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Author/s:

Doley, JR;Hart, LM;Stukas, AA;Petrovic, K;Bouguettaya, A;Paxton, SJ

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Interventions to reduce the stigma of eating disorders: A systematic review and meta-analysis

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Accepted Article

Joanna R. Doley, La Trobe University.

Laura M. Hart, La Trobe University, The University of Melbourne.

Arthur A. Stukas, La Trobe University.

Katja Petrovic, La Trobe University.

Ayoub Bouguettaya, Deakin University.

Susan J. Paxton, La Trobe University.

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Abstract

Objective: Stigma is a problem for individuals with eating disorders (EDs), forming a barrier to disclosure and help-seeking. Interventions to reduce ED stigma may help remove these barriers; however, it is not known which strategies (e.g., explaining etiology to reduce blame, contact with a person with an ED, or educating about ED) are effective in reducing stigma and related outcomes. This review described effectiveness of intervention strategies, and identified gaps in the literature. Method: A search of four databases was performed using the terms (eating disorder* OR bulimi* OR anorexi* OR binge-eating disorder) AND (stigma* OR stereotyp* OR beliefs OR negative attitudes) AND (program OR experiment OR intervention OR education), with additional texts sought through LISTSERVs. Two raters screened papers, extracted data, and assessed quality. Stigma reduction strategies and study characteristics were examined in critical narrative synthesis. Exploratory meta-analysis compared the effects of biological and sociocultural explanations of EDs on attitudinal stigma. Results: Eighteen papers were eligible for narrative synthesis, with four also eligible for inclusion in a meta-analysis. Biological explanations reduced stigma relative to other explanations, including sociocultural explanations in meta-analysis ($g=.47, p<.001$). Combined education and contact interventions improved stigma relative to control groups or over time. Most studies examined Anorexia Nervosa (AN) stigma and had mostly female, undergraduate participants. Discussion: Despite apparent effectiveness, research should verify that biological explanations do not cause unintentional harm. Future research should evaluate in vivo contact, directly compare education and contact strategies, and aim to generalize findings across community populations.

Interventions to reduce the stigma of eating disorders: A systematic review and meta-analysis.

Stigma has been described as a discredited identity that is associated with harmful cognitions (attitudes or stereotypes) and affective responses which result in negative behavior (e.g., social distance) towards stigmatized persons (1). Stigma in relation to people with eating disorders (EDs) is **very** common among community members. Unlike people with other serious mental illnesses, individuals with EDs are not seen as dangerous, but they are frequently regarded as personally responsible and blameworthy for their condition (2). In addition, desire for social distance (3-5) has been consistently observed in relation to all types of eating disorder (6), and is apparent in both community and undergraduate samples.

For a person with an **ED**, fear of stigmatization forms a barrier to treatment-seeking (7-9), and experiences of stigmatization are associated with greater symptomatology and longer duration of an ED (10). Stigma may also prevent individuals with an ED from disclosing their disorder or symptoms to family and friends, and may instead lead them to seek support from pro-ED groups online (11). Stigmatizing attitudes are present among health professionals (12) who can be reluctant to treat EDs and may perceive the problem as one of a weak personality (13). As a result of these wide-ranging problems, a number of studies have explored strategies to reduce ED stigma among community members. However, to date, no research has systematically reviewed existing studies to identify the most successful strategies for reducing ED stigma. This is essential to identify gaps in knowledge and provide direction for future research in this field. Consequently, we conducted a systematic review and exploratory meta-analysis to examine the efficacy of different intervention approaches which aimed to reduce aspects of ED stigma in non-clinical samples, and in which changes in ED stigma were measured.

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A number of different approaches have been employed to try to reduce ED stigma.

In our review, we focus on three techniques that form the major groupings for our review and are described below.

The first technique that has been employed to reduce both ED stigma and mental illness stigma in general is changing the public's perceptions of the causes of mental disorders (e.g. 14, 19), also referred to as etiological explanations. This technique is informed by the application of attribution theory (16) to stigma (17). Weiner, Perry, and Magnusson (17) found that explanations for a disorder which attributed less blame to the stigmatized person (for instance, explaining that a person's obesity was due to a glandular problem rather than poor diet and exercise), resulted in more positive judgments about the person and less perceived personal responsibility for their disorder.

Within the etiological explanations technique, in relation to EDs, there are two common explanations used. The first is explaining that EDs are primarily caused by biological factors (14, 15, 18-21). This is because illnesses perceived as being biological in origin are associated with less personal responsibility for illness (14, 22). Furthermore, discrimination against people with mental illness is associated with beliefs that mental illness is controllable (23). By explaining that an ED is caused by factors beyond the individual's control, beliefs about personal responsibility may be reduced. The second common approach within the etiological explanations technique is to explain that EDs are the result of socio-cultural and environmental factors such as trauma, pressure from media, and thin-ideal internalization (14, 15, 18-21). However, there may be the belief in the community that individuals ought to be able to manage these pressures, and therefore these explanations may be associated with study participants attributing more personal responsibility for EDs (14). Consequently, approaches that emphasize socio-cultural and environmental causes may not reduce stigmatizing attitudes about EDs to the same extent as biological explanations.

Although biological and sociocultural/environmental explanations may be proposed to change attitudes, etiological research supports the biopsychosocial model for explaining the development of EDs (24). Thus, it is likely to be misleading to suggest that EDs are solely the product of one particular influence and doing so may have negative, unintended consequences (25). A small amount of research has examined another approach under the etiological explanations technique, multifactorial explanations (which resemble the biopsychosocial model of EDs). To change beliefs about personal responsibility, however, it may be advantageous to emphasize the biological factors contributing to EDs. Thus, it was important to compare these approaches in our review.

The second technique examined in this review is a stigma reduction strategy identified by Corrigan and Penn (26) – education. Education involves teaching people factually correct information about the stigmatized condition or group, and often involves replacing commonly held but untrue stereotypes with correct information, to produce attitude and behavior change (26). Education based interventions for EDs aim to improve mental health literacy (MHL), by teaching the audience about aspects of EDs such as causes, symptoms, treatments, and help-seeking strategies (27-29). In addition to reducing stigma, the information provided to the audience can be valuable in improving the support they offer to an individual with an ED (27-29). However, its usefulness as a specific ED stigma reduction strategy, and whether it produces stigma reductions equal to contact-based interventions, is not known.

The third technique examined in this review is interventions including contact – another major stigma reduction strategy identified by Corrigan and Penn (26). Contact involves meeting, listening to, or interacting with an individual from the stigmatized group. Contact initiatives can encourage empathy and perspective-taking (30), can disconfirm stereotypes (31), and results in the most notable reductions in stigmatizing attitudes towards

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mental illness (32). Contact interventions in ED stigma reduction often focus on personal narratives of people with an ED, which may be written (33), filmed (21), or *in vivo* (presented by a live speaker). Existing studies incorporating contact in ED stigma interventions often include an educational element and thus may be described as education and contact interventions (21, 29). It should be noted that Corrigan and Penn identified an additional stigma reduction strategy in their work, protest, which involves publicly opposing discrimination against the stigmatized group, however this has not been examined in the context of EDs.

