Eating disorders among competitive and non-competitive bodybuilders: a systematic review

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FINAL DEGREE THESIS

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List of abbreviations used in this review

ED: Eating disorder

AN: Anorexia nervosa

BN: Bulimia nervosa

BED: Binge eating disorder

DSM: Diagnostic and Statistical Manual Disorders

MD: Muscle Dysmorphia

NCMBB: Non-competitive male bodybuilders

CMBB: Competitive male bodybuilders

CFBB: Competitive female bodybuilders

PCBB: Professional competitive bodybuilders

RMBB: Recreational male bodybuilders

NCWT: Non-competitive weigh-trainers

RFWT: Recreational female weight-trainers

MBN: Males with Bulimia Nervosa

UMS: Undergraduate male students

EDI: Eating Disorder Inventory

EAT: Eating Attitudes Test

ABSTRACT

Background: Eating disorders (ED), according to the Diagnostic and Statistical Manual Disorders[1], encompass several mental health disorders related to food intake. They have increased considerably over the last few years around the world. There has been a rise in bodybuilding popularity both among men and women in the last decades. **Methods:** This paper was conducted according to PRISMA recommendations. All articles were systematically searched on PubMed and Cochrane databases. Eligible articles were evaluated by one investigator for inclusion as well as study quality was assessed using NIH standardised tools. **Results:** Findings suggest that ED are more prevalent in bodybuilders practitioners, being Binge Eating Disorders (BED) and Bulimia Nervosa (BN) the most common. Causes for ED onset are multifactorial. **Conclusion:** ED in bodybuilding practitioners present a physical and mental health problem on the rise. However, these findings should be interpreted with caution as obtained in a small sample size.

RESUMEN

Contexto: Los Trastornos de la Conducta Alimentaria (TCA), según el DSM[1] comprenden distintas enfermedades mentales relacionadas con la ingesta alimentaria. En los últimos años, su prevalencia ha crecido considerablemente alrededor del mundo. Existe un auge en la popularidad en las últimas décadas por el fisicoculturismo en hombres y mujeres. **Métodos:** Este estudio se ha realizado según las recomendaciones PRISMA. Todos los artículos fueron evaluados por un investigador para la inclusión en la revisión, así como cualificados mediante las herramientas NIH. **Resultados:** los hallazgos sugieren que los TCA son más prevalentes en fisicoculturistas, siendo el Trastorno por atracón (BED) y la Bulimia Nerviosa (BN) las más comunes. Las causas de la aparición de los TCA en esta población son multifactoriales. **Conclusión:** Los TCA en el fisicoculturismo presentan un problema de salud física y mental en auge. Más investigación al respecto tiene que ser llevada a cabo para comprender mejor este fenómeno. Sin embargo, estos hallazgos han de interpretarse con cautela dado que han sido obtenidos en una pequeña muestra.

1. BACKGROUND

Eating disorders (ED), according to the Diagnostic and Statistical Manual Disorders, encompass several mental health disorders related to food intake. These include anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), pica, rumination disorder, avoidant and/or restrictive food intake disorder (UFED), among others[1]. Eating disorders have increased considerably over the last few years around the world[2] according to Galmiche *et al*., its prevalence increased from 3.5% to 7.8% in 10 years[3]. While typically associated with women, ED prevalence among males is thought to have been increasing in recent years. The study also emphasises: *"although ED are traditionally considered to affect mainly women, men represent a growing proportion of individuals suffering from them"*. Although thought to be limited to Western countries, Galmiche *et al*. highlights the high prevalence of ED in Asia and developing Middle Eastern countries.

Since the publication of the American documentary Pumping Iron (1977) in which Arnold Schwarzenegger had the starring role, preparing for his Mr. Olympia contest, the popularity of bodybuilding began to increase. Most men are looking to become leaner and at the same time bigger and more muscular[4,5,6,7,8]. Over the decades, competitive bodybuilders have tried to push the limits of mass: bigger is better.

As noted by Goldfield G., exposure to the lean and toned feminine ideal in the media may be pushing women to bodybuilding[9,10]. There is a rise in women bodybuilding popularity as exemplified by a higher women participation rate in gymnasiums[11,12] and competitions[13].

