vs non-athletes [Cisgender: 219 F; 67 M]	SBAS-2 (higher scores indicate greater body appreciation)	Cisgender men reported higher levels of body appreciation compared to cisgender women: $t(284) = 2.60$, $p = .01$, $d = 0.61$, When controlling for gender, student athletes reported higher levels of body appreciation compared with nonathletes. $F(1283) = 19.36$, $p < .001$, $\eta p^2 = .06$.	Men reported significantly higher body appreciation than women. Athletes reported significantly higher body appreciation than nonathletes.

(*continued on next page*)

Table 4 (*continued*)

Paper	Comparison groups: athletes vs non-athletes [Gender]	Body image measure (interpretation)	Outcome	Interpretation
Soulliard et al. (2019)	Competitive athletes of different sports vs non-athletes [Cisgender: 180 F, 73 M; 1 Transwoman]	BAS-2 (higher scores indicate greater body appreciation)	Women athletes reported lower body appreciation than male athletes t(77) = 4.52, p < .001. When controlling for gender, student athletes reported significantly higher levels of body appreciation than non-athletes: F(1249)= 9.10, *p* < .001, n^2 = 0.71 (medium effect).	Men reported significantly higher body appreciation than women. Athletes reported higher body appreciation than non-athletes.
Warren et al. (1990)	Competitive athletes (gymnasts; runners; athlete controls) vs non-athletes [all females]	EDI1-BD*	Non-athletes scored significantly higher on body dissatisfaction than runners (*p* < .05) but not gymnast nor athlete controls (non-lean sports) (*p* > .05)	Nonathletes had significantly higher body dissatisfaction than runners. No significant difference between nonathletes and gymnasts; or non-athletes and athlete controls
Wiggins and Moode (2000)	Competitive athletes of different sports vs non-athletes [all female]	Body Esteem Scale (weight concern subscale): higher scores indicate higher body esteem	No significant difference between athletes and non-athletes on body esteem (weight concern) (*p* > .05).	No significant difference
Loosemore et al. (1989)	Non-competitive bodybuilders vs non-athletes [all male]	EDI1-BD	ANOVA between all comparison groups (included non-athletes too) revealed a significant difference among the three groups (p < .0001). Duncan's multiple Range test indicated body builders had significantly higher body dissatisfaction than non-athletes (no *p* value reported).	Non-competitive athletes had significantly higher body dissatisfaction than non-athletes

Note.
Comparison groups separated by a semicolon indicate different comparison groups used in analyses.
M: Males; F: Females.
EDI(1;2;3)= Eating Disorder Inventory (version used), SBAS-2 = state-based Body Appreciation Scale 2, BAS-2 = Body Appreciation Scale-2; BES: Body Esteem Scale.

caution. Only three papers found that athletes had higher body image concerns than non-athletes based on comparisons with competitive (Filaire et al., 2007; Hoag, 2012) and non-competitive athletes (Loosemore et al., 1989). To summarise, the evidence was in favour of the conclusion that athletes have lower body image concerns than non-athletes.

3.4.1.2. Role of gender. Apart from Hoag (2012) and Wiggins and Moode (2000), all of the studies of females only showed that female athletes had lower body image concerns than female non-athletes, but this pattern was not repeated in the small number of studies recruiting only males ($N = 3$). Four studies directly compared male athletes with female athletes, but findings varied widely. However, the unequal sample sizes for males and females in all of these samples make it impossible to draw conclusions relating to any gender difference.

3.4.1.3. Competition level. As with gender, there was no consensus on whether non-competitive athletes had higher body image concerns than competitive athletes (Table 5). These findings did not appear to be impacted by gender.

3.4.2. Review findings II: sport type

For the second aim, research was categorised according to sport type (Lean/Non-lean). Gender was also considered for any impact on findings. These were compared across studies including two or more of the following comparator groups: lean sport(s); non-lean sport(s), non-athletes (Tables 6–8).

3.4.2.1. Lean vs non-lean sports. Seven studies compared lean sports and non-lean sports (Table 6). The majority showed that lean athletes had higher body image concerns than non-lean athletes ($N = 4$). One showed no significant difference, and two reported mixed findings dependent on the body image measure used or the lean comparison group used (runners vs gymnasts). Comparisons across genders could not be made, as six of the seven studies recruited females only.

3.4.2.2. Lean sports vs non-athletes. There were mixed findings comparing lean athletes and non-athletes (Table 7). In two studies, lean athletes had better body image than non-athletes, while in two others non-athletes had better body image than lean athletes. Finally, there was no difference in the fifth study. However, the number of studies was small, and three studies were of weak quality.

3.4.2.3. Non-lean sports vs non-athletes. The dominant pattern was that non-lean athletes had lower body image concerns than non-athletes. One study showed non-lean athletes (volleyballers) had higher body image concerns than non-athletes (Hoag, 2012). Two studies did not show any difference (Table 8). It is noteworthy that the two studies reporting no significant differences were the only two comparing males only, whilst those showing significant differences were on female samples. Therefore, this pattern of better body image among non-lean athletes may be impacted by gender.

3.5. Quantitative analyses: meta-analyses

Random effects meta-analyses were conducted initially with all papers included, and then were re-run without outliers and without papers that were of weak quality, to determine whether those papers influenced the outcome. These are presented in Table 9.

Table 5
Summarised results of the studies comparing competitive athletes versus non-competitive athletes.

