

Title: Is bullying and teasing associated with eating disorders? A systematic review
and meta-analysis

Running Title: Bullying and teasing review

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Acknowledgements: None.

Word count: 7390.

Abstract word count: 249.

ABSTRACT

Objective: Involvement in bullying and teasing has been associated with adverse health outcomes, including eating disorders (EDs). The purpose of this systematic review and meta-analysis was to examine the association between bullying/teasing and EDs. **Method:** A systematic search was conducted. We included research articles that examined the association between bullying/teasing (victimization and perpetration) and EDs. Studies were required to compare ED cases with a reference group. We performed a qualitative synthesis of included studies. Additionally, a random-effects meta-analysis of odds ratios was performed to compare rates of bullying/teasing victimization between cases and healthy controls. **Results:** A total of 22 studies were included for review. Compared to healthy controls, those with EDs were significantly more likely to have been bullied and teased. Evidence of this association was particularly strong for BN and BED, but was more mixed for AN. It was unclear whether such victimization was more common in EDs compared to psychiatric controls. The meta-analysis showed that compared to healthy controls, those with EDs were two- to threefold significantly more likely to have been teased about their appearance and bullied prior to onset of their ED. Few studies examined bullying perpetration. A number of methodological shortcomings of studies were noted. **Discussion:** Being victimized through bullying and teasing is associated with EDs, and may constitute a risk factor. Our review underscores the need for more studies, and highlights gaps in the literature. As many patients have been victims of bullying and teasing, addressing such experiences in treatment may be valuable.

Keywords: Feeding and eating disorders, anorexia nervosa, binge-eating disorder, bulimia nervosa, bullying, teasing, risk factors, systematic review, meta-analysis.

INTRODUCTION

Bullying refers to repeated negative and ill-intentioned behaviors directed against a person who has difficulty defending him or herself (Olweus, 1994). Such behaviors include being repeatedly physically attacked, stolen from, frozen out from social groups, subjected to lies and rumors, threatened, or teased. Although teasing is an ambiguous concept whose definition varies between contexts, hurtful and repeated teasing is commonly regarded as a form of verbal bullying (Keltner, Capps, Kring, Young, & Heerey, 2001; Mills & Carwile, 2009). Recognizing the ambiguities which often make it difficult to equate teasing with verbal bullying, in the present article we consider teasing a construct related - but not necessarily equivalent - to bullying. As a result, we use the terms 'bullying' and 'teasing' separately.

While bullying and teasing typically occurs through physical acts, it can also occur through online forms of communication (e.g. social media), which is referred to as "cyber-bullying". Bullying in childhood and adolescence is common, with one meta-analysis reporting that 35% of adolescents are involved in traditional forms of bullying, while 15% are involved in cyber-bullying (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014). Verbal bullying - such as name-calling and teasing - are among the most common forms of bullying (Baldry, 1998; Rivers & Smith, 1994; Sweetingham & Waller, 2008).

Being bullied and teased during childhood or adolescence is associated with a range of adverse health outcomes, including psychosomatic problems (Gini & Pozzoli, 2013), emotional problems and depression (Reijntjes, Kamphuis, Prinzie, & Telch, 2010), psychotic symptoms (Schreier, Wolke, Thomas, & et al., 2009; van Dam et al., 2012) and suicide (Klomek, Sourander, & Gould, 2010; Van Geel, Vedder, & Tanilon, 2014). Adverse outcomes also extend into young adulthood, with

higher rates of hospitalization and medication due to psychiatric illness (Copeland, Wolke, Angold, & Costello, 2013; Sourander et al., 2007; Sourander et al., 2009; Wolke, Copeland, Angold, & Costello, 2013). Ample research has also shown that being teased specifically for one's appearance (i.e. body shape or weight) is associated with body dissatisfaction, dietary restraint, and bulimic behaviors (Menzel et al., 2010).

Those who bully and tease others also have adverse outcomes, including higher rates of antisocial personality disorder (Copeland et al., 2013) and offending (Farrington, Ttofi, & Lösel, 2011; Ttofi, Farrington, Lösel, & Loeber, 2011). Studies show that those who are both bullied *and* bully others are at particularly higher risk of later psychiatric illness and suicide compared to victims only or perpetrators only (Copeland et al., 2013; Kim & Leventhal, 2008; Winsper, Lereya, Zanarini, & Wolke, 2012).

Numerous studies (e.g. Fairburn et al., 1998; Gonçalves, Machado, Martins, Hoek, & Machado, 2016; Karwautz et al., 2011) have investigated bullying and teasing experiences among individuals with eating disorders (EDs). Such experiences could be associated with EDs in a number of ways. Being bullied or teased is associated with emotional problems (Reijntjes et al., 2010), which could contribute to the development or maintenance of EDs (Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004). Also, bullying and teasing is most frequent during adolescence, coinciding with puberty and a time of significant psychological and biological maturation. As ED symptoms often debut during adolescence, disruptions in social relationships as a consequence of bullying and teasing may be of relevance to understand EDs (Duarte, Pinto-Gouveia, & Rodrigues, 2015; Striegel-Moore & Bulik, 2007). Furthermore, as bullying and teasing is social in nature, it can impart

experiences of social submissiveness and isolation. Patients with EDs tend to show submissive behaviors and more unfavorable social comparisons than healthy controls (Troop, Allan, Treasure, & Katzman, 2003), which could be caused or exacerbated by bullying and teasing experiences. Last, teasing is often appearance-focused, leading to increased body dissatisfaction and dietary restraint (Menzel et al., 2010), which in turn are risk factors for ED onset (Stice, 2016).

Despite the interest in and support for the association between bullying/teasing and EDs, there has been no systematic review of the research findings to date. Providing such a review would be useful for our understanding of correlates and risk factors related to EDs. A previous systematic review focused on the association between appearance-related teasing and disordered eating, but did not consider bullying or ED diagnoses specifically. We therefore conducted the first systematic review and meta-analysis of studies examining the association between bullying/teasing and EDs. The purpose of our review was to provide a qualitative and quantitative synthesis of the research findings, and provide an overview of the status of the research literature. Our primary aims were to evaluate the effect size of the association between: a) bullying/teasing victimization and EDs, and b) bullying/teasing perpetration and EDs.

METHOD

Identification of literature

A systematic search based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009) was conducted in collaboration with a Librarian at the University of Oslo Medical Library. There was no time restriction in the search and all articles published up to present day were considered (search conducted 31/10/2017). Index terms and keywords relating to EDs (e.g. eating disorders, anorexia, bulimia, binge-eating disorder) and bullying or teasing (e.g. cyberbullying, name-calling, victimization), were included in a systematic main search strategy. For a complete list of keywords see Supplementary Materials 1. Grey-literature including dissertations or theses were not included in the search.

The main search was performed using Ovid MEDLINE, psycINFO, and Scopus databases. An additional PubMed search was conducted to identify articles on risk factors for eating disorders that include bullying or teasing measures, but do not use “bullying” or related terms explicitly in title, abstract or keywords. This search was performed using “eating disorder*” as a major mesh-term and a title match for “risk factor” or “predictor”. To complement our search strategy, we also performed backward citation chaining of all included articles and a previous meta-analysis focusing on appearance-related teasing, body dissatisfaction and disordered eating (Menzel et al., 2010). Screening of titles and abstracts, and full-text reviews were performed by two reviewers (S.Ø.L and L.B screening and reviewing half each). Ten percent of all full-text reviews were performed independently by both reviewers, to estimate between-reviewer agreement in the decision to include/exclude articles.

Study selection criteria

We included studies comparing rates of bullying and/or teasing (both victimization and perpetration) experiences between EDs and a reference group. Our systematic review was guided by the bullying definition provided by Olweus (1994), and teasing was considered a related construct. While we acknowledge the potential ambiguities in the definitions of and relationship between bullying and teasing, we included all studies measuring bullying or teasing experiences to cover all research relevant for our aims. We therefore did not require studies to strictly adhere to any given definition or operationalization of bullying and teasing. Instead, as part of our synthesis we comment on the operationalizations of bullying and teasing employed in studies.

Only original research articles quantitatively evaluating the association between EDs and bullying or teasing were included in the systematic review. These had to be published in peer-reviewed journals, with available full-text formats in English, Norwegian, Danish, or Swedish (full-texts in other languages were excluded). Studies were required to: a) identify ED cases by evaluation of diagnostic criteria where cases were classified as fulfilling some or all criteria for clinical EDs, and b) compare ED cases with an appropriate reference group, including both longitudinal and case-control comparisons.

Articles were excluded if they a) did not investigate the association between EDs and bullying or teasing, b) only focused on life events tangentially related to bullying or teasing such as sexual harassment or negative comments about appearance, and

c) only focused on ED-associated features such as body dissatisfaction or self-esteem.

Qualitative synthesis

We performed a qualitative synthesis of all included studies, summarizing the evidence of an association between EDs and bullying/teasing victimization and perpetration. We distinguish between generic bullying (i.e. having been bullied), appearance-unrelated teasing (i.e. having been teased about something unrelated to ones appearance), and appearance-related teasing (i.e. having been teased about ones appearance), in line with the distinctions made in the included studies. Results of the qualitative synthesis are summarized in Table 1, where we provide study characteristics and main findings, including effect sizes (odds ratios [ORs] and Cohen's *d*'s). For some studies, we calculated *d*'s ourselves to show magnitudes of effects for specific between-group comparisons. Some studies reported ORs in manners that would complicate interpretation across studies (e.g. log ORs or inverted ORs). For these we calculated ORs ourselves so the direction is consistent across studies in Table 1 (i.e. OR > 1.0 signifies increased rates of bullying or teasing in EDs).