There is currently a socio-cultural emphasis on sculptural bodies[14,15]. Many men seek perfect muscular bodies while many women chase lean yet not overly muscular physiques. Large-scale surveys reveal that male body dissatisfaction has increased dramatically over the past 3 decades, from 15% to 43%, making current rates almost comparable to those found in women[16,17].

Generally, competitive bodybuilders divide their season in two. In the first period, commonly named off-season or "bulking", the goal is to accumulate as much tissue accrual as possible. To achieve this, large amounts of calories need to be

consumed, combined with heavy weight training and a good rest regimen. On the other hand, the second period is commonly called “contest prep” consists in dropping as much body fat as possible using hard diets and high-intensity activities to achieve an extremely lean physique.

Consequently, these two periods link between bodybuilding and ED[18,9], and the most common disordered eating patterns among bodybuilders are AN and BED[19] along with neuroticism, perfectionism, obsession and need for control in, both sexes[20,21]. All these personality traits conform to the perfect breeding ground for the onset of ED as they are risk factors for it[1,22,23].

To our knowledge, there is not currently any systematic review inspecting ED in competitive and non-competitive bodybuilders. We hypothesise that ED may be more frequent in the bodybuilder population and that it is even more frequent in competitive bodybuilders, in comparison to non-competitive bodybuilders.

Therefore, the present review aims to inquire into the possible causes for the apparition of this phenomenon in this population and as well as their prevalence.

2. METHODS

This study was conducted according to the "Preferred Reporting Items for Systematic Reviews and Meta-analyses" (PRISMA) statement[24].

2.1. Data sources and search strategy

PubMed and Cochrane databases were employed for this systematic review. A classical methodology was used for this literature analysis. The search strategy, for both databases was to combine:

ED in the women and men population with bodybuilding:

("eating disorders" [All Fields]) OR (eating disorders[MeSH Terms]) OR ("eating disorder"[All Fields]) OR (eating disorder[MeSH Terms]) OR ("anorexia nervosa"[All Fields]) OR (anorexia nervosa[MeSH Terms]) OR ("bulimia nervosa"[All Fields]) OR (bulimia nervosa[MeSH Terms] OR ("binge eating disorder"[All Fields]) OR (binge eating disorder[MeSH Terms]) OR ("bulimarexia"[All Fields]) OR (bulimarexia[MeSH Terms]) Or ("polyphagia"[All Fields]) OR (polyphagia[MeSH Terms]) OR ("hyperphagia"[All Fields]) OR (hyperphagia[MeSH Terms]) OR (binge-vomit syndrome[MeSH Terms]) OR (binge-vomit syndrome) OR (binge-purge syndrome[MeSH Terms] OR (binge-purge syndrome) OR ("purging"[All Fields]) OR (purging[All Fields])

AND

("bodybuilding"[All Fields]) OR ("bodybuilder"[All Fields]) OR ("muscles"[All Fields])

2.2. Study eligibility

Inclusion criteria

1-Articles must be written in the English language.

2-Articles must be published in the 21st century (2000-2022).

3-Participants must be ≥18 years old.

4-Participants of the selected studies must actively practice bodybuilding. Bodybuilders* either amateur or professionals.

5-Articles must compare a bodybuilding practitioner group to one or several distinct groups.

6-Selected articles must assess, relate, or link the effects of bodybuilding on several physical and mental health parameters, which must include eating disorders either as a primary or secondary outcome.

Exclusion criteria

1-Full-text article was not available, or when it was not available in English.

2-Studies with a single sample group.

3-Studies on participants that are not fully identified as bodybuilders practitioners*.

(e.g: powerlifters, Olympic weightlifters).

4-Case report studies, viewpoint articles, summaries for patients, editorials, commentary articles and letters.