Paper	Comparison groups: competitive athletes vs non-competitive [Gender]	Body image measure (interpretation)	Outcome	Interpretation
Goldfield (2009)	Competitive bodybuilders vs non-competitive weight training [all females]	EDI1-BD Drive for Bulk (higher scores indicate higher desire for muscularity)	No significant differences on the Body Dissatisfaction variable ($p > .05$). Competitive bodybuilders scored significantly higher on the Drive For Bulk Scale F(1,43)= 9.4, p = .004, partial eta squared= .18 than non-competitive weight training athletes.	No significant difference on EDI. Competitive bodybuilders reported signifcantly higher drive for bulk scores than non-competitive weight trainers.
Goldfield et al. (2006)	Competitive bodybuilders vs non-competitive bodybuilders [all males]	EDI1-BD Drive for Bulk (higher scores indicate higher desire for muscularity)	No significant differences ($p > .05$) between competitive and recreational bodybuilders regarding both body dissatisfaction and drive for bulk.	No significant difference on body dissatisfaction and drive for bulk.
Hale et al. (2013	Competitive bodybuilders (expert) vs non-competitive fitness lifters [all females]	Muscle Dysmorphia Inventory: Size Symmetry (higher scores indicate more body image concerns)	Female bodybuilders scored higher than fitness lifters for size symmetry scales of the MDI (F(2,71)= 11.09, p < .01). Follow up turkey post hoc tests: expert bodybuilders scored significantly higher than fitness lifters ($p < .05$)	Competitive 'expert' bodybuilders reported significantly higher size symmetry vs non-competitive fitness lifters.
Kong and Harris (2015)	Competitive (elite, recreational) vs non-competitive athletes of different sports [all females]	Figure Rating Scale: Difference between FRS current and FRS sport= sporting body dissatisfaction (higher scores indicate greater body dissatisfaction)	Sporting body dissatisfaction did not significantly differ between any of the three groups (elite, recreational athletes, non-competitive athletes ($p > .05$).	No significant difference on body dissatisfaction.
Loosemore et al. (1989)	Competitive (Hockey players) vs non-competitive (bodybuilders) [all males]	EDI1-BD	ANOVA between all comparison groups (included non-athletes too) revealed a significant difference among the three groups (p < .0001). Duncan's multiple Range test indicated body builders (non-competitive) had significantly higher body dissatisfaction than hockey players (competitive).	Non-competitive bodybuilders reported significantly higher body dissatisfaction than competitive hockey players.
Smith et al. (2010)	Competitive runners vs non-competitive runners [94 M; 90 F]	SPAS (higher scores indicate higher appearance anxiety)	A MANCOVA revealed a significant overall effect, Wilks's $\Lambda = .39$, $F(30, 499.66) = 6.21$, $p < .001$ on various different measures. Univariate F test for SPAS revealed no significant difference between competitive and non-competitive runners on appearance anxiety scores ($p > .05$).	No significant difference Means and SD were similar for competitive males and competitive females; and non-competitive males and non-comp females. Post hoc tests were not conducted on SPAS scores due to ns main effect.

Note. M: Males; F: Females.
Comparison groups separated by a semicolon indicate different comparison groups used in analyses.
EDI(1;2;3)= Eating Disorder Inventory (version used), SBAS-2 = state-based Body Appreciation Scale 2, BAS-2 = Body Appreciation Scale-2; BES: Body Esteem Scale.

Table 6
Summarised results of the studies comparing lean athletes versus non-lean athletes.

Paper	Comparison group (s) [Gender]	Body image measure (interpretation)	Outcome and interpretation	Interpretation
Hale et al. (2013)[ab]	Lean sports (Expert bodybuilders[a]) vs non-lean (Fitness lifters[b]) [all female]	MDI- Size symmetry subscale (higher scores=higher dissatisfaction with body)	Significant MANOVA group main effect (Wilks' lambda =.44, F (12, 132)= 5.59, $p < .05$. Univariate F tests indicated significant differences in size symmetry (F (2,71)= 11.09, $p < .01$. Follow-up Tukey post hoc tests showed expert bodybuilders scored significantly higher than fitness lifters ($p < .05$).	Lean athletes reported significantly higher body dissatisfaction than non-lean athletes.
Kong and Harris (2015)[ab]	'Lean athletes' (elite + recreational)[ab] vs 'Non-lean athletes'[ab] [all female]	Figure rating scale	Compared with non-lean athletes, lean athletes showed greater general body dissatisfaction [F (1, 314)= 4.08, $p = .044$, partial $n^2 = .013$] and sporting body dissatisfaction [F(1314) = 12.7, $p < .001$,partial $\eta 2 = .039$].	Lean athletes reported significantly higher body dissatisfaction than non-lean athletes (both general and sporting body dissatisfaction)
Goldfield (2009)[ab]	Lean (Bodybuilders[a]) vs non-lean (weight training athletes[b]) [females]	EDI-1 (BD) Drive for Bulk Scale	EDI-BD: no significant differences between bodybuilders (lean) and weight trainers (non-lean) Drive for bulk: ANOVA revealed that bodybuilders[a] reported significantly higher scores on drive for bulk than weight training controls: F(1,43) = 9.4, p = .004, partial eta square = .18	No significant difference on EDI. Lean (bodybuilders) reported significantly higher Drive for Bulk than weight trainers.
Reinking and Alexander (2005)[a]	'Lean athletes' (females)[a] vs 'Non-lean athletes' (females)[a]	EDI-2 (BD)	Lean sport athletes had higher body dissatisfaction scores than non-lean athletes ($p = .008$).	Lean athletes reported significantly higher body dissatisfaction than non-lean athletes.
Robinson and Ferraro (2004)[a]	Lean (swimming and running[a]) vs non-lean (golf and volleyball[a]) [females]	EDI-1 (BD)	No significant difference on body dissatisfaction between lean and non-lean athletes ($p > .05$).	No significant difference
Warren et al. (1990)[a]	'Lean sport' (runners[a]; gymnasts[a]) vs Non-lean sport ('athlete controls[a]') [females]	EDI-1 (BD)	Non-lean athletes scored significantly higher on body dissatisfaction than runners ($p < .05$) but not gymnasts ($p > .05$).	Lean (runners) had significantly lower body dissatisfaction than non-lean athletes. No significant difference between lean (gymnasts) and non-lean athletes
Loosemore et al. (1989)[ab]	Lean (bodybuilders[b]) vs non-lean (hockey players[a]) [males]	EDI-1 (BD)	ANOVA between all comparison groups (included non-athletes too) revealed a significant difference among the three groups ($p < .0001$). Duncan's multiple Range test indicated body builders (non-competitive) had significantly higher body dissatisfaction than hockey players (competitive).	Lean bodybuilders had significantly higher body dissatisfaction than non-lean hockey players.