Quantitative synthesis

A meta-analysis was performed to complement the qualitative synthesis. As there were few studies examining bullying or teasing perpetration, only studies of bullying or teasing victimization were included. Due to considerable heterogeneity across studies (e.g. type and timeframe of bullying and teasing, measures, sample

characteristics), it was inappropriate to include all studies in a meta-analysis. Therefore, only studies that measured bullying or teasing victimization experiences which with some certainty occurred prior to ED onset were considered. This included studies that specifically measured bullying and teasing that occurred prior to ED onset, or in childhood. Furthermore, only comparisons between cases and healthy controls were included. This meta-analysis therefore provides tentative evidence towards bullying and teasing experiences as risk factors for EDs. We performed separate meta-analyses for generic bullying, appearance-unrelated teasing, and appearance-related teasing (three meta-analyses in total). Studies that measured current bullying or teasing victimization, had an unspecific timeframe of bullying and teasing (e.g. lifetime), or did not distinguish between generic bullying and appearance-unrelated or related teasing were not included. Some studies separately measured teasing perpetrated by peers and family. For these we prioritized teasing by peers, as we reasoned that peer-teasing is arguably more likely to be carried out with the intent to hurt and therefore comparable to bullying. Moreover, a previous study showed that individuals with EDs are more frequently teased by peers compared to family (Sweetingham & Waller, 2008). Some studies also measured several specific types of teasing, such as teasing due to overweight, teasing about breasts, threatening teasing etc. For these we prioritized the most general form of teasing (e.g. appearance-related teasing as opposed to teasing about breasts) as the majority of studies measured teasing in this manner.

Statistical analyses were performed with RStudio statistical software version 1.1.447 (RStudio, 2016), using the metafor package (Viechtbauer, 2010). Meta-analyses were performed on log ORs calculated for the included studies. For studies reporting Cohen's d , we converted d to OR. As a result, note that the effect sizes in

Table 1 may not be identical to the ones presented in the quantitative synthesis. We then performed random-effects meta-analyses, which accounts for between-study heterogeneity by allowing variance both between and within studies (Borenstein, Hedges, Higgins, & Rothstein, 2010). Three of the included studies included overlapping healthy control samples (Fairburn, Cooper, Doll, & Welch, 1999; Fairburn et al., 1998; Fairburn, Welch, Doll, Davies, & O'Connor, 1997) and were therefore statistically dependent. To account for this dependency, the covariances between the log ORs in these studies were computed and incorporated into the models.

We present model results as ORs with 95% confidence intervals. For each model, heterogeneity between studies was estimated using Cochran Q (reported with p value) and I^2 , and evaluated as low (25%), moderate (50%), or high (75%) heterogeneity. Due to the modest number of effect sizes included for each meta-analysis, we were unable to consider moderators such as ED diagnosis, or perform tests of publication bias which are inappropriate for small meta-analyses (Ioannidis & Trikalinos, 2007).

Review structure

Our review is structured to provide a synthesis of the association between bullying/teasing and EDs. First, we provide an overview of characteristics and methodological quality of studies. Second, we provide a qualitative and quantitative synthesis on bullying and teasing victimization. Third, we provide a qualitative synthesis on bullying and teasing perpetration. Finally, a discussion of the main findings and methodological considerations is provided.

RESULTS

Articles identified

The systematic database search yielded a total of 868 articles, and an additional 294 through the supplementary PubMed mesh-term search. After removal of duplicates, titles and abstracts of all 741 remaining records were screened for eligibility. A total of 252 articles were deemed relevant for full text assessment. Three additional articles were identified through other sources. The random selection of 10% of all full texts that were reviewed independently by both reviewers yielded an agreement rate of 100%.

A total of 22 studies met the inclusion criteria and were included in the systematic review. All included articles were written in English. The main reasons for exclusion were lack of an appropriate diagnostic ED group, no measure of bullying, or not investigating the association between bullying and EDs (see PRISMA diagram in Figure 1).

INSERT FIGURE 1 ABOUT HERE

General study characteristics and methodological quality

Table 1 summarizes the study characteristics and main findings of studies included in the review. Twenty-one studies investigated bullying or teasing victimization, and only three assessed bullying or teasing perpetration. Overall sample size across all studies was 15356 unique individuals, ranging from the smallest study of 55 participants (Hilbert, Hartmann, Czaja, & Schoebi, 2013) to a

population study of 8787 individuals (Kaltiala-Heino, Rimpelä, Rantanen, & Rimpelä, 2000). The total number of ED cases was 3448, which included 850 with anorexia nervosa (AN), 1906 with bulimia nervosa (BN), 471 with binge-eating disorder (BED), 204 with eating disorders not otherwise specified, and 17 in unspecified ED groups. No studies included other eating disorders. The total number of healthy controls was 10062, and 1863 for psychiatric controls.

Four of the included studies comprised adult samples, seven comprised child/adolescent samples, eight comprised both child/adolescent and adult samples, and age-range was not available for the remaining three studies (mean age was > 18 years for these studies). Seven studies included males, but females were the majority in all but two studies (Elizathe, Arana, & Rutzstein, 2016; Mayes, Calhoun, Baweja, & Mahr, 2015). Thirteen studies were classified as having case-control designs, eight having cross-sectional designs (with subsequent differentiation between cases and controls), and one having a prospective longitudinal design. All studies included cross-sectional data and analyses (i.e. compared two or more groups at one point in time), with the exception of the longitudinal study by Hilbert and colleagues (2013) which used longitudinal data and analyses. A healthy control group was included in 20 of the 22 included studies; seven of these included an additional psychiatric control group. One study included a psychiatric control group only (Fosse & Holen, 2006), and one longitudinal study (Hilbert et al., 2013) had no separate control group as they reported within-group comparisons. Three articles were based on the same overall sample (Kaltiala-Heino et al., 2000; Kaltiala-Heino, Rissanen, Rimpelä, & Rantanen, 2003; Kaltiala-Heino, Rissanen, Rimpelä, & Rantanen, 1999), but all were included as they reported different associations in each article (e.g. different EDs). Three studies included overlapping healthy and psychiatric control samples (Fairburn

et al., 1999; Fairburn et al., 1998; Fairburn et al., 1997), but all were included as each study comprised unique cases. The majority of studies compared specific EDs (i.e. AN or BN) separately with control groups, but some compared a mixed ED group (referred to as “mixed EDs”) with control groups.

Criteria in the “Newcastle-Ottawa Scale for assessing the quality of nonrandomized studies in meta-analyses” (Wells et al., cited November 23, 2018) were used to evaluate methodological quality of the included research. The methodological quality of included studies varied. Sample sizes differed greatly, and the majority of studies included < 100 cases in their respective ED groups, which limits the statistical power of the studies. Most studies had adequate case definition, using established measures to evaluate the presence of DSM or ICD criteria. Sixteen studies used interviews to establish case status, five used self-reports, and one did not specify. Some studies (e.g. Fosse & Holen, 2006; Kaltiala-Heino et al., 2000; Kaltiala-Heino et al., 2003; Kaltiala-Heino et al., 1999) used author-specific self-report measures, but these were based on diagnostic criteria. A few studies (e.g. Elizathe et al., 2016; Kaltiala-Heino et al., 2003) included broadly-defined EDs as cases. These were nonetheless included as cases fulfilled some of the core diagnostic criteria for EDs. The representativeness of included cases is difficult to ascertain; many recruited cases from clinical settings which may not be representative of the population at large. Cross-sectional studies identified cases from community samples, which may ensure better representativeness but these cases could differ from ones recruited from clinical settings. Additionally, cases in some studies were recovered from their ED.

Healthy controls were most commonly recruited from the community, except for two studies which used healthy sisters of cases as controls (Karwautz et al., 2011;

Lehoux & Howe, 2007). Some studies also included psychiatric controls recruited from treatment centers. All studies had adequate definition of controls; this was straightforward and involved a failure to meet the case definition. Studies typically controlled for, or matched groups for age and gender. Most studies had a case-control design which precluded calculation of response rates. However, response-rates were satisfactory (78 – 97%) in the cross-sectional studies that reported this (Fosse & Holen, 2006; Kaltiala-Heino et al., 2000; Kaltiala-Heino et al., 2003; Kaltiala-Heino et al., 1999; Liu, Tseng, Chang, Fang, & Lee, 2016; Striegel-Moore, Dohm, Pike, Wilfley, & Fairburn, 2002). The only longitudinal study (Hilbert et al., 2013) reported satisfactory (92 – 98%) retention rates.