**Bodybuilder: a person that trains and eats to achieve a hyper muscular and lean physique. Recreational bodybuilders distinguish from competitive bodybuilders in the obvious fact that they do not compete but train to achieve the physique of those that do compete*[25]*.*

2.3. Data extraction and quality assessment

The selected articles for this systematic review were assessed by two researchers for inclusion. Selected articles were chosen through a two-step process: each researcher, independently, assessed each article for eligibility. In case of disagreement, a meeting was held for deciding inclusion or exclusion of the article. This process was done a total of three times for: a) title, b) abstract and c) full text assessment.

The study quality assessment tool provided by NIH (National Heart, Lung, and Blood Institute) was used to determine the studies' internal validity[26]. **Table 1** shows the scores for each study, according to the tool.

3. RESULTS

3.1. Identification and selection of studies included in this systematic review

As shown in *Fig. 1,* after typing the search strategy stated in *Search methods*, a total of 248 articles were identified, 234 articles from PubMed and 14 articles from Cochrane databases. After filtering data (2000-2022), 137 articles remained. Each of these article titles was screened by the researcher. A total of 118 were excluded due to the title being unrelated to the topic of interest, leaving 19 articles for the abstract screening. 7 of them were removed because they did not match study eligibility: not bodybuilders (n=4), single case report (n=1) and viewpoint articles (n=2). Finally, a full text assessment of the 12 remaining articles was performed. 6 articles were excluded for the following reasons: bibliographic review (n=2), unrelated outcomes (n=1), not bodybuilders (n=1), minors included (n=1) and online survey (n=1). Finally, 6 articles were included for inclusion in the review.

Study characteristics

The fundamental extracted information from the selected studies is shown in **Table 2**. Additionally, supporting information can be seen in **Table 3** *and* **Table 4.**

Selected studies locations were mixed. Out of the 6 selected studies: Canada (33.3%)[17,9], Hungary (16.6%)[27], Turkey (16.6%)[28], USA (16.6%)[15] and Cyprus (16.6%)[29]. None of the selected studies were published in the same year. From the newest to the oldest: 2021 (16.6%)[29], 2018[28] (16.6%), 2013[15] (16.6%), 2012[27] (16.6%) and 2009[9] (16.6%). The mean age of subjects from the total sample size was similar: 25.4 years old at the minimum (16.6%)[29], and 28.3 at the maximum (16.6%)[17] with 28.3 (16.6%)[28], 28.1 (16.6%)[15], 27.8 (16.6%)[27] and 25.4 (16.6%)[28] in between. Total sample sizes from the selected studies ranged from 120 (50%)[27,28,15], 103 (16.6%)[29], 74 (16.6%)[17] to 45 (16.6%)[9].

In terms of sex of participants, there were more studies that recruited men (66.6%)[27,28,17,15] than women (16.6%)[9], and only one article reported data from both sexes (16.6%)[29]. The selected studies employed different eating inventories

to assess eating disorders: EDI (50%)[27,17,9], EAT-26 (33.3%)[15,28], and EAT-40 (16.6%)[28].

Competitive bodybuilder groups were present in most of the selected studies (83.3%)[28,17,15,29,9] but only one of them included professional bodybuilders (16.6%)[29], and another one, ED as a specific group: MBN (16.6%)[17].

Studies that reported only data in men (n=4)[15,17,27,28]

Babusa B. et al. aim was to examine the muscle dysmorphia (MD) features, ED characteristics, and body attitudes in non-competitive male bodybuilders (NCMBB) who were compared to undergraduate male students (UMS)[27]. NCMBB reported the desire to gain some weight, whereas UMS reported the intention to lose some. The NCMBB group also reported significantly higher scores on the ineffectiveness and perfectionism subscales of the eating disorder inventory (EDI). A significant positive association between MD and ideal body weight was found: the higher the desired body weight and, the higher the MD symptoms.

Devrim A. et al. aim was to determine the relationship between body dissatisfaction and ED in bodybuilders[28]. 65% had EAT-40 scores above its cut-off point and 58.3% presented high muscle dysmorphia symptoms. No statistical differences between competitive and non-competitive were found. In addition, they found that bodybuilders wanted to be leaner and more muscular. But again, no difference between competitive and non-competitive bodybuilders was found.