Note. M: Males; F: Females.
Comparison groups separated by a semicolon indicate different comparison groups used in analyses.
EDI(1;2;3)= Eating Disorder Inventory (version used), SBAS-2 = state-based Body Appreciation Scale 2, BAS-2 = Body Appreciation Scale-2; BES: Body Esteem Scale.

Table 7
Summarised results of the studies comparing lean athletes versus non-athletes.

Paper	Comparison groups [gender]	Body image measure	Outcome and interpretation	Interpretation
Reinking and Alexander (2005)[a]	'Lean athletes'[a] versus non-athletes [females]	EDI-2 (BD)	No significant difference between lean athletes and non-athletes ($p > .05$)	No significant difference between lean and non-athletes.
Robinson and Ferraro (2004)[a]	Lean athletes (swimming[a] and running[a]) versus non-athletes [females]	EDI-1 (BD)	Nonathletes scored significantly higher on body dissatisfaction compared with lean athletes ($p < .05$)	Non-athletes reported significantly higher body dissatisfaction than lean athletes.
Warren et al. (1990)[a]	'Lean sport' (runners[a]; gymnasts[a]) versus non-athletes [females]	EDI-1 (BD)	Using BMI as a covariate, nonathlete controls had higher body dissatisfaction than runners ($p < .05$) but were not significantly different to gymnasts ($p > .05$)	Non-athletes reported significantly higher body dissatisfaction than runners but not gymnasts
Loosemore et al. (1989)[ab]	Lean (bodybuilders[b]) versus non-athletes [males]	EDI-1 (BD)	Bodybuilders had significantly higher body dissatisfaction scores than nonathletes (ANOVA: $p < .0001$, Duncan's multiple range test).	Lean bodybuilders reported significantly higher body dissatisfaction than nonathletes
Filaire et al. (2007)[a]	Lean athletes (cyclists[a]; Judoists[a] versus non-athletes [males]	Body Esteem Scale (weight concern) (higher scores represent higher body esteem)	ANOVA revealed significantly higher Body-esteem Weight Satisfaction for non-athletes as compared to the athletes (Judoists; cyclists) $p < .05$.	Nonathletes had significantly higher body esteem than lean athletes (both cyclists; and Judoists)

Note. M: Males; F: Females.
Comparison groups separated by a semicolon indicate different comparison groups used in analyses.
EDI(1;2;3)= Eating Disorder Inventory (version used), SBAS-2 = state-based Body Appreciation Scale-2, BAS-2 = Body Appreciation Scale-2; BES: Body Esteem Scale

3.5.1. Meta-analyses based on all papers

The random effects meta-analyses for all papers is presented in Table 9a, and the associated forest plots are presented in Fig. 3. There was a reliable difference between lean and non-lean athletes, with a medium effect size. However, none of the other effects were significant.

Inspection of the forest plots (Fig. 3) showed that some studies tended not to match the trend for the individual analysis. Hale et al. (2013), Filaire et al. (2007), and Loosemore et al. (1989) were considered outliers as they clearly did not overlap the confidence intervals of the other studies. Filaire et al. (2007) and Loosemore et al. (1989) were also a low quality studies. Thus, these three studies were removed from the meta-analyses as outliers and they were re-run (see Supplementary Material 2, Table a). Similarly, the low quality papers (Supplementary Material 1) were removed for a further set of analyses, to ensure that they did not obscure effects (see Supplementary Material 2, Table b). In each case, the removal of those papers substantially improved the identified differences and effect sizes. Therefore, they were removed from the dataset for the final analyses. On removal of the low quality studies, Hoag (2012) was identified as a further outlier among the remaining medium to high quality papers. Hoag (2012) was thus removed from the dataset for the final analyses.

3.5.2. Meta-analyses based on final set of papers

Table 9b presents the results of the final five random effects meta-analyses, with the outliers and weak quality papers removed. The meta-analyses showed a broad pattern of athletes reporting less body-image concerns than non-athletes, with medium effect sizes. For competitive athletes versus non-athletes, the meta-analysis showed a significant difference ($g = -.52$, $P < .0001$), indicating that the athletes had fewer body image concerns than the non-athletes. There was moderate heterogeneity ($I^2 = 52.47$ %). Non-lean athletes reported fewer body concerns than non-athletes ($g = -0.69$, $P < .0001$). There was low heterogeneity ($I^2 = 0$ %), supported by the non-significant Q value. However, there were no remaining papers to allow a comparison of lean athletes with non-athletes. These results support the conclusions of the narrative synthesis.

In contrast, there were no differences between classes of athletes (competitive athletes versus non-competitive athletes; lean athletes versus non-lean athletes). There was no evidence of significant heterogeneity in these non-significant meta-analyses.

Tests of publication bias were mixed. In only one of the significant comparisons (competitive athletes versus non-athletes), Egger's statistic was significant, and the trim and fill method applied to the funnel plot indicated publication bias (Supplementary material 3).

4. Discussion

The current review synthesised findings from 21 studies to determine whether athletes had lower body image concerns than non-athletes across all genders. It considered whether specific subgroups of athletes reported higher body image concerns by considering sport type. The potential role of competition level and gender were also considered. Most studies were rated moderate in quality. Low-quality papers and four outliers (two of which were also low quality papers) were excluded from the meta-analysis, to ensure that the conclusions were robust.