The studies used the same measure to assess bullying or teasing experiences for both cases and controls. Measures varied considerably with regards to the timeframe (e.g. current, lifetime, prior to ED onset, or unspecified), type (e.g. generic bullying, unspecific teasing, teasing about appearance), and perpetrator (e.g. unspecified, by peers, by family) of bullying and teasing. Of the measures that assessed appearance-related teasing, the nature of the teasing was either specifically related to being overweight (e.g. called names like “fatso”) or unspecific and about appearance in general (e.g. teased about one’s body weight or shape). Only one study specifically assessed teasing due to being underweight (Liu et al., 2016). Most measures assessed multiple forms of bullying or teasing. The quality of these measures varied, and was poor for several. A total of 12 different measures of bullying and/or teasing were used. The Oxford Risk Factor Interview (Fairburn et al., 1997) was used in seven of the studies to measure history of bullying or teasing victimization occurring prior to ED onset, and was the most comprehensive measure as it included separate items assessing generic bullying, appearance-unrelated

teasing, and appearance-related teasing. Several studies used 1-3 single item yes/no questions to assess bullying or teasing victimization. No studies measured cyber-bullying.

Many studies did not include a definition of bullying or teasing in their measures, and studies typically used the terms “bullying” or “teasing” without further definition. Also, many studies did not distinguish between different types of bullying, making it unclear what type of bullying experiences participants reported (e.g. verbal, physical, etc.). It is therefore unclear whether the responses of participants converge on similar conceptualizations of bullying or teasing, as participants may have been unsure what behaviors these terms refer to. These shortcomings raise concerns regarding whether studies measured the same types of experiences. None of the studies defined teasing as having to be intended to hurt, repeated, or difficult to defend against. Therefore, bullying and teasing should be considered related but separate experiences for the remainder of this review.

INSERT TABLE 1 ABOUT HERE

Victimization: Are individuals with EDs more frequently bullied and teased?

Of the 22 studies included, 21 examined bullying or teasing victimization. Table 1 provides details concerning each of the included studies, along with their main findings. Extraction of prevalence estimates (for descriptive purposes) of victimization was possible for ten studies. Based on these, an average of 17% (9 - 30%) of individuals with EDs, 10% (4 – 17%) of healthy controls, and 17% (13 – 21%) of psychiatric controls reported having been bullied at some point. An average of 23%

(8 – 61%) of individuals with EDs, 16% (7 – 29%) of healthy controls, and 24% (12 – 41%) of psychiatric controls reported having been teased about something unrelated to their appearance at some point. An average of 47% (36 – 59%) of individuals with EDs, 24% (13 – 37%) of healthy controls, and 33% (28 – 42%) of psychiatric controls reported having been teased about their appearance at some point.

Qualitative synthesis

A total of 21 studies compared rates of bullying and teasing victimization between EDs and a control group. Twenty studies included a healthy control group, and eight studies included a psychiatric control group. An AN group was included in seven studies (with 21 relevant effect sizes), a BN group was included in eight studies (with 21 relevant effect sizes), a BED group was included in five studies (with 14 relevant effect sizes), and a mixed ED group was included in five studies (with seven relevant effect sizes). Of all studies, 15 (71%) reported significantly higher rates of some form of bullying or teasing victimization in EDs compared to a control group, while six (29%) reported no significant differences between groups.

For AN, findings were mixed, but pointed in the direction of increased victimization compared to healthy controls. While history of being a victim of teasing both unrelated and related to appearance was more common (ORs between 1.0 - 4.3) among individuals with AN compared to healthy controls, effect sizes were mostly non-significant (Fairburn et al., 1999; Hilbert et al., 2014; Kim, Heo, Kang, Song, & Treasure, 2010), with some exceptions (Karwautz et al., 2011; Machado, Goncalves, Martins, Hoek, & Machado, 2014). Similarly, although some studies showed that history of being bullied were more than twice as common among individuals with AN

compared to healthy controls, none of the effect sizes reached significance (Fairburn et al., 1999; Kaltiala-Heino et al., 2000; Karwautz et al., 2011; Troop & Bifulco, 2002). There was some evidence to suggest rates of teasing victimization were significantly higher for AN compared to psychiatric controls (ORs between 0.70 – 2.91), but evidence was scarce and mixed (Fairburn et al., 1999; Machado et al., 2014).

For BN, there was a clear association with bullying and teasing victimization. Compared to healthy controls, individuals with BN were significantly more likely to have been teased about their appearance and bullied (Fairburn et al., 1997; Gonçalves et al., 2016; Hilbert et al., 2014; Kaltiala-Heino et al., 2000; Kaltiala-Heino et al., 1999; Lehoux & Howe, 2007), with medium to large effect sizes (ORs between 2.50 - 7.43, *d*'s between .56 - .88). Although rates of appearance-unrelated teasing victimization were also higher for BN cases compared to healthy controls (ORs between 1.20 - 6.0), these differences were not significantly different (Fairburn et al., 1997; Gonçalves et al., 2016). Rates of bullying and teasing victimization were significantly higher for BN compared to psychiatric controls according to some sources, but evidence was mixed (e.g. ORs between 0.80 - 2.89, Fairburn et al., 1997; Fosse & Holen, 2006; Gonçalves et al., 2016).

Similar findings were obtained for BED. Compared to healthy controls, individuals with BED were significantly more likely to have been teased about their appearance and bullied (Duarte & Pinto-Gouveia, 2017; Fairburn et al., 1998; Hilbert et al., 2014; Striegel-Moore et al., 2002), with most effects sizes of medium and large magnitudes (ORs between 2.30 - 5.50, *d*'s between .39 - 1.25). Only one study examined rates of appearance-unrelated teasing specifically, which were non-significantly lower in BED compared to healthy controls (Fairburn et al., 1998). A few studies showed slightly higher rates of bullying and teasing victimization among individuals with BED

compared to psychiatric controls (ORs between 1.00 - 1.88), but differences were non-significant (Fairburn et al., 1998; Striegel-Moore et al., 2002).

For studies of mixed ED groups, findings showed that a history of being teased about appearance was significantly more common among these individuals compared to healthy controls (Elizathe et al., 2016; Jackson, Grilo, & Masheb, 2000; Krug et al., 2015; Liu et al., 2016), with medium effect sizes (d 's between .64 - .66, ORs between 2.40 - 2.99). No studies investigated rates of appearance-unrelated teasing in a mixed ED group. Only one study (Mayes et al., 2015) considered bullying, showing that although history of being victimized in the mixed ED group was almost twice as high compared to healthy controls, the difference was not significant. This study also showed that rates of bullying victimization were lower for EDs compared to other psychiatric disorders.

Some studies also directly compared rates of bullying and teasing victimization between specific ED subtypes. There was some evidence to suggest that while rates of bullying and teasing victimization were similar between bulimic (BN, BED and AN-binging/purging subtype) ED subtypes, they were significantly higher (d 's between 0.23 - 0.40) for bulimic compared to restrictive (i.e. AN and AN-restricting subtype) ED subtypes (Fairburn et al., 1998; Hilbert et al., 2014; Krug et al., 2015). However, not all studies supported this (Fairburn et al., 1999; Karwautz et al., 2011; Troop & Bifulco, 2002).

In summary, studies generally showed that a history of having been bullied or teased was significantly more common among individuals with EDs compared to healthy controls. This association had strongest support for studies of BN, BED or mixed ED groups, where effect sizes were generally of medium to large magnitudes.

Evidence was more mixed in AN, where effect sizes tended to be smaller and non-significant, although findings pointed in the direction of increased teasing victimization in AN compared to healthy controls. While rates of generic bullying and appearance-related teasing victimization was consistently higher in EDs compared to healthy controls (with the exception of AN), evidence was weaker and more mixed for appearance-unrelated teasing. Whether rates of bullying and teasing were higher among EDs compared to psychiatric controls was unclear, as evidence was scarce and mixed. Direct comparisons between specific EDs raised the possibility that history of being bullied or teased is more common among bulimic as opposed to restricting ED subtypes, although findings were inconsistent.

Quantitative synthesis

A total of 12 studies were eligible for the meta-analyses, all investigating rates of bullying and teasing victimization prior to ED onset. Data suitable for the comparison of generic bullying victimization rates between EDs and healthy controls were available from six studies, including 494 cases and 516 controls (Fairburn et al., 1999; Fairburn et al., 1998; Fairburn et al., 1997; Karwautz et al., 2011; Striegel-Moore et al., 2002; Troop & Bifulco, 2002). The random-effects pooled OR was 2.22 (CI: 1.53 – 3.22), which was statistically significant ($p < .0001$). Minimal heterogeneity was present ($I^2 = 0\%$, $p = 0.37$). See Figure 2 for a forest plot of the results.

Data suitable for the comparison of appearance-related teasing victimization rates between EDs and healthy controls were available from ten studies, including 1341 cases and 1646 controls (Duarte & Pinto-Gouveia, 2017; Fairburn et al., 1999; Fairburn et al., 1998; Fairburn et al., 1997; Gonçalves et al., 2016; Karwautz et al.,

2011; Kim et al., 2010; Krug et al., 2015; Liu et al., 2016; Machado et al., 2014). The random-effects pooled OR was 2.93 (CI: 1.97 - 4.37), which was statistically significant ($p < .0001$). High heterogeneity was present ($I^2 = 82.89\%$, $p < 0.0001$). See Figure 3 for a forest plot of the results.