Also, a positive relationship between EAT-40 and muscle dysmorphia inventory (MDDI) total scores was found. Fat free mass index (FFMI) results were correlated with drive for size: the more they gained, the more they wanted.

Goldfield GS, *et a*l. assessed eating attitudes, body image, weight and shape preoccupations, the prevalence of BED, weight loss practices, lifetime rates of ED, anabolic androgenic steroid use (AAS), and general psychological factors[17]. Males with Bulimia nervosa (MBN) reported significantly higher scores on all EDI subscales compared to competitive male bodybuilders (CMBB) and recreational male bodybuilders (RMBB) groups but no significant differences between them

were found. Eating disturbances and preoccupation with weight and shape were common among CMBB and RMBB but less than MBN.

Pickett TC, *et al.* examined the differences among 3 groups -CMBB, non-competitive weight trainers (NCWT) and athletically active controls- on body composition and multiple facets of body image evolution, investment and anxiety, ED, and social self-esteem[15].

Both CMBB and NCWT reported a significantly more positive evaluation of their appearance versus the athletically active control group. In terms of satisfaction with specific body areas: bodybuilders and weight trainers alike were more satisfied with their muscle tone and upper torso than were active control participants. Psychologically speaking, bodybuilders reported higher social self-esteem than controls. CMBB reported more eating disturbance than active controls (two CMBB and three NCWT scored above the EAT-26 clinical cut-off).

Studies that reported only data in women (n=1)[9]

Goldfield GS compared competitive female bodybuilders (CFBB) and recreational female weigh trainers (RFWT) controls on a wide range of eating related and general psychological characteristics[9].

CFBB attained higher scores on the Bulimia subscale, Drive for Bulk scale, and the Drive for Muscle Tone scale. Psychological variables did not differ between groups. CFBB reported higher incidence of BED, over concern with body weight or shape, strict dieting and vigorous exercise for weight control compared to RFWT.

Studies that reported data in men and women (n=1)[26]

Efthymiou, D. *et al.* goal was to investigate potential exacerbators of the development of disordered eating in professional male bodybuilders (PMBB), RMBB, and Strength athletes (SA)[29].

No statistically significant difference between the sexes was observed in the overall scores of EAT-26 and the Three-factor eating questionnaire (TFEQR21) except for emotional eating where females scored higher. The overall score on EAT-26 increased according to a higher deviation between actual and perceived ideal body weight. High-deviating groups demonstrated higher EAT-26 overall scores and bulimia, cognitive restraint, and emotional eating.

4. DISCUSSION

In the present systematic review, we have evaluated different studies involving bodybuilders of both sexes and their connection with ED. Most of the study's conclusions were in line with our first part of the hypothesis, but not the second. In most of our studies, bodybuilder practitioners were at a higher risk to develop an ED, but no differences between competitive and non-competitive bodybuilders were found[15,17,28,29], except for Goldfield GS[9]. In contrast, the available research on the subject was in line with our full hypothesis: bodybuilders were at a higher risk, but competitive more so than non-competitive[25]. In general, evidence shows that ED are more prevalent in competitive bodybuilders versus recreational ones. Our selected studies used self-report questionnaires to assess ED which may present bias, offering a possible explanation for the contradiction with general evidence.

The selected studies showed similar results, bodybuilders present dissatisfaction with their bodies and the more they gained, the more they wanted. Babusa B. *et al.*, showed a positive association between ideal body weight and muscle dysmorphia[27]. Devrim A et al. demonstrated a positive association between EAT-40 scores and muscle dysmorphia symptoms which were found in 58.3% of subjects[28]. Goldfield GS et al., results showed a higher preoccupation with weight and shape in male bodybuilders[17]. It was also the case for competitive female bodybuilders, as shown by Goldfield GS[9]. CFBB presented over concerns with their bodies and scored higher on the Drive for Bulk, Drive for Muscle Tone, and Bulimia subscale of the EDI. In contrast, Pickett TC et al results demonstrated that bodybuilders, independently of their competitive status, had a positive evaluation of their appearance and higher self-esteem[15]. A possible explanation for this phenomenon could be that, as shown by Rodrigue, C. *et al*., subjects from the MD group demonstrated *"higher levels of narcissistic grandiosity"*[30]. Also, in Weiger Y book *the social construction of a masculine identity*, he says that bodybuilders display narcissistic tendencies[19].