Overall, the meta-analysis confirmed and extended the conclusions of the narrative review, so the meta-analysis outcomes will be the focus of the summary of the findings here. The most robust finding was that athletes have lower levels of body image concerns than non-athletes. Athletes had fewer body image concerns than non-athletes, though there were not the high- or medium-quality

Table 8
Summarised results of the studies comparing non-lean athletes versus non-athletes.

Paper	Comparison groups (Gender)	Body image measure	Outcome and interpretation	Interpretation
Dinucci et al. (1994)[a]	Non-lean (Basketball[a], volleyball[a] and softball[a] players) versus nonathletes [females]	Body Esteem Scale (Weight Concern)= higher scores indicate more positive feelings about body weight.	Duncan's multiple range test indicated non-athletes scored significantly lower on weight concern than the means of the athletic groups ($p < .05$).	Non-athletes reported significantly lower body esteem than non-lean athletes (basketball, volleyball, softball) and thus more body image concerns.
Hoag (2012)	Non-lean athletes (volleyballers) vs non-athletes [all females]	EDI1-BD	MANOVA with BMI as covariate: Volleyball players scored significantly higher on the body dissatisfaction subscale [Mean = 10.00 (+ 2.25)] compared with non-athletes [Mean = 9.14 (+2.32)]. $F(1322)= 10.09$, $p = .002$, $\eta p^2 = .03$.	Non-lean athletes had significantly higher body image concerns than non-athletes
Reinking and Alexander (2005)[a]	'Non-Lean athletes'[a] versus non-athletes [females]	EDI-2 (BD)	Significant difference between non-lean athletes and non-athletes ($p < .01$).	Non-lean athletes had significantly lower body dissatisfaction than nonathletes.
Robinson and Ferraro (2004)[a]	Non-lean athletes (golf[a] and volleyball[a]) versus non-athletes[a] [all females]	EDI-1 (BD)	Nonathletes scored significantly higher on body dissatisfaction compared with non-lean athletes ($p < .05$)	Non-lean athletes had significantly lower body dissatisfaction than nonathletes.
Warren et al. (1990)[a]	'Non-lean sport' (athlete controls[a]) versus non-athletes [females]	EDI-1 (BD)	Using BMI as a covariate, nonathlete controls had higher body dissatisfaction than non-lean athlete controls ($p < .05$).	Controlling for BMI, non-lean athletes had significantly lower body dissatisfaction than non-athletes.
Loosemore et al. (1989)[ab]	Non-lean (Hockey[b]) versus non-athletes [males]	EDI-1 (BD)	ANOVA between all comparison groups (lean, non-lean, nonathletes) revealed a significant difference among the three groups ($p < .0001$). Duncan's Multiple Range indicated no significant difference between hockey players and non-athletes.	No significant difference between non-lean hockey players and nonathletes.
Arroyo et al. (2008)	Soccer players[a] versus non-athletes [males]	Somatomorphic Matrix Test	There were no body-dissatisfaction differences between the soccer players and controls for both muscularity (78.5 % players and 82.2 % controls were dissatisfied) and % body fat (64.3 % players and 64.3 % controls dissatisfied)	No significant difference between non-lean soccer players and nonathletes.

Note. M: Males; F: Females.
Comparison groups separated by a semicolon indicate different comparison groups used in analyses.
EDI(1;2;3)= Eating Disorder Inventory (version used), BD= Body Dissatisfaction, SBAS-2 = state-based Body Appreciation Scale 2, BAS-2 = Body Appreciation Scale-2; BES: Body Esteem Scale.

Table 9
Results of the five random effects meta-analyses, based on: a) all papers; and b) with low-quality papers and outliers removed.

a) Preliminary analyses, based on all papers

Comparison	*K*	*N*	Weighted mean effect size g [95 % CI][a]	Q	I^2	Eggers
Competitive athletes vs. non-athletes	16	3117	-0.30 [− 0.67 – 0.07], *p* = .1170	111.374, *p* < .0001	95.65 %	*P* = .896
Competitive athletes vs. Non-competitive athletes	6	682	-0.06 [− 0.87 – 0.75], *p* = .8827	39.986, *p* < .0001	95.13 %	*P* = .830
Lean athletes vs non-lean athletes	7	657	0.57 [0.20 – 1.13], *p* = .0437	34.196, *p* < .0001	88.74 %	*P* = .272
Lean athletes vs non-athletes	5	329	0.49 [− 0.68 – 1.67], *p* = .4090	71.095, *p* < .0001	95.37 %	*P* = .001
Non-lean athletes vs non-athletes	7	783	-0.43 [− 0.78 - − 0.07], *p* = .0178	46.308, *p* < .0001	79.31 %	*P* = .057

b) Final random effects meta-analyses, with low-quality papers and outliers removed

Comparison	*K*	*N*	Weighted mean effect size g [95 % CI][a]	Q	I^2	Eggers
Competitive athletes vs. non-athletes	11	2441	-0.44 [− 0.52 - − 0.36], *p* < .0001	24.862, *p* = .0056	59.78 %	*P* = .007
Competitive athletes vs. Non-competitive athletes	4	601	-0.15 [− 0.32 – 0.03], *p* = .0983	0.055, *p* = .9970	0 %	*P* = .185
Lean athletes vs non-lean athletes	4	492	0.14 [− 0.04 – 0.32], *p* = .1191	2.286, *p* = .5150	0 %	*P* = .030
Lean athletes vs non-athletes	-	-	-	-	-	-
Non-lean athletes vs non-athletes	4	291	-0.69 [− 0.93 - − 0.44], *p* < .0001	3.164, *p* = .3670	0 %	*P* = .334

studies needed to reach that conclusion for lean athletes in the meta-analysis. In contrast, there were no robust differences between groups of athletes in the meta-analysis, though lean athletes had greater body image concerns than non-lean athletes in the narrative review.