In this study, we aimed to systematically review the literature on interventions to reduce ED stigma so as to describe and evaluate the effects of interventions (i.e. etiological explanations, education, and those including contact) in reducing attitudinal (the type of beliefs and opinions held about people with EDs), affective (emotional reactions to people with EDs), and behavioral (actual or intended behavior towards people with EDs) stigma in non-ED populations. Further, we aimed to identify other characteristics of stigma reduction studies that appear to affect the success of an intervention, such as changes in knowledge, type of ED targeted, and the demographic characteristics of the sample. Finally, we aimed to identify gaps in the literature on stigma reduction in EDs to provide directions for future interventions and research. Although the primary goal of this study was to create a systematic review of the literature on interventions to reduce ED stigma, there was a small number of studies that compared effects on stigma of biological or sociocultural explanations (k=4) with similar designs and measures. Therefore, an exploratory meta-analysis was conducted to quantify differences in outcomes of these two intervention strategies.

Method

This review follows the PRISMA (34) and PRISMA-P (35) guidelines for developing and reporting systematic reviews and meta-analyses. The review protocol was registered at PROSPERO (42016038744;36).

Search Strategy

Four databases (Google Scholar, MedLine, PsycINFO, and Scopus) and LISTSERVs (AED, ANZAED, SASP, SPSSI) were searched to obtain papers for inclusion in this review. Unpublished (searched through LISTSERVs, Google Scholar, and Proquest Dissertations and Theses which is automatically searched through PsycINFO) and published studies in English from January 1990 onwards were eligible. Search terms were constructed from those used by studies known to the authors and by searching relevant Medical Subject Headings (MeSH) terms.

Title, abstract, and keyword searches were performed simultaneously using the terms (eating disorder* OR bulimi* OR anorexi* OR binge-eating disorder) AND (stigma* OR stereotyp* OR beliefs OR negative attitudes) AND (program OR experiment OR intervention OR education). The search was completed on 4th April, 2016. Search strategies for each database can be obtained from the authors upon request.

Study Screening and Selection

Once duplicates were removed from search results, two authors (JD and KP) screened all studies for inclusion in the review to ensure accuracy. Studies were screened for inclusion at three stages based on title, abstract, and full text, and raters used yes/no (include, exclude) criteria. A third author (LH) resolved any discrepancies. Studies meeting the following criteria were eligible for inclusion in the final analyses:

- i) Included an intervention with either a primary or secondary aim of reducing or observing changes in ED stigma;
- and,

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- ii) Must include an ED stigma outcome measure (e.g., social distance scale adapted for eating disorders) or one that was related to ED stigma (e.g., attitudes);
and,
- iii) Must include a target population without an ED (i.e., recruitment did not target individuals with EDs or mental illnesses more generally);
and,
- iv) Must not be a review;
and
- v) Must not focus on treatment for EDs.

A flow diagram of the study selection process is presented in Fig. 1.

Data Extraction

Three authors independently extracted data using a spreadsheet template and structured, written protocol designed by JD. One completed a full set of data extraction (JD), two each contributed to the other set of data (AB and KP). Author LH resolved any discrepancies between raters in data extraction. Inter-rater agreement was $\kappa = .69$ for title screening, $\kappa = .53$ for abstract screening, $\kappa = .70$ for full text screening, and $\kappa = .68$ for Critical Appraisal Skills Programme (CASP – to assess study quality, adapted from [37](#), [38](#), [39](#)). Inter-rater agreement for data extraction was 80%.

In addition to descriptive statistics, the following data were extracted (where available) from each paper: description of participants (N, gender, SES, occupation/field of study, country, age, ethnicity), description of intervention (setting, type, ED diagnosis targeted, intervention length), description of outcomes and their general pattern of results (stigma and knowledge), and all items corresponding to CASP questions. Where any data were unavailable, author JD made two attempts to contact the corresponding author or the

author's supervisor to obtain data. From the 18 studies included in this review, we requested extra information for 17. Of these 17, 11 (64%) provided data, 5 did not respond (29%), and one responded initially but did not respond to a follow-up email (5.8%). These data were provided to KP and AB for their extraction. Results of the data extraction are presented in Table 1; Studies that have data unavailable for inclusion in the narrative synthesis are noted.

Critical Narrative Review

Using the data extracted in the template, author JD examined the outcomes and variables of interest, constructed the synthesis and established gaps in current evidence.

Stigma outcomes were grouped into attitudinal, affective, and behavioral domains for each intervention type (i.e., etiological explanations, education, and contact), as these outcomes are conceptually distinct (40). In addition to these intervention characteristics, secondary outcomes that may affect the effectiveness of an intervention were examined, such as degree of knowledge gained (41), the type of ED examined (6, 42), and participant demographics (4, 43, 44).

Meta-analysis

The exploratory meta-analysis comparing biological explanations with sociocultural explanations was completed using Comprehensive Meta-Analysis software (45). A random effects model was used, which provides more precise results for studies with varying populations (46). As the outcome measures used continuous data, Hedge's g was used as a summary measure, as this corrects for positive bias among smaller sample sizes relative to Cohen's d (47). Hedge's g was calculated using Comprehensive Meta-Analysis (45) software, using the formula $g = \frac{M_1 - M_2}{\sqrt{MSE}}$ where M_1 and M_2 were the means of biological and sociocultural groups at post-test, and \sqrt{MSE} is the square root of the mean square error of biological and sociocultural groups at post-test.

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To ensure that studies with more outcome measures of attitudinal stigma were not given greater weight than those with fewer, the first author (JD) decided which measure to include based on both a) available psychometric data (e.g., Cronbach's α), and b) the inclusion of the measure in previous literature on ED stigma/mental illness stigma. This decision was based on data extracted by both independent raters (JD and AB, with discrepancies resolved by LH). Analyses were repeated with less widely used and validated measures and these revealed little difference in results – see Fig. 2 for details. As the results were fairly consistent across measures, we report the analysis using the best validated instruments.

Publication bias. We examined the potential for publication bias using both a funnel plot and Egger's regression test in Comprehensive Meta-Analysis software.

Risk of Bias. Table 2 includes the results of the CASP to examine quality of interventions. This CASP was developed based on Hart et al. (37, 38), and the final items were agreed upon by a group of the authors (JD, LH, SP, AS). We did not adjust study weights based on risk of bias for the meta-analysis; however, the results and conclusions of both the meta-analyses and narrative synthesis were constructed with the CASP results in mind. Each item was rated as either 'Yes' (i.e., criterion met or exceeded), 'Somewhat' (i.e., criterion met somewhat, with some issues), or 'No' (i.e., criterion not met). The full protocol for rating CASP items can be found at PROSPERO (42016038744; [36](#)).

Results

Results of the systematic literature search are presented in Table 1. Eighteen studies were eligible for inclusion in the narrative synthesis, with four also eligible for inclusion in the exploratory meta-analysis. Across all studies, there was a total of N= 5,916 participants, with N=542 participants included in the meta-analysis.

Different Etiological Explanations for EDs

Below we have examined stigma outcomes for studies using etiological explanations.