Nevertheless, Efthymiou, D. *et al*. found that EAT-26 scores were positively associated with higher deviation weight (subjects desiring a weight loss from 5 kg up to 19 kg)[29]. The latter could be explained by the fact that Efthymiou, D. *et*

al. mixed men and women, thus altering the commonly found results[29]. Surprisingly, they also reported that no differences between sexes on the EAT-26 scores were found, except for emotional eating where women scored higher[29]. The latter may explain why Goldfield GS found that CFBB had a higher incidence of BED[9].

We could theorise that body dissatisfaction may gravitate this population towards suffering an ED, constituting an important role in its development. This assumption is in concordance with Ravaldi, C. *et al.* results where body image disturbance was found in all participants suffering from an ED[31]. Our selected studies[15,17,9,27,28,29] are also in agreement with Blouin, AG. *et al*. where most of the bodybuilders in their sample scored higher on perfectionism subscales[32]. It is not surprising as it is a trait presented in nearly all ED sufferers, as shown by clinical and experimental evidence, as stated in Raich, R.M. *Anorexia, Bulimia y otros trastornos de la conducta alimentaria*[33]. Bodybuilding is an inherently repetitive sport that can ultimately trigger or boost OCD behaviours by encouraging ritualistic attitudes. Six times Mr. Olympia Dorian Yates' statements in his biography confirms that he kept a training diary from his first day at the gym throughout his whole career[34].

As already stated, body dissatisfaction may be the culprit for suffering an ED. Raich, R.M. confirms it by stating that body dissatisfaction seems to be the cause of the altered perceptions rather than the consequence[33]. ED is also linked to MD, as shown by some of our studies[9,27,28]. MD was first described by Pope, Katz, and Hudson in 1993 as “reverse anorexia nervosa”[32]. Although described in the nineties, it has only been included in the latest DSM versions as a subtype of body dysmorphic disorder in the OCD category. This categorisation has brought some discrepancies[30,35], as MD walks together with ED[30,35,36,37]. As Badenes-Ribera, L. *et al.* meta-analyses clearly state in conclusion: ED and MD symptomatology co-occur in males and females[37]. So, clinicians should pay close attention when evaluating presenting either MD or ED, as they could be affected simultaneously by both. Badenes-Ribera, L. *et al*., also points an extremely interesting idea suggesting that MD and ED predisposed individuals may choose some sports that may potentiate their pathological symptoms, or, in the worst-case scenarios, some MD and ED sufferers may choose a sport to mask or justify

their pathological behaviour[37]. But they also state beforehand they did not believe that participation in sports is inherently pathological. Mitchell, L. *et al*., in a meta-analysis support the theory: *"it remains unclear whether these characteristics are exacerbated by bodybuilding, or whether individuals with these characteristics are attracted to the bodybuilding context"*[38].

Another possible cause that is exacerbating ED and MD is the rise of social media. 79% of young people use social media[39,40]. Instagram is the most used with 2000 million users[41] and women are more likely to use it[42,43]. Recent evidence clearly shows that social media use is undoubtedly linked to ED[44,45,46,47,48,49,50]. The subject is now exposed to a never-ending profusion of images portraying the idealised body with increasingly unrealistic and unachievable body ideals. The latter may trigger inferiority complexes, pushing the individual to risky endeavours to achieve the idealised body. This can be linked with The Inferiority Complex theory[51] explained by Austrian medical doctor Alfred Adler.

Strengths

-The first systematic review to differentiate the association between ED in bodybuilders.

-Includes a classification of different ED.

-Includes a variety of studies from different countries.

-All studies possess multiple samples.

-It approaches a subject of high interest that presents a menace to public health.

-It uses samples composed of bodybuilders, being aesthetics centred sports growingly popular.

Limitations

-The number of studies identified and included was small

-All studies were cross-sectional

-Studies lack homogeneity: screening tests used differ from one to another.