4.1. Links to existing research

Only 19 % of studies considered male athletes, which is comparable to the 19.2 % in Hausenblas and Symons Downs (2001) systematic review on body image across all ages and genders. Thus, a

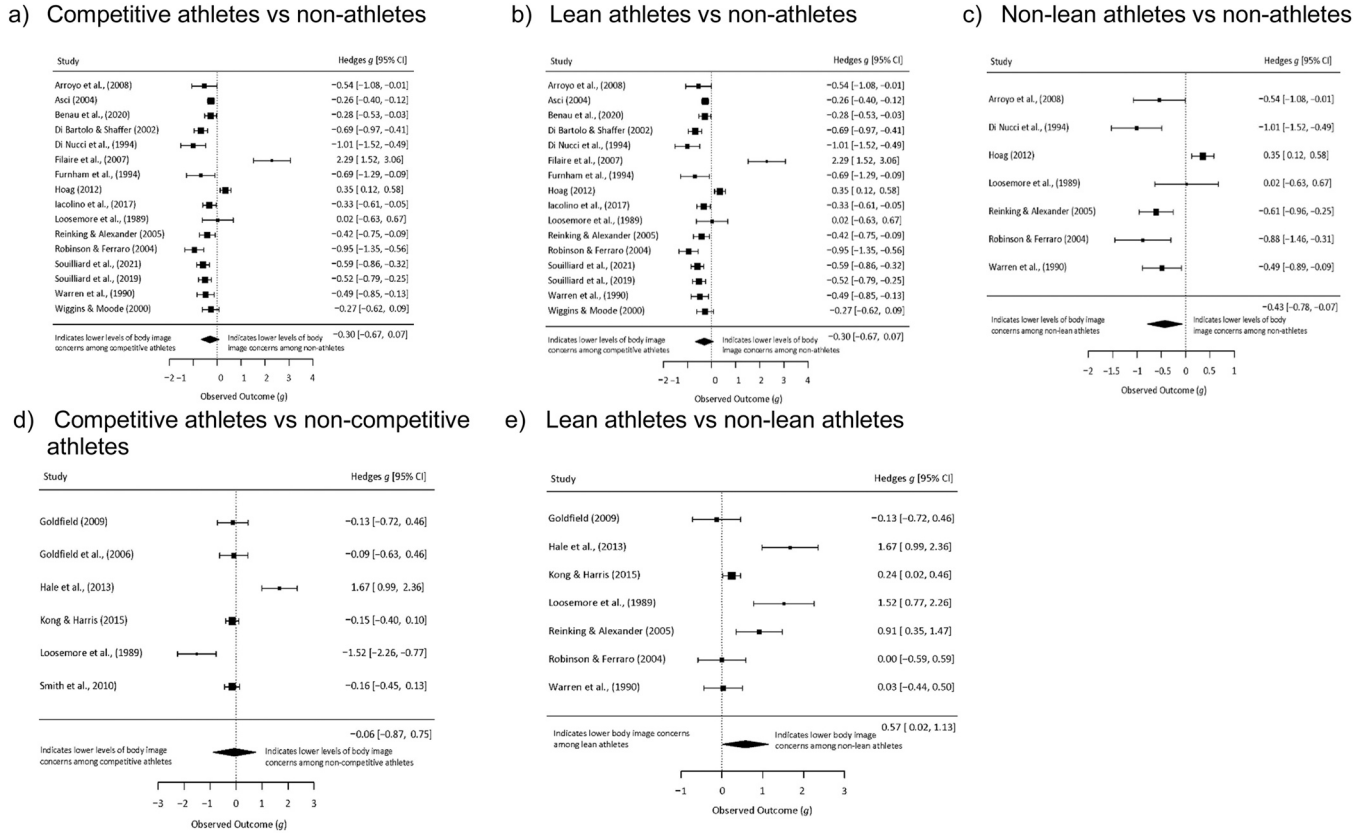

Fig. 3. Random effects meta-analyses for all papers: Forest plots comparing body image effect sizes (95 % CI) across groups of athletes and non-athletes.

female bias still appears to operate in research exploring body image in athletes. The finding that athletes had fewer body image concerns overall than non-athletes mirrors previous review findings (Chapa et al., 2022; Hausenblas & Symons Downs, 2001; Hausenblas & Fallon, 2006; Karrer et al., 2020; Varnes et al., 2013), though the narrative review indicates that this effect is possibly more due to the experience of non-lean athletes.

In contrast to some individual studies (Chapa et al., 2022; Stoyel et al., 2019; Swami et al., 2009; Varnes et al., 2013), lean athletes did not display reliably higher body image concerns than non-lean athletes (particularly in the meta-analysis). Therefore, it is possible that participation in a range of sports types promotes positive body image, increasing psychological wellbeing (Landers & Arent, 2001), but that extraneous factors (e.g., the impact of level of dress) might explain some of the individual lean/non-lean differences found, as some lean sport athletes (e.g. volleyball players; swimmers) commonly dress in more revealing ways (Kampouri et al., 2019). Factors such as background of sport training, individual/non-individual competition, and intensity of training (Budzisz & Sas-Nowosielski, 2021; Hausenblas & Fallon, 2006) might also explain the apparent impact in some individual studies on lean athletes. However, that difference did not apply across studies in the more robust quantitative review, suggesting that it might be more common factors that influence body image across sports, such as pressures from others (coaches, parents, friends, judges) and training regimes (Petrie & Greenleaf, 2012; Reel et al., 2013).