Findings are grouped by type of stigma outcome (attitudinal, affective and behavioral

outcomes). [Two studies - Wingfield et al. \(15\) and Bannatyne and Stapleton \(18\) compared different etiological explanations with a control \(no explanation or no intervention\). Four - Bannatyne and Abel \(19\), Borenstein \(20\), and Crisafulli et al. \(14, 21\) compared etiological explanations with each other.](#)

Attitudinal measures of stigma. Six studies examining etiological explanations of ED included attitudinal outcomes of stigma (14, 15, 18-21) e.g., attitudes towards people with ED such as personal responsibility and blame. All but one (21) included more than one attitudinal measure of stigma. All studies included biological explanations (14, 15, 18-21), four included sociocultural explanations (14, 15, 19, 21), three included multifactorial explanations (18, 19, 21), and two included environmental explanations (19, 20). All but one study, [by Wingfield et al. \(15\)](#) specifically examined AN as the target diagnosis (i.e., the person in the vignette was identified as someone with AN). Only two studies included a control group; one with no intervention [by Bannatyne and Stapleton \(18\)](#), and the other [by Wingfield et al. \(15\)](#) with an ambiguous explanation of etiology (i.e., no explanation). As such, a limitation of the other studies is that they do not offer [an](#) understanding of how etiological explanations compare with no explanation of etiology.

There was a distinct pattern favoring biological explanations of EDs over other explanations, particularly when using measures specifically designed to measure ED stigma [such as the EDSS which was used by Bannatyne and Abel \(19\), Bannatyne and Stapleton \(18\) and Crisafulli et al. \(21\)](#), or constructs observed more in ED stigma than other mental illness stigma [such as personal responsibility for one's illness, used by Wingfield et al. \(15\), and Bannatyne and Stapleton \(19\)](#). Sociocultural explanations tended to result in higher stigma than other explanations on attitudinal measures (19, 21), although one study found

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sociocultural explanations were preferable to ambiguous etiology (i.e., no explanation, 15).

Multifactorial explanations proved more effective than a control group in one study (18), but were not as effective as biological explanations (18, 19, 21), and were approximately equal to sociocultural explanations in their effect on attitudinal stigma (19). Environmental explanations were only featured in two studies; they appeared mostly equal to biological explanations in both (19, 20) and slightly better than multifactorial and sociocultural explanations in the one study comparing them (19). Where less frequently used measures were employed (particularly those used more commonly in other mental illness stigma as opposed to ED stigma), fewer differences were observed. There were no differences found in characteristics (bipolar adjectives, e.g., boring/interesting, emotional/rational) assigned to people with AN across any etiological explanations (14, 19). There were no differences in opinions (common opinions reflecting mental illness stigma, e.g., they are hard to talk to) about people with AN between biological and sociocultural explanations (14).

Only biological, multifactorial, and sociocultural explanations were compared with an inactive control group (15, 18). Any explanation appeared preferable to *no* explanation of ED etiology, and effect sizes were generally moderate favoring explanations (15, 18). However, in Bannatyne and Stapleton (18), both etiological explanation groups received detailed educational information about EDs (e.g. symptoms, management, treatment within the medical context) in addition to etiological information, which the control group did not receive.

Interestingly, several studies observed some moderate to large improvements in attitudes through using biological explanations either relative to a control (15), or relative to other etiological explanations (19, 21), through minimal intervention such as reading a vignette, information sheet, or watching a video. Moderate to large sustained changes were

also observed (relative to control) in the one study in which the intervention was more involved (18) and included a training program about EDs.

Affective measures of stigma. Four studies examining etiological explanations of ED included measures of affective stigma, such as likeability ([in Wingfield et al., 15](#)), and the Affective Reaction Scale ([in Bannatyne and Abel, 19](#)) asking participants how they would feel interacting with someone with [an](#) ED (14, 20). All studies included biological explanations, three included sociocultural explanations (14, 15, 19), two included environmental explanations (19, 20), and one included a multifactorial explanation (19). One study included an ambiguous explanation as a control group (15). All studies had targets with AN, with [Wingfield et al. \(15\)](#) [including](#) a target with BN, although specific data for the effect of explanations on BN were unavailable. All studies found no statistically significant difference between etiological explanations on affective measures, with two finding no differences in Affective Reactions (14, 19), one finding no difference in anger or pity towards the target (20), and one finding no difference in likeability (15). Effect sizes also showed there was either virtually no difference depending on explanation, or the difference was small. Small differences favored multifactorial explanations in Bannatyne and Abel (19), [and biological explanations in Wingfield et al. \(15\)](#).

Behavioral measures of stigma. Four studies included behavioral measures of stigma, with three using a measure of willingness to sign a petition for better insurance for people with AN (14, 19, 21), and one using the Social Distance Scale (20). All had a target with AN, and none compared etiological explanations with an inactive or ambiguous control condition. All studies included a biological explanation; three included a sociocultural explanation (14, 19, 21), two included an environmental explanation (19, 20), and two included a multifactorial explanation (19, 21). Two studies - Bannatyne and Abel (19), [and Crisafulli et al. \(14\)](#) found no difference in willingness to sign a petition between etiological

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explanations; however, it should be noted that although these differences were not statistically significant, there was a small effect size favoring biological explanations in Crisafulli *et al.* (14), and larger differences (favoring mostly biological explanations) in Bannatyne and Abel, 2015 (19). Both of these studies included only research evidence rather than a vignette featuring a person with AN, in their intervention content. In the remaining two studies, biological explanations resulted in the lowest behavioral stigma; in Borenstein (20) on the Social Distance Scale compared with environmental explanations, and in Crisafulli *et al.* (21) on willingness to sign a petition (in which it was not significantly different from multifactorial explanations but significantly better than sociocultural explanations). Both of the interventions that found statistically significant differences between etiological explanations on behavioral measures featured either a named character or a video of a person with a history of ED, which may have made filling out the measures more meaningful. However, interventions that included research evidence still found non-significant differences.

It is important to note that only one of the behavioral outcomes for etiological explanations measured actual intentions to *interact* with someone with an ED. Although signing a petition is behavioral and would be helpful for people with EDs, it does not demonstrate an improvement on how people interact with people with EDs.

Exploratory meta-analysis. The results of the exploratory analysis comparing biological with sociocultural explanations are presented in Fig. 2. All studies comparing biological with sociocultural explanations had sufficient data for meta-analysis, but only for attitudinal outcomes. Biological interventions were associated with statistically significantly better outcomes than sociocultural interventions on attitudinal ($k=4$, $N= 542$, $g =.47$, $SE=.102$; CI 95% [.275, .674], $p <.001$) measures of ED stigma, which is a small to moderate effect. These differences are unlikely to be due to study heterogeneity ($Q(3)=4.60$, $p=.20$,

$I^2=34.84$) (48). Combined with the results of the narrative synthesis, it appears biological explanations result in lower attitudinal stigma than sociocultural explanations.