Data suitable for the comparison of appearance-unrelated teasing victimization rates between EDs and healthy controls were available from six studies, including 495 cases and 478 controls (Fairburn et al., 1999; Fairburn et al., 1998; Fairburn et al., 1997; Gonçalves et al., 2016; Karwautz et al., 2011; Machado et al., 2014). The random-effects pooled OR was 1.50 (CI: 0.88 - 2.55), which was not statistically significant ($p = 0.13$). Moderate heterogeneity was present ($I^2 = 63.70\%$, $p = 0.02$). See Figure 4 for a forest plot of the results.

In summary, random-effects pooled ORs of both generic bullying and appearance-related teasing victimization prior to ED onset were two- to threefold higher among individuals with EDs compared to healthy controls. Although the random-effects pooled OR of appearance-unrelated teasing victimization prior to ED onset indicated increased exposure among individuals with EDs compared to healthy controls, this effect was non-significant. These results are consistent with the overall qualitative synthesis.

INSERT FIGURE 2 ABOUT HERE

INSERT FIGURE 3 ABOUT HERE

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Perpetration: Do individuals with EDs more frequently bully and tease others?

Of all 22 articles included in this review, only three considered perpetration; all in the context of generic bullying behaviors. Table 1 provides details concerning these studies. All three studies included a healthy control group, and one study included an additional psychiatric control group. An AN group was included in one study (with two relevant effect sizes), a BN group was included in two studies (with four relevant effect sizes), and a mixed ED group was included in one study (with one relevant effect size).

Two of the articles described large population studies based on the same overall sample, but used different case definitions. One of these (Kaltiala-Heino et al., 2000) reported that rates of both BN and AN were higher among those who bullied others compared to those not involved in bullying (ORs 2.70 and 3.90), but the effect size was only significant for AN. However, the second study (Kaltiala-Heino et al., 2003) found that both boys and girls who bullied others were significantly more likely to have broadly-defined BN (ORs 2.5 and 4.1), compared to those who were not categorized as bullies. There were some evidence to suggest that those who were both bullied *and* bullied others were particularly more likely to have AN (OR = 6.4) and BN (OR = 9.5) compared to those not involved in bullying (Kaltiala-Heino et al., 2000). In contrast, the last study found that rates of bullying others were lower in a mixed ED group compared to both healthy controls and psychiatric controls (Mayes et al., 2015). Of note, this study differed from others in that rates of bullying perpetration were based on maternal reports of their children's behavior.

In summary, based on the scarce body of evidence, the association between EDs and bullying perpetration was unclear. Some evidence suggests increased rates of bullying perpetration among individuals with EDs.

DISCUSSION

This is the first systematic review and meta-analysis of the association between bullying, teasing, and EDs. Our review showed that individuals with EDs were significantly more likely to have been bullied and teased compared to healthy controls. This association was particularly strong for BN and BED, while evidence was more mixed for AN. Meta-analysis showed that compared to healthy controls, individuals with EDs were two- to threefold significantly more likely to have been teased about their appearance and bullied prior to onset of their ED. However, it was unclear whether victimization was more common in EDs compared to psychiatric controls. Based on a scarce body of evidence, the association between EDs and bullying perpetration was unclear. A number of methodological shortcomings of the available studies were noted.

The main finding of this review was that a history of being bullied and teased is significantly more common among individuals with EDs compared to healthy controls. This is in line with previous studies showing an association between bullying and teasing victimization and ED symptoms (Copeland et al., 2015; Menzel et al., 2010). Rates of both general bullying and appearance-related teasing victimization were elevated in EDs compared to healthy controls, while evidence was more mixed for appearance-unrelated teasing. This indicates that being teased about one's appearance is more strongly associated with EDs, compared to general teasing experiences.

In terms of specific EDs, this main finding was most strongly supported for BN and BED, with medium to large effect sizes. Evidence was more mixed in AN, where effect sizes tended to be smaller and non-significant. However, studies generally showed that history of being teased was more common in AN compared to healthy

controls, raising the possibility that many studies of AN were underpowered. Although mixed, there was some evidence to suggest that history of being bullied and teased were significantly more frequent in bulimic (i.e. BN, BED, AN-binging/purging subtype) as opposed to restricting (i.e. AN, AN-restricting subtype) ED subtypes (Hilbert et al., 2014; Krug et al., 2015). Such diagnostic differences are similar to previous studies reporting that adverse life events, such as childhood maltreatment, tend to be more strongly associated with bulimic ED subtypes (Caslini et al., 2016; Molendijk, Hoek, Brewerton, & Elzinga, 2017). This is also supported by findings from non-clinical populations that report stronger associations between bullying victimization and bulimic symptoms than between bullying victimization and dietary restraint (Kwan, Gordon, Minnich, Carter, & Troop-Gordon, 2017). Also, children and adolescents who are overweight or obese are bullied and teased more frequently than their normal-weight peers (Janssen, Craig, Boyce, & Pickett, 2004). As binge-eating is associated with overweight and obesity (De Zwaan, 2001), this could relate to the diagnostic differences.

Many of the studies included in our review retrospectively investigated rates of bullying and teasing victimization prior to ED onset. Given the lack of longitudinal studies, such studies provide preliminary evidence of bullying and teasing as risk factors that predates the onset of EDs. Our meta-analysis of these studies showed that both generic bullying and appearance-related teasing victimization prior to ED onset were two- to threefold significantly higher among individuals with EDs compared to healthy controls. A similar meta-analysis of appearance-unrelated teasing was not significant, although the pooled OR was in the direction of increased exposure among EDs. These results provide preliminary evidence that being teased about ones appearance or bullied may constitute risk factors for EDs. However, it is

important to acknowledge that retrospective studies of bullying and teasing victimization prior to ED onset rely on the definitions of the events involved (i.e. does ED onset reflect time of diagnosis or time when core symptoms emerged), and on participants' ability to remember and report the timing of these. Therefore, there is some uncertainty regarding whether these studies managed to accurately record the timing of the victimization events and ED onset, and thus determine whether bullying or teasing contributed to the development of EDs. A significant number of studies in our meta-analysis used the Oxford Risk Factor Interview which defined ED onset as the age at which the first noteworthy and persistent behavioral characteristic of an ED began (Fairburn et al., 1997). Other studies used measures with less precise wordings. Considering these limitations, longitudinal studies are needed to confirm the results of our meta-analysis.

Several potential pathways might account for the association between bullying/teasing and EDs. Being victimized through bullying and teasing constitutes a considerable stressful event, and can lead to emotional problems (Reijntjes et al., 2010) which in turn can increase risk for EDs (Jacobi et al., 2004). Being teased about one's weight might expose individuals to feedback regarding their body which could lead to a preoccupation with appearance, increased social comparison, and body dissatisfaction. Both appearance-related teasing (Menzel et al., 2010) and unfavorable social comparisons (Myers & Crowther, 2009) are associated with body dissatisfaction, which is a robust risk factor for EDs (Jacobi et al., 2004; Stice, 2002). Related to this, it is interesting to note that our review showed that there was stronger evidence of an association between appearance-related teasing and EDs, compared to appearance-unrelated teasing and EDs.

However, it is important to acknowledge that there is likely to be a reciprocal relationship between bullying, teasing, and psychiatric disorders. For example, individuals with pre-existing psychiatric or developmental difficulties can be at higher risk of being victimized because they are viewed as “odd” or “different” by peers (Arseneault, Bowes, & Shakoor, 2010; Reijntjes et al., 2010). A recent longitudinal study found that disordered eating behavior in adolescence preceded bullying victimization by peers in a non-clinical population, underscoring the importance of considering bidirectional relationships between bullying/teasing and EDs (Lee & Vaillancourt, 2018).

In our review, it was less clear whether rates of bullying and teasing victimization were more common in EDs compared to other psychiatric disorders, as the studies examining this yielded inconsistent results (Fairburn et al., 1999; Fairburn et al., 1998; Fairburn et al., 1997; Fosse & Holen, 2006; Machado et al., 2014; Mayes et al., 2015; Striegel-Moore et al., 2002). Bullying and teasing victimization has been shown to also increase risk of other adverse health outcomes, such as emotional problems and depression (Reijntjes et al., 2010), and suicide (Klomek et al., 2010; Van Geel et al., 2014).

Only three of the included studies investigated perpetration, all in the context of generic bullying behaviors. Due to the scarce body of evidence, the association between bullying perpetration and EDs was unclear. Evidence from two large population-based studies (comprising the same overall sample) pointed in the direction of increased rates of bullying perpetration among individuals with EDs compared to healthy controls (Kaltiala-Heino et al., 2000; Kaltiala-Heino et al., 2003). This is in line with a previous longitudinal study showing that childhood bullies have increased risk of ED symptoms (Copeland et al., 2015). In contrast, one study in our

review found no such association between EDs and perpetration (Mayes et al., 2015). This study however, was small in comparison, included a very young sample, and was based on maternal ratings of their child's behavior. If bullying perpetration and EDs are associated, the direction and underlying mechanisms of this potential relationship is unclear. It is possible that individuals who struggle psychologically (e.g. with low self-esteem or EDs) resort to bullying others as a way to acquire social dominance, to overcome their own feelings of inferiority. However, a previous longitudinal study indicated that the act of bullying others itself increases ED symptoms (Copeland et al., 2015). This underscores the need to consider potential bidirectional relationships between bullying perpetration and EDs. Only one study (Kaltiala-Heino et al., 2000) examined individuals who were both victims and perpetrators of bullying. These individuals were significantly more likely to fulfil criteria for AN and BN compared to those who were neither a victim nor perpetrator, with particularly large effect sizes. This is in line with previous research showing that those who are both victims and perpetrators of bullying are at particularly high risk for adverse outcomes (Copeland et al., 2013; Winsper et al., 2012). Considering the lack of studies investigating bullying perpetration in EDs, more studies are needed.