4.2. Limitations

The results of this review should be considered in light of its limitations. Only one author quality assessed the papers, which may have increased the chances of bias. Many studies had issues such as poor definitions of comparator groups (regarding both competition level and sport type). 'Non-athletes' were particularly poorly defined, meaning that they could have included individuals who participated in some sports, thus confounding study findings and making it hard to generalise findings both locally and in practice. Studies over-represented one country (the USA), university/college students, some sports (endurance, aesthetic and ball sports) and female participants, limiting their generalisability further. A further complication is that there might be relevant differences between the function and experience of different sports. For example, body building might merit separate consideration in future, as the goal for competition can be focused on physique perfection itself. Some of the meta-analyses were conducted on a small number of studies, which is problematic when assessing heterogeneity, since this can increase the bias of I^2 and reduce the power of the Q statistic (von Hippel, 2015). Finally, given the nature of the literature and how it is focused and reported, some positive body image terms may have been missed. Future research should focus more fully on positive body image, using a wider set of constructs and reporting them clearly (including keywords and highlights).

4.3. Future research

Future research should recruit all genders and gender identities. Researchers should provide clear details about participants' sport type, competitive level and ethnicity, since these were lacking across the studies in the current review. To ensure replicability, it will also be important to provide details about the specific sport types categorised as 'lean' and 'non-lean', a wider range of sports (e.g., weight-dependent; technical), and factors such as training background and frequency (Budzisz & Sas-Nowosielski, 2021). All competition levels should be considered across groups as such data are highly limited at present. Researchers should recruit across sport types (lean athletes, non-lean athletes and non-athletes) so that any differences and similarities in body image are better understood. Critically, it is important to note that the research in this field is overwhelmingly cross-sectional in nature. Longitudinal designs are needed to enhance the interpretability of the findings, to allow the positive or negative impact of sport participation to be considered from a causal and developmental perspective.

The measures used also need careful consideration, as they are not always relevant to the sporting population. For example, the EDI neglects the upper body, which may be of more concern to males, making the measure less appropriate for male populations (Hausenblas & Symons Downs, 2001). Furthermore, the EDI does not account for the different body images experienced by athletes (social; sporting) (De Bruin et al., 2011). Other researchers also created their own measures without providing validity statistics, and such details should be a requirement in future studies. It will also be important to address positive and negative aspects of body image in the same datasets (Tylka & Wood-Barcalow, 2015a), as well as considering multiple aspects of body image (e.g., an athletic and social body image - Russell, 2004). Muscularity should be measured as a body image construct in future research on athletes. To enable comparisons across gender and gender identities, body image measures that target by gender and gender identity could be created and validated across sport types (e.g., specific questions could be scored or weighted differently depending on gender or gender identity). Finally, to mitigate against confounds such as puberty, the review focused only on those aged 17 years and above. Future research might explore body image in athletes younger than 17 years, considering age as a potential moderator of findings.

4.4. Clinical implications

These findings indicate that participation to healthy levels in sports might promote positive body image. Therefore, encouraging participation in sports might promote wider wellbeing, since poor

body image has been linked to eating disorders (Coco et al., 2014; Menzel et al., 2010; Waller & Mountford, 2015). Thus, in prevention terms, participation in an exercise programme can improve body image (Hausenblas & Fallon, 2006).

However, excessive and compulsive exercise can be harmful. Therefore, the potential negative impact of sports on body image should also be considered, with athletes being encouraged to reflect on their own body image and seek support as necessary (Koulanova et al., 2021). Sports coaches should also be advised to be attentive to athletes on an individualised basis in order to ensure that support is offered if an athlete has poor body image (Koulanova et al., 2021). Specific risk factors to consider and address might include: reducing frequent weight/composition measures; avoiding comments on body image; and reducing pressures to wear uniforms or revealing costumes. Programmes could be implemented to reduce body image concerns in athletes at risk of EDs (Becker et al., 2012). Ensuring athletes have positive body image is important since negative body image is a predictor of a variety of health problems, including depression, eating disorders and obesity (Stice, 2002).

4.5. Conclusion

The current review and meta-analysis have shown better body image among athletes in general rather than among non-athletes, with little difference between types of sporting activity. However, existing research in the field has a range of limitations, which require attention in future research. The review has potential clinical implications in terms of the potential benefits and negative impact of exercise at different levels.

Appendix A

Appendix Table A1.

Role of funding sources

No funding obtained.

CRediT authorship contribution statement

Rachel H. Burgon: Conceptualization, Methodology, formal analysis. **Jessica Beard**: Methodology, formal analysis. **Glenn Waller**: Conceptualization, Methodology.

Data availability

All data are presented in the paper itself.

Declaration of Competing Interest

None.

Table A1
Study Characteristics, separated by comparison groups (competitive, non-athletes, non-competitive).