Using Comprehensive Meta-Analysis software, we examined the exploratory meta-analysis for publication bias using a funnel plot and Egger's regression test (see Figure 3). As the funnel plot is relatively symmetrical, this suggests publication bias is not present. However, the interpretation of this plot is somewhat subjective, so we sought to verify the result with additional testing. Egger's two-tailed regression test (49) was used to further examine whether results were due to publication bias, which did not appear to be the case ($p = .98$). The issue of publication bias cannot be ruled out completely, however, as our sample size is very small.

Stigma Reduction Strategy

Studies examining stigma reduction strategies included education-only, and interventions including contact (both education and contact, and contact-only). Some studies comparing etiological explanations with each other (e.g. comparing biological with sociocultural) are classified under these strategies. However, as this section is focused on the broader strategy, only papers that compared education/contact strategies over time or with a control group are discussed. For instance, a study that compares biological and sociocultural explanations is not examining education over time or compared with a control group, so we cannot separate the effects of education itself. Thus, studies of this kind were not included.

Attitudinal measures of stigma. Five studies using education or contact strategies included attitudinal measures of stigma (27, 33, 50-52). Attitudinal measures were less ED-specific than those in etiological studies, for instance the Adjective Rating Form (participants rate how much negative adjectives describe a target) and an opinions scale (common opinions about people with mental illness, e.g., they are to blame for their condition) which are used in general mental illness stigma research (27, 50). Other studies included scales or items

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specifically designed for the study (50, 51). No studies compared education and contact. Three studies used education only; two found no difference in stigma; specifically, [Duffy and Henkel \(50\)](#) on personal responsibility or vanity compared with a control group and [Iles et al. \(51\)](#) on positive/negative attitudes towards people with ED over time. The other study using education-only, [Bannatyne and Stapleton \(18\)](#) found improvements on the EDSS (Eating Disorder Stigma Scale) and Opinions Scale compared with a control group, with effect sizes ranging from small to large (18). Three studies included contact. [Two combined education and contact](#); [Shepherd, \(33\)](#) using written narrative, [Brownlow et al. \(27\)](#) using filmed contact. [Katterman and Klump \(52\)](#) used contact-only which was filmed. Combined education and contact interventions resulted in lower stigma from pre- to post-test [in Brownlow et al. \(27\)](#), and compared with a control group in [Shepherd \(33\)](#), who observed a medium difference between groups at post-test. Contact-only was not different from a control group in [Katterman and Klump \(52\)](#); [however, it should be noted that the filmed contact was a sitcom that was thought to be stigmatizing](#). Two of the more successful interventions in changing attitudes were those that combined education and contact and were more involved (i.e. slightly longer, more information-based interventions) (28, 33) and showed medium to large improvements in attitudes, with less involved interventions showing almost no change (50-52).

Affective measures of stigma. One study, [by Hart et al. \(29\)](#), included a measure of affective stigma, and used a combined education and contact strategy (with a substantial ED mental health literacy component) but had no control group. Sympathy towards a target with an ED significantly increased from pre- to post-test, but was not maintained at follow-up.

Behavioral measures of stigma. Four studies included behavioral measures of stigma, (e.g., Social Distance Scale); one used education-only and three used combined education and contact (27-29). Two studies that combined education and contact found improvements

in behavioral stigma; [Brownlow et al. \(27\)](#) [found increased willingness to treat people with BED and EDNOS among health care professionals from pre- to post-test, and Gratwick-Sarll and Bentley \(28\)](#) [found a significant decrease in social distance over time](#). Both of these interventions contained a very large component of mental health literacy information, however the effect size data is not available so we cannot be certain of the degree of change. One study that combined education and contact found no improvements in desire for social distance or level of contact over time [\(29\)](#). [Iles et al.](#), using education-only found small improvements in desire for social distance over time [\(51\)](#), and was a very short intervention using only a video public service announcement.

Secondary Outcomes and Study Characteristics

In addition to examining stigma outcomes directly, it was important that we assess secondary outcomes and study characteristics relevant to the application of ED stigma interventions. These outcomes and characteristics included knowledge, ED type, and demographics.

Knowledge. Four studies assessed knowledge-related outcomes [\(27-29, 53\)](#). Three of these, [by Brownlow et al. \(27\)](#), [Gratwick-Sarll and Bentley \(28\)](#), and [Hart et al. \(29\)](#), used outcome measures directly related to knowledge about EDs, while [Tillman et al.](#) measured knowledge of help-seeking resources on a university campus [\(53\)](#), and [Brownlow et al. \(27\)](#) [measured clinical knowledge](#). All studies showed significant improvements in at least one knowledge outcome, one relative to a control group [by Tillman et al. \(53\)](#), and three that did not include a control group but showed improvements relative to pre-test measures [\(27-29\)](#). Three studies focused on improving ED mental health literacy [\(27-29\)](#), while the other aimed to improve ED awareness, help-seeking, and reduce stigma [\(53\)](#). Reduction in stigma did not necessarily occur with increases in knowledge, with one study [observing no change in stigma \(29\)](#) and another [showing higher stigma in persons surveyed after the awareness intervention,](#)

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relative to those surveyed before (53). Knowledge was only examined in studies including students or health professionals, and was not measured in interventions using etiological explanations as a stigma reduction strategy. Where effect sizes were available, changes in knowledge tended to be medium to large (29).

ED type. As the type of stigma expressed can vary as a function of the target's ED diagnosis (6), we examined the type of ED measured. In two studies, the diagnosis of the target (either person in a vignette, described in an intervention, or diagnosis addressed in an educational intervention), was AN, but stigma relating to EDs as a general diagnosis, was also measured (51, 54). For studies with matching target and outcome diagnoses, seven measured AN stigma (14, 18-21, 55, 56), six measured general ED stigma or multiple diagnoses (15, 27, 33, 50, 52, 53), and two measured BN stigma (28, 29). One study had insufficient information to determine the target diagnosis, but the outcome measure was stigma towards EDs as a general diagnosis (2). With the exception of one study by Kubota (56), which hypothesized *increases* in stigma but was included in order to observe any direction of change, all studies that focused on AN achieved some reduction in at least one stigma outcome (14, 18, 19, 21, 51, 54, 55). Three studies that examined ED stigma in general, or multiple diagnoses, did not find any significant reductions in stigma (50, 52, 53). The two studies that examined BN stigma found significant reductions in at least one stigma outcome variable - one behavioral and one affective; though neither examined attitudinal stigma (28, 29). Interestingly, studies specifically examining AN stigma generally had stronger methodology, (e.g., usually an experimental design), than those examining general ED or BN stigma. Additionally, no studies examined the effects of etiological explanations on BN, Binge Eating Disorder (BED) or Other Specified Feeding and Eating Disorders (OSFED) stigma specifically.