None of the studies in our review investigated associations between cyber-bullying and EDs, which presents a considerable gap in the research literature. Such behaviors are common (Modecki et al., 2014), and have been linked to adverse mental health outcomes (Bannink, Broeren, van de Looij-Jansen, de Waart, & Raat, 2014; Goebert, Else, Matsu, Chung-Do, & Chang, 2011; Hinduja & Patchin, 2010). To keep up with the emergence of such new forms of bullying and teasing, future studies of bullying and EDs should include measures of cyber-bullying.

Our review highlighted a number of methodological shortcomings of the literature. Many studies were based on small sample sizes limiting their statistical power. Several studies did not differentiate between specific EDs, which according to our review may impact results. The lack of longitudinal studies was also identified as a limitation of the available evidence. The low prevalence rates of EDs in the general population presents a major challenge to longitudinal studies of risk factors for EDs. However, retrospective research designs that include measures able to assess time of onset of both bullying/teasing experiences and EDs can give a good indication of the temporal relation between events. Many of the retrospective studies in our review included such measures, which is a strength. However, such measures are vulnerable to recollection bias. However, as such retrospective studies are limited in their ability to establish temporal precedence of events (e.g. due to recollection bias), longitudinal studies are needed.

The biggest shortcoming of many of the included studies was the lack of comprehensive measures of bullying and teasing, and ambiguities in the definition of these terms. Many of the studies in our review used only a few items to assess bullying, often with a yes/no response option. Such short measures are likely unable to appropriately assess the presence, type, duration and severity of bullying, which may all be important factors that affect the development of psychiatric symptoms. Also, many of the bullying measures did not include a specific definition of the term "bullying". Without explicit reference to a definition of bullying, it is unclear whether participants' responses reflect experiences in line with formal bullying definitions. A previous meta-analysis also highlighted the variations and ambiguities in the terms used to characterize peer victimization, including bullying and teasing (Reijntjes et al.,

2010). Furthermore, many studies did not differentiate between different types of bullying (e.g. physical, verbal, etc.).

A significant proportion of the articles in this review measured teasing. Teasing often has connotations of being less severe than bullying, and without a clear definition there is a risk of potential ambiguity which may affect participants' responses. In our meta-analyses, heterogeneity was minimal for effect sizes related to generic bullying, and considerably higher for effect sizes related to teasing, which could reflect some of these ambiguities. Additionally, studies varied in the extent to which they documented the exact nature of the appearance-related teasing measured. Some measured unspecific appearance-related teasing which included teasing about body or appearance in general, while others measured teasing specifically due to being overweight. One meta-analysis found that use of the term "teasing" (as opposed to "bullying") increased prevalence rates of such events, possibly due to the fact that individuals may be unsure how to characterize teasing and distinguish it from bullying (Modecki et al., 2014). One study showed that children/adolescents viewed bullying as teasing that gets out of hand (Guerra, Williams, & Sadek, 2011). Ambiguities of the teasing concept have been discussed previously (Keltner et al., 2001; Mills & Carwile, 2009). However, it is clear that teasing can constitute serious experiences with adverse outcomes, as highlighted in our review. Future studies would benefit from including definitions of bullying and/or teasing in their measures, to reduce the ambiguity of these concepts.

Our review has a number of strengths. We performed a systematic search spanning several databases, using a multitude of keywords to capture all relevant articles. This proved necessary, as many articles did not specifically include "bullying" or "teasing" in the title or abstract, or among the keywords. We also performed

backward citation chaining of all included articles. Moreover, we used clear inclusion criteria to ensure we only included studies that examined associations between clinical EDs and bullying or teasing. Lastly, we supplemented our qualitative synthesis with a meta-analysis.

Our review has a number of limitations. First, we decided to focus on clinical EDs as opposed to ED-related symptoms. This entailed an exclusion of a sizable body of literature that examines the relationship between bullying and ED-related features, such as body dissatisfaction. However, this is covered in a previous meta-analysis (Menzel et al., 2010). We also excluded studies that examined behaviors tangentially related to bullying, such as harassment or other forms of peer victimization. Moreover, we included studies that measured many different forms of bullying and teasing, which introduces heterogeneity. However, this was necessary as the studies distinguished between several forms of bullying and/or teasing behaviors. As our meta-analysis included a modest number of effect sizes, we were unable to examine moderators such as ED diagnosis, or to assess publication bias. Last, we did not include grey literature in our search. However, it is doubtful that inclusion of such literature would alter our main findings, and one recent study shows that inclusion of such literature has limited impact on reviews (Hartling et al., 2017).

In conclusion, our review shows that EDs are associated with bullying and teasing victimization, but more studies are needed. Clear gaps in the literature include the lack of longitudinal studies, and studies examining bullying perpetration and cyber-bullying. This should be considered in future studies. Future research would benefit from designs or measures that establish the temporal precedence among bullying or teasing events and EDs. Furthermore, future studies should use more comprehensive measures that include definitions of bullying and/or teasing, to clarify

the events measured and ease comparisons between studies. Separating between specific ED diagnoses or subtypes would also be beneficial, as evidenced by our review. As many patients have been victims of bullying and teasing, addressing such experiences in treatment may be a valuable means to understand patients' body image concerns, and may open up avenues to discuss ED-related problems such as low self-esteem.

1 Table 1. Studies of bullying and teasing in eating disorders sorted by diagnostic comparisons

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
Anorexia nervosa comparisons					
†Fairburn et al. (1999), UK	Case-control	AN (67); 22 yrs HC (204); age-matched PC (102); age-matched Age-range: 16-35 yrs 100% female	ORFI Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related teasing victimization prior to ED onset.	EDE SCID Clinician-derived	A) Rates of generic bullying victimization did not differ significantly between AN and HC (OR = 2.4), or AN and PC (OR = 1.0). B) Rates of appearance-unrelated teasing victimization did not differ significantly between AN and HC (OR = 2.0), or AN and PC (OR = 2.2). C) Rates of appearance-related teasing victimization did not differ significantly between AN and HC (OR = 1.5), or AN and PC (OR = 0.7).
‡Hilbert et al. (2014), Germany	Case-control	AN (71); 26 yrs [BED (160); 31 yrs] [BN (66); 29 yrs] HC (323); 29 yrs All >= 18 yrs 100% female	ORFI Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related teasing victimization prior to ED onset.	EDE SCID	A) Rates of bullying and teasing victimization (combined) were not significantly different between AN and HC ($d = 0.15$).
‡Kaltiala-Heino et al. (2000), Finland	Cross-sectional	AN (35) [BN (93)] HC (8659) Mean age 15 yrs for whole sample Age-range: 14-16 yrs 51% female	Author-specific 2-item measure Self-report assessing generic bullying victimization and perpetration in the ongoing school-term.	Author-specific self-report based on DSM-III	A) Rates of AN were not significantly different between bullying victims and those not involved in bullying (OR = 0.004). B) Rates of AN were significantly higher for bullying perpetrators compared to those not involved in bullying (OR = 3.9*). C) Rates of AN were significantly higher for those who were both victims and perpetrators of bullying compared to those not involved in bullying (OR = 6.4*).
†Karwautz et al. (2011), UK	Case-control	AN (128); 25 yrs HC sisters (128); 26 yrs Age-range: 14-37 yrs	ORFI Interview assessing generic bullying, appearance-unrelated	EATATE	A) Rates of generic bullying victimization did not differ significantly between AN and HC sisters (OR = 2.75). B) Rates of appearance-unrelated teasing victimization did not differ significantly between

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
		100% female	teasing, and appearance-related teasing victimization prior to ED onset.		AN and HC sisters (OR = 1.0). C) Rates of appearance-related teasing victimization were significantly higher for AN compared to HC sisters (OR = 3.0**). D) Rates of teasing victimization about breasts did not differ significantly between AN and HC sisters (OR = 2.0).
†Kim et al. (2010), South-Korea	Case-control	AN Korean (52); 23 yrs HC Korean (108); 22 yrs Age-range: NA 100% female	CRQ Self-report assessing appearance-related teasing victimization prior to ED onset.	EDE-Q EATATE EDE	A) Frequency of being teased by mother about weight or shape was not significantly different between AN and HC (OR = 1.20). B) Frequency of being teased by father about weight or shape was not significantly different between AN and HC (OR = 1.27). C) Frequency of being teased by others about weight or shape was not significantly different between AN and HC (OR = 1.08).
†Machado et al. (2014), Portugal	Case-control	AN (86); 20 yrs HC (86); 20 yrs PC (68); 20 yrs Age-range: 13-33 yrs 100% female	ORFI Interview assessing appearance-unrelated teasing, appearance-related teasing, and threatening teasing victimization prior to ED onset.	SCID EDE	A) Rates of appearance-unrelated teasing victimization were significantly higher for AN compared to HC (OR = 3.30**) and PC (OR = 2.91*\$). B) Rates of appearance-related teasing victimization were significantly higher for AN compared to HC (OR = 4.31***) and PC (OR = 2.04*\$). C) Rates of threatening teasing victimization did not differ significantly between AN and HC (OR = 2.76); rates were not compared to PC.
†‡Troop & Bifulco (2002), UK	Case-control	AN (31); 28 yrs [BN (12); 26 yrs] HC (20); 29 yrs Age-range: NA 100% female	CECA Interview assessing generic bullying (verbal and physical) victimization prior to ED onset.	Clinician-derived based on ICD-10	A) Frequency of verbal and physical bullying victimization was not significantly different between AN and HC (<i>d</i> 's range from ±.26 to ±.59).
Bulimia nervosa comparisons					
†Fairburn et al. (1997),	Case-control	BN (102); 24 yrs	ORFI	EDE	A) Rates of generic bullying victimization were significantly higher for BN compared to HC