-A single investigator endured the project: biases may be present.

-Some of the selected studies omit data, which offers greater difficulty to discuss the subject.

-Secondary aim of the review cannot be quantitatively expressed due to the lack of data from some of the studies.

-Extrapolation may not be viable as all the selected studies are cross-sectional thus causation cannot be deduced.

5. CONCLUSION

In this systematic review, 6 cross-sectional studies were analysed, addressing ED and its variety of interrelated factors within an increasingly popular sport: bodybuilding. The causes for ED apparition in a bodybuilding population are complex and troublesome to adequately address, by the inherently intricate nature of the sport and, the pathologies in question. Possible causes for this phenomenon have been shown, as well as new ideas that may help enlarge the horizon for a better understanding of the subject. The most common ED in bodybuilding populations, as shown by this review, are BED and BN, due to the idiosyncrasy of the sport.

However, more research needs to be endured on this increasingly alarming issue. More studies on this subject may help clinicians comprehend the problem and, in consequence, create more solutions which may reduce the incidence of ED in this population.

Acknowledgments

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Supporting information

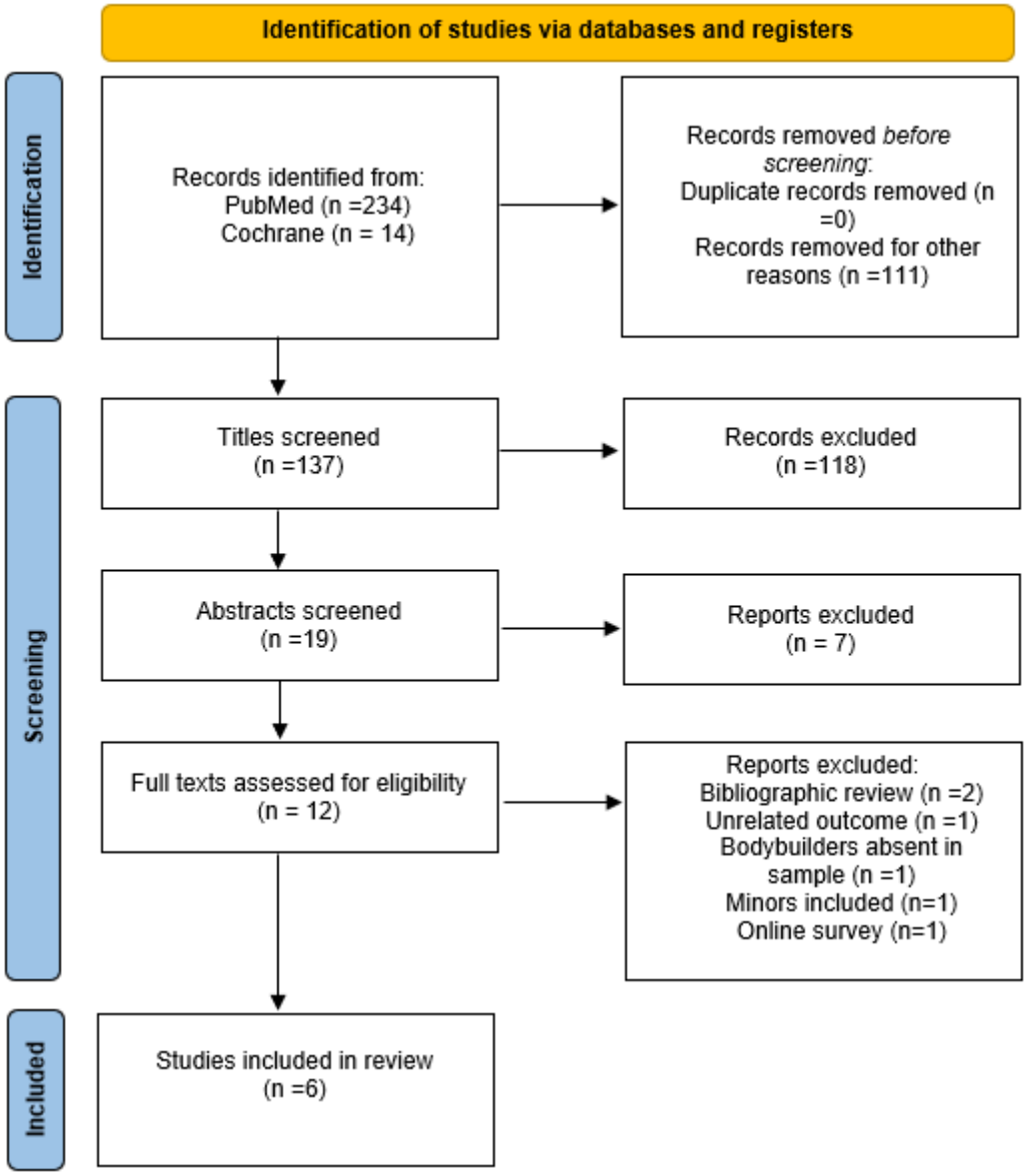

Figure 1: Flow chart