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Demographics. The majority of studies reviewed included student populations (14, 15, 18-21, 28, 29, 33, 50-53, 55, 56), many with only undergraduate participants (14, 15, 20, 21, 28, 33, 50-52, 54-56), and most with students of psychology or health-related disciplines. Notably, all interventions examining the effects of etiological explanations were conducted with student populations, with most from health or psychology-related disciplines. One study, by Crisp (2) included a community sample, and one by Brownlow et al. (27) included health professionals. Most studies included either female-only or over 70% female samples (14, 15, 19, 21, 27, 28, 50, 52, 53, 55, 56). The study that did include males by Shepherd (33) used a combined education and contact approach with an emphasis on psychoeducational material, and it appeared effective in reducing stigma. One study reported parents' income, which was average or lower, (52), and most reported ethnicity or place of birth (2, 14, 15, 18, 20, 21, 28, 29, 33, 50-52, 54, 55). Study populations included low percentages of people who did not identify as White or Caucasian (2, 20, 21, 33, 50, 52). One study reported sexual identity of participants (33); the majority of participants were heterosexual. In studies that reported age, mean or median age was often under 25-years-old (15, 19, 21, 28, 29, 50-52, 54, 55). For studies rated as having some or good generalizability to a community sample three (those by Crisp, and both by Iles et al.) used awareness campaigns (2, 51, 54), three (those by Brownlow et al., Gratwick-Sarll and Bentley, and Hart et al.) used mental health literacy approaches with contact (27-29) and one (by Bannatyne and Abel) used etiological explanations (15). All of these were successful in significantly reducing stigma on at least one measure relative to a control group or pre-test.

Risk of Bias

The results of the CASP to assess study quality are displayed in Table 2. The majority of studies included in the meta-analysis were rated well on most CASP items (14, 19, 21). Higher quality studies (i.e., studies that met or exceeded most of the criteria) were

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mostly lacking in components relating to the application of the results; namely, generalizability of the sample and presence of follow-up assessments (14, 18, 19, 51, 52, 54).

The only study that was evaluated as having good generalizability to a community sample, by Crisp (2) did not rate well on all other aspects of methodology. Thus, there was a distinct lack of research that we could confidently suggest would produce sustained change in the community.

Additional methodological problems worth noting are either unequal treatment of groups or failure to account for confounds in the study. Many higher quality studies, such as that by Bannatyne and Abel (19) and both by Crisafulli et al. (14, 21) accounted for confounds such as a previous history of AN/ED by removing these participants from analyses, or ensured that interventions were kept constant with the exception of manipulation of the independent variable. This was the case for most studies examining etiological explanations (14, 19-21). Two studies (those by Crisp, and Tillman et al.) included different samples at pre- and post-test and did not account for any factors such as previous history of an ED (2, 53). These studies were not rated well on the CASP criteria overall (2, 53).

Additionally, we cannot say for certain whether interventions themselves resulted in improvements long-term in pre-post design studies, as they did not include a control group (27-29, 50). Studies with pre-post designs generally included education and contact, education-only, or undefined interventions. Over half of the studies in this review either did not include a control group, or did not account for major confounds. While many of these studies are still valuable in describing stigma interventions, and some were stronger in other regards (e.g., generalizability to community samples), further research is needed to verify their effects.

Most interventions had an adequate sample size (e.g., greater than 30 per condition for experimental designs, or 30 participants for each time point in a longitudinal study). In

general, etiological interventions had adequate sample sizes for the number of comparison groups in analyses, with two exceptions (19, 20). Education and contact studies all had at least somewhat adequate sample sizes.

One strength across most studies was the use of well-validated measures of stigma. Most measures had been used previously in mental illness stigma literature, and were subsequently used and validated in ED stigma research. Overall, the quality of interventions that target ED stigma should be addressed, as there was no one study, or subgroup of studies (e.g., stigma reduction strategy, studies that measured knowledge outcomes), that did not have at least one major flaw.

Discussion

The purpose of this review was to examine current evidence for interventions to reduce ED stigma and to give direction for future research. In relation to the effect of different etiological explanations for EDs, both the review and meta-analysis indicated that biological explanations of EDs reduce attitudinal stigma relative to sociocultural explanations, although the effect is small to moderate. The role of multifactorial and environmental explanations is less certain, but it appears they are generally situated between sociocultural and biological approaches in effectiveness. Sociocultural explanations appear ineffective in reducing behavioral stigma; biological explanations appear promising, and the role of multifactorial and environmental explanations is less certain due to a low number of studies.

In relation to stigma reduction strategy, combined education and contact may be helpful for reducing attitudinal stigma, and education-only had little effect. Interventions including contact may assist in reducing behavioral stigma and have a minimal effect on affective stigma. Furthermore, our conclusions about strategies compared with a control

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group (including etiological explanations) are limited due to the absence of a control group in most instances.

The finding that biological explanations reduce attitudinal and behavioral stigma relative to sociocultural ones is consistent with attribution theory, as biological causes of illness are more likely to be perceived as outside of an individual's control (17). Likewise, the pattern of results for multifactorial explanations (which was present in fewer studies) relative to biological and sociocultural explanations is consistent with attribution theory, as it incorporates factors that may be perceived as both within and outside a person's control. Thus, these explanations may play an important role in reducing perceived blameworthiness. Further research is required, however, as it has been proposed that biological explanations may contribute to beliefs in biological essentialism (that an illness is biologically-based and unchangeable), which may result in unintended, negative consequences (25, 57) such as the belief that one is unlikely to recover from an ED (58, 59). In addition, it is widely recognized that biological explanations are incomplete (24). Interestingly, there was little difference between etiological explanations of EDs on affective outcomes. Recent literature indicates that biological explanations of mental illness may decrease clinicians' empathy for clients relative to psychosocial explanations, because those suffering from biological disorders are seen as categorically different (57). The findings in our review about affective stigma (in which biological explanations did not differ from other explanations) may be indicative of a similar effect in EDs.

The small number of studies and less consistent methodology of interventions using education or contact means that we cannot draw as strong conclusions about these approaches as we can for etiological approaches. However, our results suggest promise for education with contact interventions in reducing attitudinal stigma, particularly when they include a substantial ED mental health literacy component, and indicate that future research should

examine these strategies in detail. We know little about the effects of education-only interventions, although they may not effectively reduce attitudinal stigma.

The four studies that included knowledge outcomes found improvements in knowledge. Most of the interventions in question were designed to increase knowledge and improve ED mental health literacy, so this finding is unsurprising. Knowledge and stigma did not necessarily improve together. This is also evident in samples of professionals, who have higher levels of knowledge but may retain stigmatizing attitudes (60), highlighting that stigma and knowledge are distinct domains. Those wishing to plan stigma reduction interventions should bear this in mind.

The majority of interventions reviewed focused on stigma towards people with AN, with some measuring stigma towards EDs more generally or multiple diagnoses. The methodological strength of studies examining AN stigma was generally better than studies examining ED stigma generally or BN stigma. The balance of interventions relative to prevalence of diagnoses is also an issue that requires attention. If researchers wish to conduct interventions to reduce stigma of different diagnoses, they should bear in mind that BED, BN, and OSFED have higher prevalence rates than AN (61, 62), and thus require at least as much attention in [stigma interventions](#). No intervention isolated BED or OSFED stigma. Puhl and Suh (6) identified that attributions of blame towards people with BED are higher than those seen in AN and BN. These interventions may need additional [educational elements](#), as the public generally has less knowledge of these disorders than AN and BN. Furthermore, many people with BED (and to a lesser extent, BN) may experience additional weight-based stigma (6), and researchers may wish to incorporate this into their intervention planning.