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
UK		HC (204); age-matched PC (102); age-matched Age-range: 16-35 yrs 100% female	Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related teasing victimization prior to ED onset.	SCID	(OR = 2.6*§), but not compared to PC (OR = 0.8). B) Rates of appearance-unrelated teasing victimization did not differ significantly between BN and HC (OR = 1.2), or BN and PC (OR = 1.3). C) Rates of appearance-related teasing victimization were significantly higher for BN compared to HC (OR = 2.5***), but not compared to PC (OR = 1.3).
Fosse & Holen (2006), Norway	Cross-sectional	BN (12) PC (95) Mean age 32 yrs for whole sample Age-range: 18-55 yrs 100% female	Author-specific 3-item measure Self-report assessing generic bullying victimization in childhood.	Author-specific self-report based on DSM-IV	A) Frequency of generic bullying victimization was significantly higher for BN compared to PC ($d = 1.14^{***}$).
†Gonçalves et al. (2016), Portugal	Case-control	BN (60); 22 yrs HC (60); 22 yrs PC (60); 21 yrs Age-range: 14-38 100% female	ORFI Interview assessing appearance-unrelated teasing, appearance-related teasing, threatening teasing, and teasing by friends victimization prior to ED onset.	EDE SCID	A) Rates of appearance-unrelated teasing victimization did not differ significantly between BN and PC (OR = 0.36), significance test between BN and HC (OR = 1.27) was not performed. B) Rates of appearance-related teasing victimization were significantly higher for BN compared to HC (OR = 7.43**§) and PC (OR = 2.89*§). C) Rates of threatening teasing victimization did not differ significantly between BN and HC (OR = 6.0), or BN and PC (OR = 1.91). D) Rates of teasing victimization by friends were significantly higher for BN compared to HC (OR = 5.4*§) and PC (OR = 2.1*§).
‡Hilbert et al. (2014), Germany	Case-control	[AN (71); 26 yrs] [BED (160); 31 yrs] BN (66); 29 yrs HC (323); 29 yrs	ORFI Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related	EDE SCID	A) Rates of bullying and teasing victimization (combined) were significantly higher for BN compared to HC ($d = 0.56^{**}$).

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
		All >= 18 yrs 100% female	teasing victimization prior to ED onset.		
Kaltiala-Heino et al. (1999), Finland	Cross-sectional	BN girls (78); 15 yrs BN boys (13); 15 yrs HC (8437); 15 yrs Age-range: 14-16 yrs 51% female	Author-specific 1-item measure Self-report assessing generic bullying victimization in the ongoing school-term.	Author-specific self-report based on DSM-III	A) Rates of BN were higher for girls who reported frequent bullying victimization compared to girls who did not report frequent victimization (OR = 3.3***). B) Rates of BN were higher for boys who reported frequent bullying victimization compared to boys who did not report frequent victimization (OR = 13.1***).
‡Kaltiala-Heino et al. (2000), Finland	Cross-sectional	[AN (35)] BN (93) HC (8659) Mean age 15 yrs for whole sample Age-range: 14-16 yrs 51% female	Author-specific 2-item measure Self-report assessing generic bullying victimization and perpetration in the ongoing school-term.	Author-specific self-report based on DSM-III	A) Rates of BN were significantly higher for bullying victims compared to those not involved in bullying (OR = 3.0*). B) Rates of BN were not significantly different between bullying perpetrators compared to those not involved in bullying (OR = 2.7). C) Rates of BN were significantly higher for those who were both victims and perpetrators of bullying compared to those not involved in bullying (OR = 9.5*).
Kaltiala-Heino et al. (2003), Finland	Cross-sectional	BN-type girls (810) BN-type boys (546) HC girls (3643) HC boys (3788) Mean age 15 yrs for whole sample Age-range: 14-16 yrs 51% female	Author-specific 1-item measure Self-report assessing generic bullying perpetration in the ongoing school-term.	Author-specific self-report based on DSM-III	A) Rates of BN-type pathology were significantly higher for girls who were frequent bullying perpetrators, compared to girls who were not (OR = 4.1***). B) Rates of BN-type pathology were significantly higher for boys who were frequent bullying perpetrators, compared to boys who were not (OR = 2.5***).
Lehoux & Howe (2007), Canada	Case-control	BN (39); 25 yrs HC sisters (39); 26 yrs	POTS weight-teasing subscale Self-report assessing lifetime	EDE	A) Frequency of appearance-related teasing victimization was significantly higher for BN compared to HC sisters ($d = 0.88^{***}$).

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
		Age-range: 16-40 yrs 100% female	appearance-related teasing victimization.		
†‡Troop & Bifulco (2002), UK	Case-control	[AN (31); 28 yrs] BN (12); 26 yrs HC (20); 29 yrs Age-range: NA 100% female	CECA Interview assessing generic bullying (verbal and physical) victimization prior to ED onset.	Clinician-derived based on ICD-10	A) Frequency of verbal and physical bullying victimization was not significantly different between BN and HC (<i>d</i> s range from -.08 to -.51).
Binge-eating disorder comparisons					
†Duarte & Pinto- Gouveia (2017), Portugal	Case-control	BED (73); 38 yrs HC (75); 28 yrs Age-range: 18-60 yrs 100% female	BIVES Self-report assessing appearance-related bullying and teasing victimization in childhood or adolescence.	EDE	A) Frequency of being bullied or teased by peers about appearance was significantly higher for BED compared to HC (<i>d</i> = 1.25***). B) Frequency of being bullied or teased by parents about appearance was significantly higher for BED compared to HC (<i>d</i> = 0.60***).
†Fairburn et al. (1998), UK	Case-control	BED (52); 25 yrs HC (104); age-matched PC (102); age-matched Age-range: 16-35 yrs 100% female	ORFI Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related teasing victimization prior to ED onset.	EDE SCID	A) Rates of generic bullying victimization were significantly higher for BED compared to HC (OR = 5.5**), but not compared to PC (OR = 1.5). B) Rates of appearance-unrelated teasing victimization did not differ significantly between BED and HC (OR = 0.5), or BED and PC (OR = 1.0). C) Rates of appearance-related teasing victimization were significantly higher for BED compared to HC (OR = 2.4**), but not compared to PC (OR = 1.2).
Hilbert et al. (2013), Germany	Prospective longitudinal	Baseline LOC (55) BED at follow-ups (14) Mean age 11 yrs for whole sample Age-range: 8-13 yrs	POTS weight-teasing subscale Self-report assessing lifetime appearance-related teasing victimization.	ChEDE	A) Frequency of appearance-related teasing victimization did not significantly predict subsequent development of BED over a two-year period (OR = 0.94).

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
		60% female			
‡Hilbert et al. (2014), Germany	Case-control	[AN (71); 26 yrs] BED (160); 31 yrs [BN (66); 29 yrs] HC (323); 29 yrs All >= 18 yrs 100% female	ORFI Interview assessing generic bullying, appearance-unrelated teasing, and appearance-related teasing victimization prior to ED onset.	EDE SCID	A) Rates of bullying and teasing victimization (combined) were significantly higher for BED compared to HC ($d = 0.39^{**}$).
†Striegel-Moore et al. (2002), USA	Cross- sectional	BED (162); 30 yrs HC (251); age-matched PC (107); age-matched Age-range: 18-40 yrs 100% female	Oxford assessment Interview assessing generic bullying victimization prior to ED onset.	SCID EDE	A) Rates of generic bullying victimization were significantly higher for white BED women compared to white HC women (OR = 2.3**), but not compared to white PC women (OR = 1.38). B) Rates of generic bullying victimization were significantly higher for black BED women compared to black HC women (OR = 3.3***), but not compared to black PC women (OR = 1.88).
Mixed EDs comparisons					
Elizathe et al. (2016), Argentina	Cross- sectional	Mixed ED (17); 11 yrs HC (83); 11 yrs Age-range: 9-13 yrs 37% female	Author-specific 2-item measure Self-report assessing lifetime teasing victimization due to being overweight.	EDE	A) Rates of being teased due to being overweight were not significantly different between ED and HC (OR = 2.40).
Jackson & Chen (2007), China	Cross- sectional	Mixed ED (42); 16 yrs HC (42); 16 yrs Age-range: 12-21 yrs 86% female	POTS weight-teasing subscale Self-report assessing lifetime appearance-related teasing victimization.	EDDS	A) Frequency of appearance-related teasing victimization was significantly higher for ED compared to HC ($d = 0.65^{**}$).
†Krug et al. (2015), Spain / UK / Slovenia /	Case-control	Mixed ED (653); 27 yrs HC (611); 24 yrs	CCQ Self-report assessing	SCID EATATE	A) Frequency of being teased about appearance by family during childhood/adolescence was significantly higher for ED compared to HC ($d = 0.64^{***}$).