Author (s) (Date)	Location	Sample [Males; Females] Mean age (±SD)[c]	Sample comparison classification: competitive, non-competitive, non-athlete (recruitment strategy); [Males; Females]	Body Image measure (s) used	Construct measured
***Competitive athletes* versus *non-athletes* (*n*=16)**					
Arroyo et al. (2008)	Spain	56 undergraduate males	Competitive: 28 male soccer players (University academy)= competitive Non-athletes: 28 male undergraduates (university students participating in a study to assess their nutritional status).	Somatomorphic Matrix Test[$+†] (Pope et al., 2000)- figure rating - Body Fat: Perceived actual body image; perceived ideal body image - Fat Free Mass index (FFMI) (Muscularity): Perceived actual body image; perceived ideal body image Body dissatisfaction: Difference between actual and ideal body image (Body Fat; FFMI)	Body dissatisfaction (Body Fat; Muscularity)
Aşçi (2004)	Turkey	798 Elite athletes and undergraduate non-athletic controls [482 M; 316 F], mean age[c] national level: 19.1 (± 3.3) years (male), 18.5 (± 3.6) years (female)	Competitive: 329 Elite athletes (recruited through national teams); [207 M; 122 F] Non-athletes: 469 'non-athletic' university students (enrolled on courses in a Sport department) [275 M; 194 F]	The Physical Self-Perception profile[+] (Fox & Corbin, 1989): indicate how much of that kind of person they are on five subscales including body attractiveness.	Body attractiveness subscale (perceived attractiveness of body)
Benau et al. (2020)	United States	279 university students sorted into sports or non-sports categories based on answers to a questionnaire [177 F; 102 M]	(Recruited from University course, course not specified) Competitive athletes[*] :183 engaging in at least one sport [87 M;96 F] Separated by competition level: 42 recreational athletes 74 club level 63 collegiate level 2 semi-pro/pro 2 Competition level not specified Non-athletes: 96 engaging in no sports [15 M; 81 F]	Eating Disorder Inventory-3 (Body dissatisfaction subscale) (Garner, 2002)	Body dissatisfaction
Di Bartolo and Shaffer (2002)	United States	209 female undergraduate students	Competitive: 94 female college athletes (Division III university teams) Non-athletes: 115 female 'non-athletes' (from psychology classes)	Eating Disorder Inventory-1 (body dissatisfaction subscale only) (Garner, Olmstead & Polivy, 1983)[a] Body Image Survey[†] (Fallon & Rozin, 1985): difference between actual and ideal body image (figure rating)	Body dissatisfaction
Dinucci et al. (1994)	United States	65 female university students	Competitive: 31 Female athletes (Division I, top ranked or conference champion): - 9 basketball players - 10 volleyball players - 12 softball players Non-athletes: 34 female non-athlete university 'controls' (recruitment not specified)	Body Esteem Scale (weight concern subscale)[+] (Franzoi & Shields, 1984) Higher scores indicate higher body esteem	Body self-esteem: Weight concern
Filaire et al. (2007)	France	44 males Judoist mean age[c]: 19.5 (± 0.5) Cyclist mean age[c]: 21.2 (± 2.8) Nonathlete mean age[c]: 21.8 (± 1.8)	Competitive: 27 competitive athletes (recruited through national training teams): - 12 Judo national level - 15 Cyclist national level Non-athletes: 17 'controls' (maths students doing an average 2 h exercise per week and not training for a particular sport)	Body Esteem Scale- Weight concern subscale (Canadian-French version)[+]-Mendelson et al., 2001 Higher scores indicate higher body esteem	Body self-esteem: Weight concern subscale
Furnham et al. (1994)	England	60 females (40 undergraduates), mean age[c] 22.96 (± 4.93) years	(Recruited from a gym, student union, further education courses) Competitive (First university team) 45 athletes - 15 netball players - 15 rowers - 15 bodybuilders Non-athlete: 15 'non-exercisers'	Body Shape Selection[b†] (figure rating) (constructed by researchers based on the Repertory Grid Technique (Kelley, 1955) and their own prior research (Furnham, 1981;Furnham & Alibhai, 1983)-attractiveness subscale	Body dissatisfaction-attractiveness subscale

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Table A1 (*continued*)

Author (s) (Date)	Location	Sample [Males; Females] Mean age (±SD)[c]	Sample comparison classification: competitive, non-competitive, non-athlete (recruitment strategy); [Males; Females]	Body Image measure (s) used	Construct measured
Hoag (2012)	United States	326 females Volleyballers mean age: 19.76 (± 1.08) Non-athletes mean age: 19.44 (± 1.16)	Competitive: 209 volleyballers (competitive, across divisions I, II, III) Non-athletes: 117 'non-athletes'	Eating Disorder Inventory-1 (body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)[a]	Body dissatisfaction
Iacolino et al. (2017)	Italy	200 students stratified according to whether they engaged in sport or not (35.3 %M; 62.7 % F) [70 M, 125 F]	- Competitive: 100 'sporting subjects' (recruited from Sicilian sport centres and enrolled in the Faculty of Motor Science at Kore University)- participated in at least one non-agnostic competition over the past 12 months. - Non-athletes: 100 (psychology students at Kore University) 'non-sporting subjects'	Body uneasiness test (Cuzzolaro et al., 2006) includes 5 factors: Weight phobia, body image concerns, avoidance, compulsive self-monitoring; depersonalisation). GSI higher than 1.2 = significant discomfort with body.	Body dissatisfaction (Body image concerns subscale of Body Uneasiness Test)
Reinking and Alexander (2005)	United States	146 female undergraduates	Competitive: 84 collegiate athletes (Recruited from university teams- Division I) Non-athletes: 62 undergraduate non-athletes (not athletes in collegiate sports), (recruited from resident halls) Separated as: 16 Lean sports 68 non-lean sports	Eating Disorder Inventory-2 (Body dissatisfaction) (Garner, 1991)[a]	Body dissatisfaction
Robinson and Ferraro (2004)	United States	108 female university students, 18 years and above	Competitive: 53 female varsity athletes: 6 golf; 10 volleyball 15 swimming; 22 track (recruited from university sports teams) Separated according to sport type: 16 technique (golf + volleyball) (non-lean) 37 speed (swimming and track) (lean) Non-athletes: 55 female nonathletes (recruited from psychology undergraduate course)	Eating Disorder Inventory-1 (body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)[a]	Body dissatisfaction
Soulliard et al. (2021)	United States	286 undergraduates, aged 18–30 years [Cisgender: 219 F; 67 M]	(University students- specific recruitment strategy not stated): Competitive: 75 student athletes (Division I) 6 men baseball 13 women softball 5 men soccer 19 women soccer 10 men swimming 22 women swimming Nonathletes: 211 'non-athletes'	State-based Body appreciation scale-2 (SBAS-2)[+] (Homan, 2016); adapted from Body appreciation scale (BAS-2) (Tylka & Wood-Barcalow, 2015b)	Body appreciation in a general context
Soulliard et al. (2019)	United States	254 undergraduate students, aged 18–38 [Cisgender: 180 F, 73 M; 1 Transwoman]	(Recruited via email to all students and an online research website for psychology undergraduate course students) Competitive: 79 athletic students (Division I athletes): 8 baseball; 2 Basketball; 7 cheerleading/dance; 24 track/ crosscountry; 3 hockey; 10 soccer; 6 softball; 11 swimming; 5 tennis; 3 volleyball Non-athletes: 175 'non-athletes'	Body appreciation scale (BAS-2)[+] (Tylka & Wood-Barcalow, 2015b)	Body appreciation
Warren et al. (1990)	United States	126 undergraduate female students	(Recruited through university: sports teams, university course): Competitive: 74 female athletes (Division I): - 27 'lean sport athletes (15 gymnasts, 12 cross country runners) - 47 non-lean sport athletes (basketball, golf, volleyball, swimming, tennis) Non-athletes: 52 female nonathlete college controls (for course credit)	Eating Disorder Inventory-1 (body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)	Body dissatisfaction