This review found that interventions to reduce ED stigma are generally administered with groups less likely to stigmatize persons with EDs, such as university students (4, 43, 44). Therefore, future interventions should target groups more likely to stigmatize to improve

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generalizability of findings. It is also apparent that more work needs to be done among populations of treating professionals (13). The one intervention for professionals (35) reviewed was successful in reducing stigma and improving knowledge through an educational training program that included contact; future interventions for professionals may wish to verify this improvement with a control group.

Limitations and Strengths

Some limitations of this review have been addressed, such as the poor generalizability of findings to community samples other than young adult students. Other limitations include the variability in the nature of these interventions. All of the studies fall under a broad umbrella of ED stigma intervention, which covers several *types* of ED as well as different stigma reduction strategies. While we believe we have classified these accurately and have good theoretical basis for our comparisons, only a small number of studies adequately fit each category for review. Another limitation is the quality of literature available. There is a distinct gap between interventions strong in methodology and those appropriate for community interventions (e.g., larger scale anti-stigma campaigns). Future research should address methodological concerns and problems of generalizability so that we have suitable evidence to inform policy.

Strengths of this review include a robust systematic search strategy and data screening and extraction performed by two independent raters, with discrepancies resolved by a third rater, thereby minimizing the chance of bias within the review. Finally, by including both a systematic review and exploratory meta-analysis, we have attempted to provide some guidance where evidence is not necessarily definitive, and hope that this will generate ideas and hypotheses for future research.

Future Research Directions

This review identified several areas for generating new studies and improving on existing work. Our findings in relation to etiological explanations, have several main implications for future research. First, in light of possible negative consequences of biological explanations, research in this field should include a measure for unintended negative consequences. Second, researchers should consider further investigating the effects of multifactorial explanations of EDs as they better fit our current conceptualization of how EDs develop (24). Furthermore, while studies examining etiological explanations of EDs were generally of higher quality, most lacked a control group, and the findings lack generalizability to community samples.

Interventions should also include measures of ED symptoms. A small amount of literature suggests that normalizing EDs may make them seem more appealing, and encourage vulnerable persons to engage in ED behaviors (63).

There are gaps in the evidence for education and contact-based interventions; in particular, comparing the two strategies directly, and including in vivo speakers or social interactions in contact-based interventions. It is surprising that no studies examined in vivo presentations, given the strategy is commonly used by eating disorder advocacy organizations (64-66), and future research should whether this strategy reduces stigma in a manner similar to other mental illnesses (32). Additionally, no studies examined the potential for autobiographical memoirs of EDs - a form of contact - to reduce stigma. Previous literature has examined whether they glamorize EDs (67); however, stigma has not been measured in such studies.

Future research must also focus efforts on improving attitudes towards people with BN, BED, and OSFED, as research has primarily focused on AN, or ED in general. Finally, interventions need to target those more likely to stigmatize, such as males.

Conclusions

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Interventions to reduce ED stigma, relative to other mental illness stigma interventions, are still in their infancy. A great deal of work is required to refine our understanding of what is effective in stigma reduction and what is not, and to identify interventions that will be effective among community groups for larger scale campaigns. The field shows promise, and has a good theoretical basis that should continue to guide interventions. However, there is a need for higher quality studies to identify effective ways to reduce ED stigma and to ensure individuals with EDs receive the support and treatment that they need.

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Table 1. *Characteristics and effect sizes of studies identified for inclusion in meta-analysis and/or critical narrative synthesis by intervention type*

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
<i>Etiological explanations</i>					
Bannatyne & Abel (19)	Experimental AN/AN Education	University students, Australia (N=151) Males 23.8%, Females 76.2%. Mean age 21.32 years Most (53.6%) from health related degrees.	Online. Participants randomly allocated to read vignettes with evidence from research studies emphasizing either biological, sociocultural, environmental, or multifactorial causes of AN. No inactive control group.	Characteristics, Affective reactions scale, Opinions scale, EDSS ^{bj} , behavioral intentions	Characteristics: No statistically significant difference between groups ^{ll} Affective reactions: No statistically significant difference between groups (But biological more negative affective reactions than sociocultural, $g=.20$, multifactorial, $g=.32$; and environmental less negative than sociocultural, $g=.20$, and multifactorial, $g=.35$). EDSS: Blame subscale - Multifactorial statistically significantly greater blame for illness than biogenetic ($g=1.37$) and environmental ($g=.90$). No statistically significant difference multifactorial and sociocultural ^{ll} . Sociocultural statistically significantly greater blame than biogenetic ($g=.95$) and environmental ($g=.55$) groups. Weak/trivial subscales - No statistically significant difference between groups. However, biological lower perception of EDs as weakness than multifactorial ($g=.40$) and sociocultural ($g=.30$). Environmental lower perceptions of EDs as weakness than multifactorial ($g=.35$) and sociocultural ($g=.26$). Biological

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
					<p>lower perceptions of EDs as trivial than multifactorial ($g=.29$) and sociocultural ($g=.20$).</p> <p>Opinions: Responsibility subscale - Multifactorial statistically significantly greater perception of responsibility for illness than environmental ($g=.60$) or biogenetic ($g=.55$). No statistically significant differences between multifactorial and sociocultural ($g=.40$).</p> <p>Fear and exclusion subscale - No statistically significant difference – small differences in effect sizes with biological less fear than sociocultural ($g=.21$) and sociocultural less than multifactorial ($g=.27$).</p> <p>Behavioral intention: Sociocultural statistically significantly less likely to sign petition for better medical coverage than biogenetic, $g=1.39$. No statistically significant difference between biogenetic, environmental, multifactorial, however effect sizes revealed biological more likely to sign than multifactorial ($g=.60$), and environmental ($g=.22$). Multifactorial more likely to sign than sociocultural ($g=.91$). Environmental more likely to sign than sociocultural ($g=.84$) and multifactorial ($g=.22$).</p> <p><i>Effect size and study weight for exploratory meta-analysis: $g=.43, 9.70$</i></p>

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
Bannatyne & Stapleton (18)	Experimental AN/AN Education	Medical students Australia (N=41) Males 60%. Females 40%. Mean age 25.33 years 50% participants Caucasian, 35% Asian, 15% identified as “Other”.	Classroom. Educational training program for medical students. Randomly allocated to control group (no intervention), or receive research evidence about either biogenetic (e.g., heritability, neurobiology, endophenotypes) or multifactorial (e.g. gene- environment interaction, biopsychosocial model) emphasis on causes within educational intervention. Both educational interventions included information about diagnosis, treatment, symptoms, management, myth-busting, and empathic communication skills.	EDSS ^b , Opinions scale	EDSS: Biogenetic and multifactorial statistically significantly lower stigma than control ($g=2.63$ and $g=1.46$ respectively) at Time 3. Statistically significant decrease only in biogenetic from Time 1 to Time 2 ($g=.75$) and maintained at follow-up. No statistically significant change over time in control or multifactorial conditions. Opinions: Responsibility subscale – Biological and multifactorial thought people with AN statistically significantly less responsible for illness than control at Time 3 ($g=1.11$ and $g=.57$ respectively), no statistically significant differences between multifactorial and biogenetic ($g=.74$). Both biological ($g=.75$) and multifactorial ($g=.64$) statistically significantly decreased from Time 1 to Time 3. Multifactorial statistically significant increase from Time 2 to Time 3 ($g=.73$), but remained statistically significantly lower than Time 1 ($g=.64$). Fear and exclusion subscale - No statistically significant differences between groups, however at time 2 and 3 biological had lower fear and exclusion than multifactorial ($g=1.19$, $g=.91$) and control ($g=.92$).
Borenstein	Experimental	Undergraduate	Online. Participants	SDS ^c , PPA-Q ^d , item on	SDS: Environmental explanation resulted in statistically