Study, country	Design	Sample (n); mean age Age-range, % female	Bullying/teasing measure	ED measure	Main findings (effect size)
Italy		Age-range: NA 100% female	appearance-related teasing victimization before the age of 12.		B) Frequency of being teased about appearance by peers during childhood/adolescence was significantly higher for ED compared to HC ($d = 0.66^{***}$).
†Liu et al. (2016), Taiwan	Cross-sectional	Mixed ED (68) HC (374) Mean age 16 yrs for whole sample Age-range: 15-18 yrs 100% female	Author-specific 2-item measure Self-report assessing appearance-related teasing victimization for being overweight or underweight during the developmental stage.	SCID	A) Rates of teasing victimization due to overweight were significantly higher for ED compared to HC (OR = 2.99 ^{***}). B) Rates of teasing victimization due to underweight were not significantly different between ED and HC (OR = 0.16).
Mayes et al. (2015), USA	Case-control	Mixed ED (90); 14 yrs HC (186); 9 yrs PC (1431); 9 yrs Age-range: 6-18 yrs 47% female	PBS Self-report assessing generic bullying victimization and perpetration during the past two months, rated by mothers.	Clinical interview	A) Maternal ratings of generic bullying victimization did not differ significantly between ED (30% were victims) and HC (17% were victims, effect size not reported). B) Maternal ratings of generic bullying perpetration did not differ significantly between ED (7% were perpetrators) and HC (9% were perpetrators, effect size not reported).

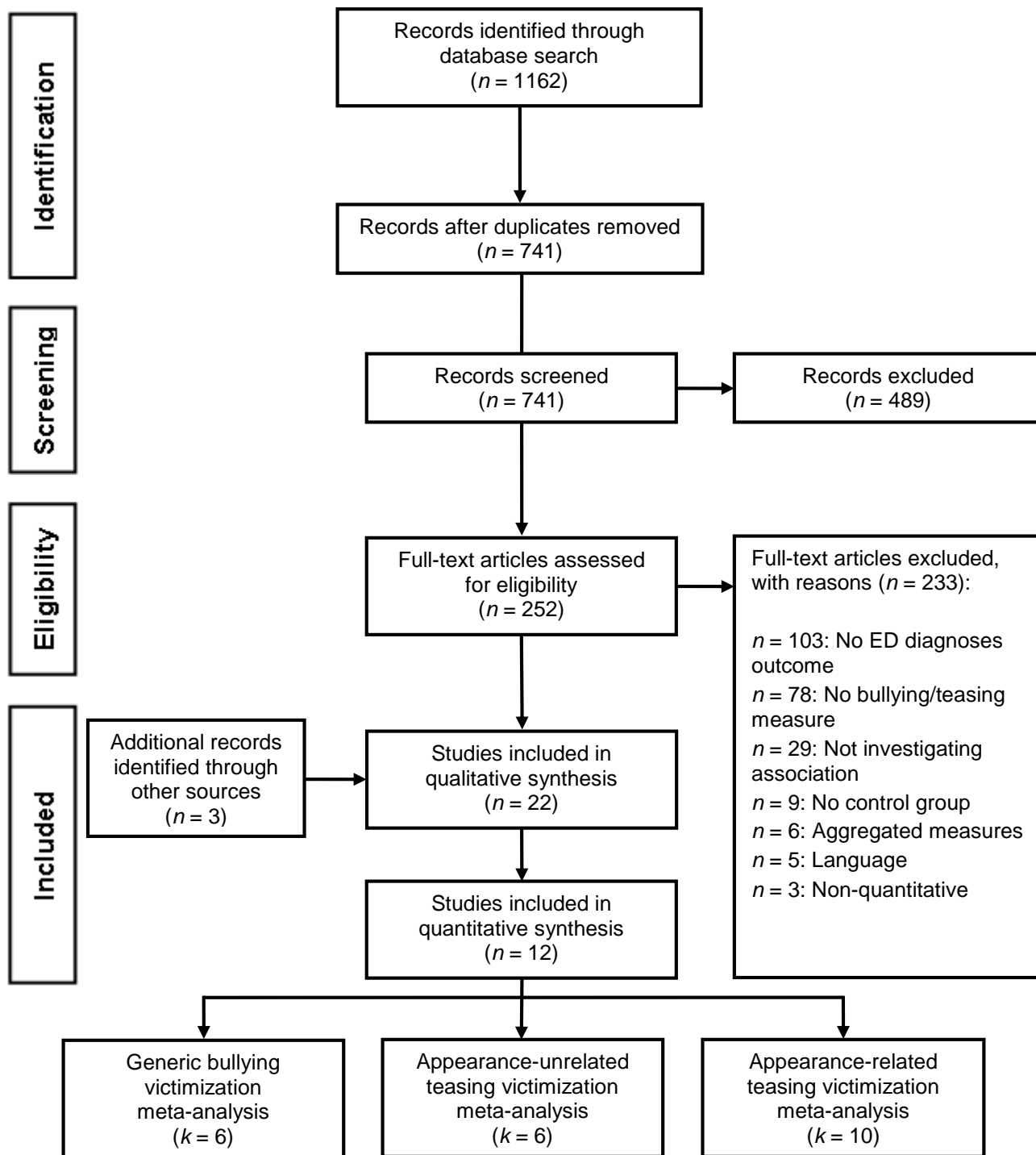
1 Note: AN = Anorexia nervosa; BED = Binge-eating disorder; BIVES = Body Image Victimization Experiences Scale; BN = Bulimia nervosa; CCQ = Cross-Cultural Risk Factor Questionnaire; CECA = Childhood Experiences of
2 Care and Abuse interview; ChEDE = Children's Eating Disorder Examination; CRQ = Childhood Risk Factors Questionnaire; d = Cohen's d (0.20 = small, 0.50 = medium, 0.80 = large); DSM = Diagnostic and Statistical Manual
3 of Mental Disorders; EATATE = EATATE Lifetime Diagnostic Interview; ED = Eating disorders; EDDS = Eating Disorder Diagnostic Scale; EDE = Eating Disorder Examination; EDE-Q = Eating Disorder Examination-
4 Questionnaire; EDI = Eating Disorder Inventory; HC = Healthy controls; ICD = International Classification of Diseases; LOC = Loss of control eaters; NA = Not available; OR = Odds ratio (positive OR signify higher rates in
5 cases versus controls); ORFI = Oxford Risk Factor Interview; PBS = Pediatric Behavior Scale; PC = Psychiatric controls; POTS = Perception of Teasing Scale; SCID = Structured Clinical Interview for Diagnostic and Statistical
6 Manual for Mental Disorders; * = $p < .05$; ** = $p < .01$; *** = $p < .001$.

7 †Study was included in meta-analyses.

8 ‡Study included separate comparisons for multiple ED diagnoses, and so is repeated multiple times throughout the table.

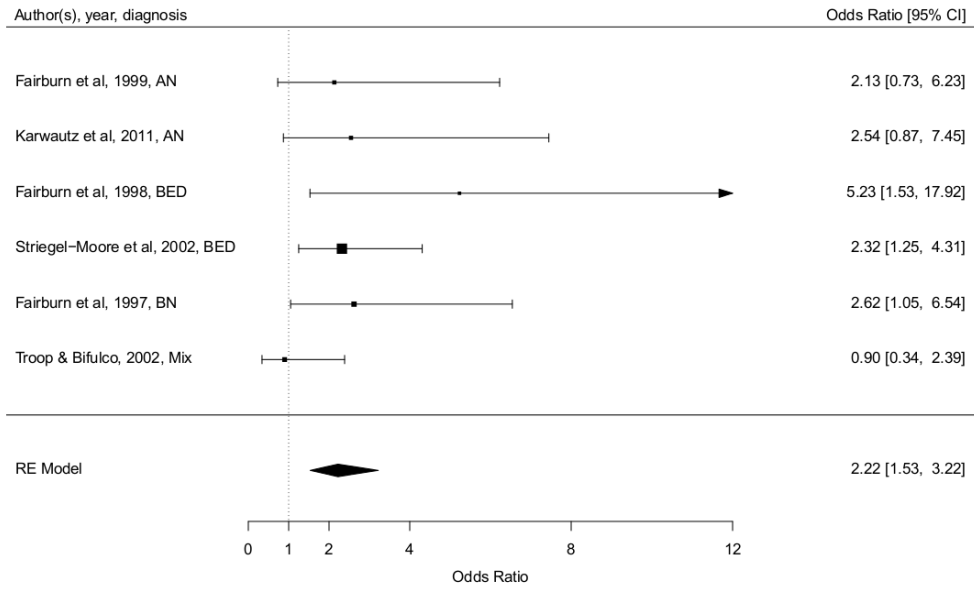
9 §This comparison was statistically significant at the specified alpha-level, but was not considered significant in the original study as authors lowered (i.e. more stringent) their alpha-level to correct for multiple comparisons.