Study	Score	1: Was the research question or objective in this paper clearly stated?	2: Was the Study population clearly specified and defined?	3: Was the participation rate of eligible persons at least 50%?	4: Were all the subjects selected or recruited from the same or similar populations? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	5: Was a sample size justification, power description, or variance and effect estimates provided?	6: For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	7: Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	8: For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome?	9: Were the exposure measures clearly defined, valid, reliable, and implemented consistently across all study participants?	10: Was the exposure assessed more than once over time?	11: Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?	12: Were the outcome assessors blinded to the exposure status of participants?	13: Was loss to follow-up after baseline 20% or less?	14: Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure and outcome?
Babusa B et al	**7**	YES	YES	YES	YES	NO	NO	NO	YES	YES	NO	YES	NA	NA	NA
Devrim A et al	**8**	YES	YES	YES	YES	YES	NO	NO	YES	YES	NO	YES	NA	NA	NA
Efthymiou et al	**7**	YES	YES	YES	YES	NO	NO	NO	YES	YES	NO	YES	NA	NA	NA
Goldfield GS	**7**	YES	YES	YES	YES	NO	NO	NO	YES	YES	NO	YES	NA	NA	NA
Goldfield GS et al.	**7**	YES	YES	YES	YES	NO	NO	NO	YES	YES	NO	YES	NA	NA	NA
Pickett TC et al.	**7**	YES	YES	YES	YES	NO	NO	NO	YES	YES	NO	YES	NA	NA	NA