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Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
(20)	AN/AN Education	psychology students, US (N=125) Males 30.4%, Females 69.6%. 83.2% White, 6.4% Hispanic or Latino, 5.6% Asian or Asian American, 2.4% Black or African American, 2.4% other.	randomly allocated to read one of four vignettes, about a young woman, Kelly. In two vignettes, Kelly had AN (one vignette explained biological etiology, the other explained environmental), and in two vignettes Kelly had depression (one vignette explained biological etiology, the other explained environmental).	causal attributions scale (weakness of character as a cause for illness).	significantly higher desire for social distance than biological, explanation – did not differ depending on diagnosis. ($\eta^2 = .03$). PPA-Q: Statistically significantly greater anger towards, and responsibility attributed to, target with AN than depression ^{II} . No differences by etiology for target with AN on pity, anger, or personal responsibility ^I Item on causal attributions scale: Results not available for specific item ^I

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
Crisafulli et al.(2008)(1 4)	Experimental AN/AN Education	Undergraduate nursing students, US (N=98) Female only. 79.8% white, 9.6% black, 6.1% Asian, and 4.4% Other.	Classroom. Participants randomly allocated to read one of two information sheets about AN (each one page long), with information emphasizing either biogenetic etiology or sociocultural etiology of the illness.	Characteristics, Affective reaction scale, Opinions scale ^j , behavioral intention, attribution to vanity	Characteristics: No statistically significant differences between groups ⁱⁱ Affective reactions: No statistically significant differences between groups ⁱⁱ Opinions: No statistically significant differences between groups, except on blame, which disappeared with FDR correction (before correction, biological had more favorable opinions, $g=.21$) Behavioral intention: More willing to sign petition supporting better insurance coverage in genetic group, but difference not statistically significant ($g=.44$). Attribution to vanity: Biogenetic statistically significantly less attribution of AN to vanity than sociocultural ($g=.49$). <i>Effect size and study weight for exploratory meta-analysis:</i> $g=.21, 15.20$
Crisafulli et al. (2010) (21)	Experimental AN/AN Education + (Filmed) Contact	Undergraduate psychology, sociology and communications students, US (N=163) Males 28.3%,	Classroom. Participants randomly allocated (by small group) to watch one of three 5 minute videos. All content was identical with the exception of a doctor's explanation of the etiology	EDSS ^{bj} , behavioral intention	EDSS: Biological statistically significantly less stigma than sociocultural ($g=.78$) and multifactorial ($g=.42$) explanations. No statistically significant difference between multifactorial and sociocultural (although multifactorial had lower stigma, $g=.27$). Behavioral intention: Sociocultural statistically significantly less likely to sign petition than biological ($g=.54$) or multifactorial ($g=.52$) groups. No statistically significant

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
Wingfield et al. (15)	Within subjects design (post-test only) Multiple Diagnoses/ Multiple diagnoses Education	Undergraduate students, US, (N=235) Males 27.2%. Females 72.8%. Mean age 20.21 years 57.4% White, 20% African American, 13.2% Asian, 4.3% other, 3.8% Hispanic	Online. All participants read 16 short descriptions (vignettes) of people with AN or BN. All vignettes contained either no explanation of the etiology of the person's ED, a biological explanation (e.g., a family member of the person also having an ED), or a sociocultural explanation (e.g. a	Responsibility for ED^j , likeability, self- destructiveness	difference biological and multifactorial ^{ll} <i>Effect size and study weight for exploratory meta-analysis: g=.78, 14.35</i> Responsibility: Characters with biological explanations resulted in statistically significantly less perception of responsibility for illness than sociocultural (g=.48) and ambiguous (g=.92) explanations. Sociocultural less responsibility than ambiguous (g=.44). Likeability: Characters with ambiguous explanations statistically significantly less likeable than biological explanations (g=.24). No difference biological and sociocultural or sociocultural and ambiguous ^{ll} . Self destructive: Characters with ambiguous explanations rated statistically significantly more self-destructive than

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Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
<i>Education/Contact</i>			modelling agency telling the person to lose weight).		sociocultural ($g=.26$) and biological ($g=.45$). Sociocultural statistically significantly more self-destructive than biological ^{II} . <i>Effect size and study weight for exploratory meta-analysis: $g=.48, 60.75$</i>

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
Bannatyne & Stapleton (18)	Experimental AN/AN Education	Medical students Australia (N=41) Males 60%. Females 40%. Mean age 25.33 years 50% participants Caucasian, 35% Asian, 15% identified as “Other”.	Classroom. Educational training program for medical students. Randomly allocated to control group (no intervention), or receive research evidence about either biogenetic (e.g., heritability, neurobiology, endophenotypes) or multifactorial (e.g. gene- environment interaction, biopsychosocial model) emphasis on causes within educational intervention. Both educational interventions included information about diagnosis, treatment, symptoms, management, myth-busting, and empathic communication skills.	EDSS ^b , Opinions scale	EDSS: Biogenetic and multifactorial statistically significantly lower stigma than control ($g=2.63$ and $g=1.46$ respectively) at Time 3. Statistically significant decrease only in biogenetic from Time 1 to Time 2 ($g=.75$) and maintained at follow-up. No statistically significant change over time in control or multifactorial conditions. Opinions: Responsibility subscale – Biological and multifactorial thought people with AN statistically significantly less responsible for illness than control at Time 3 ($g=1.11$ and $g=.57$ respectively), no statistically significant differences between multifactorial and biogenetic ($g=.74$). Both biological ($g=.75$) and multifactorial ($g=.64$) statistically significantly decreased from Time 1 to Time 3. Multifactorial statistically significant increase from Time 2 to Time 3 ($g=.73$), but remained statistically significantly lower than Time 1 ($g=.64$). Fear and exclusion subscale - No statistically significant differences between groups, however at time 2 and 3 biological had lower fear and exclusion than multifactorial ($g=1.19$, $g=.91$) and control ($g=.92$).
Brownlow	Pre-post	Health	Online. Participants	Attitudes and beliefs	Attitudes and beliefs about people with EDs: Statistically