- 1 Figure 1. PRISMA flow diagram of included and excluded studies. ED = Eating
2 disorders.
- 3 Figure 2. Summary effects of association between generic bullying victimization and
4 eating disorders. AN = Anorexia nervosa; BED = Binge-eating disorder; BN = Bulimia
5 nervosa; CI = Confidence interval; RE = Random effects.
- 6 Figure 3. Summary effects of association between appearance-related teasing
7 victimization and eating disorders. AN = Anorexia nervosa; BED = Binge-eating
8 disorder; BN = Bulimia nervosa; CI = Confidence interval; RE = Random effects.
- 9 Figure 4. Summary effects of association between appearance-unrelated teasing
10 victimization and eating disorders. AN = Anorexia nervosa; BED = Binge-eating
11 disorder; BN = Bulimia nervosa; CI = Confidence interval; RE = Random effects.



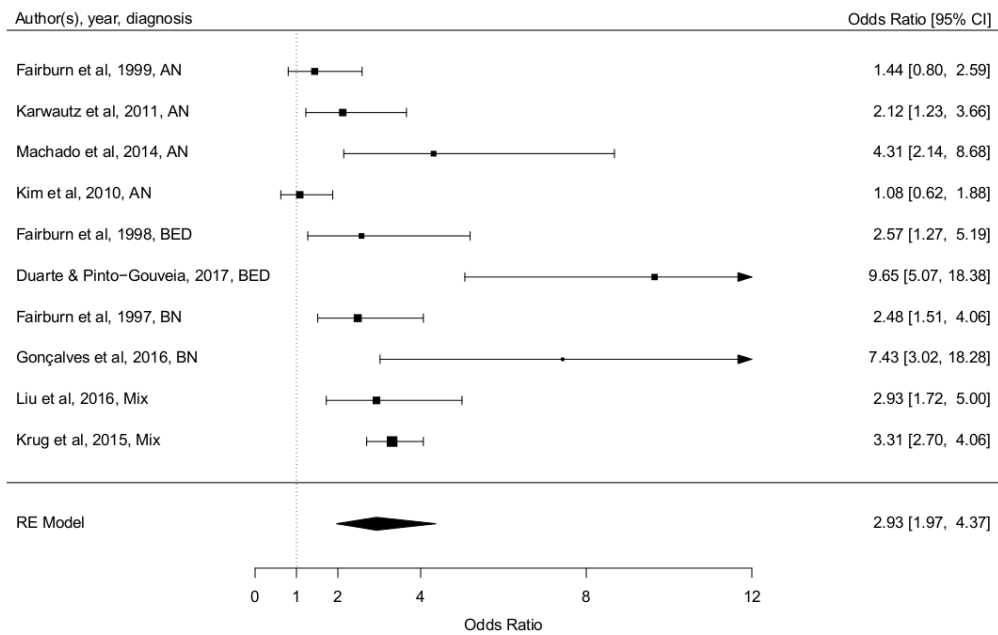
1
2 Figure 1.
3

1 Figure 2.



2

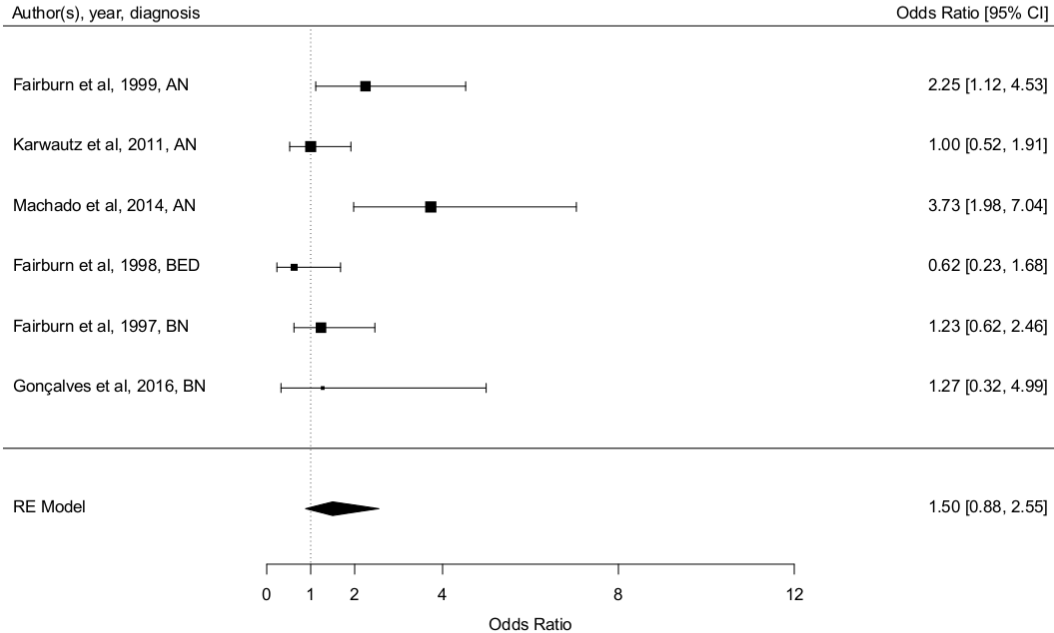
3 Figure 3.



4

5

1 Figure 4.



2

SUPPLEMENTARY MATERIALS 1

1. Ovid Medline search

Database: Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

1 harassment, non-sexual/ or bullying/ (2719)

2 (Bullying or bully or bullied or cyberbull* or mobbing or victimization or teasing or
3 teased or ridicul* or harass* or intimidat* or name-call* or (social* adj exclu*) or
4 (verbal* adj taunt*) or (rumor adj spread*) or (rumour adj spread*)).ti,ab. (17702)

5 1 or 2 (18175)

6 "feeding and eating disorders"/ or anorexia nervosa/ or binge-eating disorder/ or
7 bulimia nervosa/ or "feeding and eating disorders of childhood"/ or female athlete
8 triad syndrome/ or pica/ (28533)

9 ((eating adj1 disorder*) or anorexia or anorectic or bulimia or bulimic or (binge
10 adj eating) or arfid or ((Avoidant* and Food) adj Intake adj Disorder*)).ti,ab. (46810)

11 4 or 5 (54690)

12 3 and 6 (257)

13 limit 7 to (danish or english or norwegian or swedish) (243)

14 9 remove duplicates from 8 (231)

2. PsychINFO search

Database: PsycINFO <1806 to October Week 4 2017>

Search Strategy:

1 1 bullying.mp. [mp=title, abstract, heading word, table of contents, key concepts,
2 original title, tests & measures] (9488)
3 2 bullying/ or relational aggression/ or cyberbullying/ (8009)
4 3 harassment/ (826)
5 4 teasing/ or victimization/ (19168)
6 5 (bullying or bully or bullied or cyberbull* or mobbing or victimization or teasing or
7 teased or ridicul* or harass* or intimidat* or name-call* or (social* adj exclu*) or
8 (verbal* adj taunt*) or (rumor adj spread*) or (rumour adj spread*)).ti,ab. (32244)
9 6 2 or 3 or 4 or 5 (42196)
10 7 Eating disorders/ (14184)
11 8 anorexia nervosa/ or binge eating disorder/ or bulimia/ or hyperphagia/ or pica/ or
12 "purging (eating disorders)"/ (16232)
13 9 binge eating/ (2554)
14 10 ((eating adj1 disorder*) or anorexia or anorectic or bulimia or bulimic or (binge
15 adj eating) or arfid or ((Avoidant* and Food) adj Intake adj Disorder*)).ti,ab. (34581)
16 11 7 or 8 or 9 or 10 (36815)
17 12 6 and 11 (493)
18 13 limit 12 to (danish or english or norwegian or swedish) (468)
19 14 limit 13 to "0100 journal" (307)
20 15 remove duplicates from 14 (306)

21

22 **3. Scopus search**

23 (*TITLE-ABS*

24 *KEY* (bullying OR bully OR bullied OR cyberbull* OR mobbing OR victimization
25 OR teasing OR teased OR ridicul* OR harass* OR intimidat* OR name-

1 call* OR "social exclusion" OR "verbal taunting" OR "rumor
 2 spreading" OR "rumour spreading") AND TITLE-ABS-KEY ("eating
 3 disorder" OR "eating disorders" OR "disordered
 4 eating" OR anorexia OR anorectic OR bulimia OR bulimic OR "binge
 5 eating" OR arfid OR (avoidant* AND "Food Intake disorder")) AND (LIMIT-
 6 TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-
 7 TO (LANGUAGE , "Swedish"))

8

9 **4. PubMed search**

10 1 "Feeding and Eating Disorders"[Majr] AND "Risk Factors"[Mesh] AND ((risk[Title]
 11 AND factor*[Title]) OR predictor*[Title])

12 2 eating[title] AND disorder*[ti] AND ((risk[Title] AND factor*[Title]) OR
 13 predictor*[Title]) NOT medline[sb]

14

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