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Table A1 (*continued*)

Author (s) (Date)	Location	Sample [Males; Females] Mean age (±SD)[c]	Sample comparison classification: competitive, non-competitive, non-athlete (recruitment strategy); [Males; Females]	Body Image measure (s) used	Construct measured
Wiggins and Moode (2000)	United States	124 female university students, aged 17–35 years.	(Recruited through university- specific strategy not stated) Competitive: 67 female intercollegiate athletes (division not specified) Non-athletes: 57 female 'non-athletes'	Weight concern subscale of the Body Esteem Scale (Franzoi & Shields, 1984)[+]	Body self-esteem: Weight concern
***Competitive athletes* versus *non-competitive athletes* (*n*=5)**					
Goldfield (2009)	Canada	45 females: mean age[c]: 26.3 (± 5.3) competitive; 27.3 (± 5.7) recreational	(Recruited from local gyms) Competitive: 20 competitive female bodybuilders (actively training for a competition) Non-competitive: 25 'recreational weight training' female controls (never competed and no plans to compete in next 12 months)	Eating Disorder Inventory-1 (Body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)[a] Drive for Bulk Scale[b$], created as modification of body dissatisfaction subscale	Body dissatisfaction Drive for Bulk
Goldfield et al. (2006)	Canada	74 males, recruited from local gyms, mean age[c]: 33.6 (± 8.9) men with bulimia; 26.7 (± 5.0) competitive bodybuilders; 24.9 (± 5.0) recreational bodybuilders	(Recruited from local gyms) 27 competitive male bodybuilders (actively training for a competition) 25 recreational male bodybuilders (never competed and no plans to compete in next 12 months) 22 men with Bulimia	Eating Disorder Inventory-1 (Body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)[a] Drive for Bulk Scale[b$], created as modification of body dissatisfaction subscale	Body dissatisfaction Drive for Bulk
Hale et al. (2013)	United States	74 females, aged 18–48 years.	(Recruited from a university fitness centre) Competitive*: - 26 expert female bodybuilder: ≥ 10 competitions - 29 novice female bodybuilders: ≤ 3 competitions (not included in analyses due to heterogeneity within the group) Non-competitive: 19 fitness lifters: 6 months minimum experience.	Muscle Dysmorphia Inventory[$] (MDI;Rhea et al., 2004) subscales: Size symmetry)	Muscularity body dissatisfaction (Muscle dysmorphia)
Kong and Harris (2015)	Australia	320 female athletes, aged 17–30 years.	(Recruited via sports clubs, dance companies and gyms, plus informative websites about eating disorders) Competitive*: - 128 Elite; 112 'recreational' (compete at local, state, national level- Division I) Non-competitive: - 80 non-competitive athletes Categorised as: 174 lean; 146 non-lean	Figure Rating Scale (FRS)[†] (own current figure, ideal figure, figure most athletically capable for sport) (Stunkyard, Sorensen & Schulsinger, 1983)	General body dissatisfaction: FRS (Current)- FRS (ideal) Sporting body dissatisfaction: FRS (Current) – FRS (Sport)
Smith et al. (2010)	England	184 distance runners (94 M; 90 F), mean age[c]: 28.05 (± 6.83) years old.	(Recruited from running teams/personal association with researcher): Competitive (competed within last year or planning to compete):47 competitive male runners; 44 competitive female runners Non-competitive: 47 non-competitive male runners; 46 non-competitive female runners	Social Physique Anxiety Scale (SPAS) (Hart et al., 1989)	Appearance anxiety

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Table A1 (*continued*)

Author (s) (Date)	Location	Sample [Males; Females] Mean age (±SD)[c]	Sample comparison classification: competitive, non-competitive, non-athlete (recruitment strategy); [Males; Females]	Body Image measure (s) used	Construct measured
***Competitive athletes* versus *non-competitive athletes versus non-athletes* (*n*=1)**					
Loosemore et al. (1989)	Canada	54 male undergraduates	Competitive: 18 male undergraduate hockey players (recruited from the university varsity league, unspecified division) Non-competitive: 18 male bodybuilders (recruited from university fitness centre and regularly worked out) Non-athletes: 18 male 'classroom subjects' ('comparison group' recruited from psychology undergraduate course)	Eating Disorders Inventory-1 (body dissatisfaction subscale) (Garner, Olmstead & Polivy, 1983)	

Note. M: Males, F: Females. GSI: Global Severity Index score. ED: Eating Disorder. NCAA: National Collegiate Athletic Association.
*: includes a sample with more than one competitive athlete group.
[a] Did not use the most up-to-date EDI.
[b] researchers created their own body image measure.
[c] mean age (SD) has been provided for studies that failed to report age ranges and/or were undergraduates.
[+]study measured positive body image.
[$]study measured muscular body dissatisfaction.
[†]study used figure ratings.

Appendix B. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.bodyim.2023.04.007.

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