Table 1: NIH quality control assessment of the included cross-sectional studies

Author	Title	Country	Sample	Measurements	Findings
Babusa B, et al. 2012	*Muscle dysmorphia in Hungarian non-competitive male bodybuilders.*	Hungary	Total sample (n=120) Sample 1: NCMBB (n=60) Sample 2: UMS (n=60) Mean age: 27.75 Males only	-MASS (Muscle Appearance Scale) -EDI (Eating Disorder Inventory) -BAT (Body Attitude Test)	Muscle dysmorphia associated with bodybuilding activity, higher ideal bodyweight and eating disorder characteristics. AAS users had higher muscle dysmorphia symptoms.
Devrim A, et al. 2018	*Is there any relationship between body image perception, eating disorders and muscle dysmorphia disorders in male bodybuilders?*	Turkey	Total sample (n=120) Sample 1: CMBB (n=62) Sample 2: NCMBB (n=58) Mean age: 28.25 Males only	-EAT-40 (Eating Attitude Test) -BIG (Bodybuilder Image Grid) -MDDI (Muscle Dysmorphia Disorder Inventory)	A positive relationship between EAT and MDDI was found. EAT was positively correlated with both fat and muscle dissatisfaction. ED psychopathology is positively related to body dissatisfaction and body dysmorphia disorders.
Goldfield GS, et al. 2006	*Body image, binge eating and bulimia nervosa in male bodybuilders.*	Canada	Total sample (n=74) Sample 1: MBN (n=22) Sample 2: CMBB (n=27) Sample 3: RMBB (n=25) Mean age: 28.14 Males only	-EDI (Eating Disorder Inventory) -Drive for bulk (modified EDI subscale) -DSM-III-R (BN diagnosis criteria)	High rate of weight/shape preoccupations, BED and BN were reported among MBB, especially those who competed (CMBB). CMBB presented higher rates of BED, BN and AAS use versus RMBB but had less eating related and general psychopathology versus MBN.
Pickett TC, et al. 2013	*Men, muscles and body image, comparisons of competitive bodybuilding, weight trainers and athletically active controls.*	USA	Total sample (n=120) Sample 1: CMBB (n=40) Sample 2: NCWT (n=40) Sample 3: Athletically active controls (n=40) Mean age: 28.0 Males only	-MBSRQ (Multidimensional body self-relations questionnaire) -SPAS (Social Physique Anxiety Scale) -TSBI (Texas Social Behaviours Inventory) -EAT-26 (Eating Attitudes Test) -Weight distress -Body fat distress rating	CMBB and NCWT presented higher global appearance evaluation as well as more psychological investment in physical appearance. CMBB also reported higher self-esteem but higher eating disturbance.
Goldfield GS. 2009	*Body image, disordered eating, and anabolic steroid use in female bodybuilders*	Canada	Total sample (n=45) Sample 1: CFBB (n=20) Sample 2: RFWT (n=25) Mean age: 26.85 Females only	-BDI (Beck Depression Inventory) -EDI (Eating Disorder Inventory) -DSM-III-R (BN diagnosis criteria)	Higher rates of weight/shape preoccupations, body dissatisfaction, bulimia practices and AAS use were reported by CFBB versus RFWT. CFBB share eating related features with BN suffering women, but few psychological traits.
Efthymiou, et al. 2021	*Perceived ideal bodyweight exacerbates bulimia and dieting in bodybuilding athletes.*	Cyprus	Total sample (n=103) Sample 1: PCBB (n=38) Sample 2: NCBB (n=33) Sample 3: Strength athletes (n=32) Mean age: 25.4 Mixed (males n=76 and females n=27)	-EAT-26 (Eating Attitude Test) -TFEQ-R21 (Three-Factor Eating Questionnaire-R21) -Bodyweight dissatisfaction (Actual BW minus perceived ideal BW)	The degree of deviation between perceived ideal BW and actual BW was associated with increased risk of ED. Desire of lower BW was associated higher scores of EAT-26, as well as dieting and bulimia subscales. Emotional eating score was higher in females.

Table 2: Fundamental extracted information from the included studies (n=6)

	N ± SD	Mean Age ± SD	Mean BMI ± SD
Babusa B et al	120 ± 31.16	27.8 ± 1.37	25.84 ± 1.85
Devrim A et al	120 ± 31.16	28.25 ± 1.37	26.16 ± 1.85
Efthymiou D et al	103 ± 31.16	25.4 ± 1.37	26.61 ± 1.85
Goldfield G et al	74 ± 31.16	28.27 ± 1.37	27.99 ± 1.85
Goldfield G	45 ± 31.16	25.57 ± 1.37	22.55 ± 1.85
Pickett TC	120 ± 31.16	28.1 ± 1.37	26.76 ± 1.85
Mean Total	97	27.39	26.22

Table 3: Descriptive data from the selected studies (n=6)

	N ± SD	Mean Age ± SD	Mean BMI ± SD
CMBB	157 ± 73,9	28,13 ± 1,83	27,78 ± 2,22
NCMBB	207 ± 73,9	25,5 ± 1,83	25,61 ± 2,22
CFBB	30 ± 73,9	25,87 ± 1,83	22,06 ± 2,22
NCFBB	34 ± 73,9	26,43 ± 1,83	22,5 ± 2,22
MBN	22 ± 73,9	33,6 ± 1,83	25,8 ± 2,22
UMS	58 ± 73,9	27,8 ± 1,83	24,55 ± 2,22
SA	32 ± 73,9	25,9 ± 1,83	25,1 ± 2,22
Mean TOTAL	77,1 ± 73,9	26,94 ± 1,83	25,71 ± 2,22

Table 4: Descriptive data from homogenous groups united between the selected studies.

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