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et al. (27)	Various diagnoses /ED Education + (Filmed) Contact	professionals; Australia, UK, USA, Indonesia (N=187). Mean age bracket 31-40 years. Males 8.6%, Females 91.4%. 34.6 % psychologists, 22.7 % nurses, 19.5 % dietitians, 9.2 % social workers. Employment setting 62.2% metropolitan area, 36.8 % rural/regional.	completed five training modules about EDs within clinical/health context (e.g. understanding, treatment, management) Modules incorporated interactive content, psychoeducation, quizzes, and filmed contact.	about people with EDs. Willingness to treat EDs. <i>Knowledge of EDs</i> <i>Clinical skill level in assessing and treating EDs</i>	significant improvement in attitudes and beliefs from pre-post ^I . Willingness to treat EDs: Statistically significantly greater willingness to treat people with BED and EDNOS from pre- post ^I . <i>Knowledge of EDs: Statistically significant. increase in knowledge from pre-post^I.</i> <i>Clinical skill level: Statistically significant increase in skills in assessing and treating EDs from pre-post^I.</i>
Duffy & Henkel (50)	Pre-post Various diagnoses /ED Education	Undergraduate students, US (N=131) Female only. Median age 21 years 86% Caucasian.	In vivo. Passive education campaign; educational posters and brochures displayed around campus. Brochures included “What is Anorexia Nervosa?” , “What is Bulimia Nervosa?”, “What is Binge Eating	Opinions scale, attribution to vanity, stereotypes about people with ED	Opinions: No statistically significant difference on overall opinions about people with ED from pre- to post ^{II} Attribution to vanity: No statistically significant difference from pre-post ^{II} Stereotypes about people with ED: Statistically significant decrease from pre to post in belief that people with ED are almost always women ($g = .21$). No statistically significant

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Gratwick- Sarrl & Bentley (28)	Pre-post Various diagnoses /BN-NP Education + (Personal written narrative) contact	Undergraduate students, Australia (N=177) Males 19.8%, Females 79.7%, Other 0.5%. Mean age 20.3 years. 62.1% born in Australia 76.8% English as a first language.	Disorder?" and "For friends and family". Poster messages included myth- busting information, e.g. 1 in 4 people with EDs are male, the high mortality rate from AN. All posters and brochures included help- seeking information. Classroom. All participants attended a 3-hour Mental Health First Aid for ED workshop. Part one of the workshop described types of EDs, risk factors, treatment, and warning signs. Part two described how to provide help to a person with ED, including how to suggest professional help and providing follow-up with the person.	SDS ^c <i>FAKT^e</i> <i>MHLQ-B^f</i>	difference in the belief that people with EDs are almost always women between ages of 13 and 24 ¹ . SDS: Statistically significant decrease in desire for social distance from baseline (Time 1) to post-training (Time 2), and Time 1 to Time 3. No statistically significant difference Time 2 to Time 3 ¹ . <i>FAKT: Statistically significant. increase from Time 1 to Time 3. No statistically significant improvement from Time 2 to Time 3¹</i> <i>MHLQ-B: Statistically significant improvement on all items across time¹</i>

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
Hart et al. (29)	Pre-post Various diagnoses /BN Education + (Filmed) Contact	University residences staff and students, Australia (N=90) Males 41.4%. Females 58.9%. Mean age 23.84 74.44% born in Australia. 92.22% English as first language.	Classroom. 4-hour Mental Health First Aid for ED workshop. Included general information about mental illness and its impact, information about types of EDs, risk factors, early intervention. Also included content on how to provide Mental Health First Aid to a person with an ED, including help for suicidal thoughts, non-suicidal self- injury, and medical emergencies.	SDS, sympathetic to condition, Level of contact <i>FAKT^e</i> <i>MHLQ-B^f</i>	SDS: No statistically significant difference over time ⁱⁱ . Level of contact: no statistically significant difference in level of contact with people with EDs over time ⁱⁱ . <i>FAKT: Statistically significant improvement from baseline (Time 1) to post-training (Time 2 $\eta^2=.77$) and Time 1 to follow- up (Time 3; $\eta^2=.60$)</i> <i>MHLQ-B: No statistically significant difference over time in how distressing it would be to have BN^f. Statistically significant increase from Time 1 to Time 2 in sympathy, no statistically significant difference from Time 1 to Time 3^f.</i>
Iles et al (2015) (51)	Experimental AN/ED Education (Awareness campaign)	Undergraduate students, US. (N=174). Males 31.6%, Females 68.4%. Mean age 19 years. White 54.00%, 18.40% Black, 14.40% Asian, 9.20%	Lab. Participants were randomly assigned to watch one of two short PSAs about AN - A stigmatizing (Don't die for a diet) or non- stigmatizing ('Anorexia' - government PSA) PSA. The stigmatizing PSA included common 'tips and tricks' for weight loss, and the non-	SDS ^c ; attitudes toward people who have EDs.	SDS: Statistically significantly higher desire for social distance in stigmatizing PSA condition than non-stigmatizing PSA condition $\eta_p^2 = .03$. Statistically significant time by condition interaction - increase in desire for social distance from pre-post for those in stigmatizing PSA condition, $\eta_p^2 = .03$. Attitudes towards people with EDs: No statistically significant differences between groups or over time, $\eta_p^2 = .008$.

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
Iles et al. (2016) (54)	Experimental AN/ED Education (Awareness campaign)	Hispanic/Latino, and 4.00% other Undergraduate students, US, (N=174). Males 31.6%, Females 68.4%. Mean age 19 years White 54.00%, 18.40% Black, 14.40% Asian, 9.20% Hispanic/Latino, and 4.00% other	stigmatizing PSA emphasized the experiences and activities a person with AN would miss out on. Lab. Participants were randomly allocated to view either a stigmatizing (Don't die for a diet) or non- stigmatizing ('Anorexia' - government PSA) PSA about eating disorders. See above for description.	Warmth, competence, contempt (feelings of annoyance and disgust).	Warmth and competence: Statistically significantly lower perceptions of warmth and competence in stigmatizing condition than non-stigmatizing condition (warmth $b = -.55$, competence $b = -.38$). Contempt: Statistically significant direct effect of warmth and competence on contempt – lower warmth and competence led to higher contempt (model $R^2 = .23$).
Katterman & Klump (52)	Experimental Various diagnoses /ED Contact-only	Undergraduate students, US. (N=89) Female only. Mean age 19 years. 84% Caucasian. 8% African American, 4% Asian, 2%	Lab. Participants were randomly allocated by small group to watch either an episode of a TV show about EDs (a sitcom, 'Starved', that featured main characters with different types of EDs) or watching an episode of a	EDPTS ^h	EDPTS: No statistically significant differences across time or between groups. ⁱⁱ

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
Shepherd (33)	Experimental People with body image concerns or disordered eating/ People with body image concerns or disordered eating Education + (Personal written narrative)	Pacific Islander, 2% other. 80% participants' parents' annual income > \$60,000, 19% between \$20,000 and \$60,000, 1% <\$20,000." Undergraduate students, US (N=296) Male only. 83.1% White Non- Hispanic, 8.1% Hispanic/Latino, 4.0% African- American, 2.4% Asian-American, 1.7% other, 0.7% American Indian/Alaska Native. 95.6% heterosexual, 2.0%	non-ED related TV show (control). Both groups also watched an episode of a successful sitcom. Online. Participants were randomly allocated to receive either an intervention (a psychoeducational website with information on male body image and EDs, which included facts about ED, lived experience stories, and help-seeking information) or inactive control.	ARFNeg ⁱ	ARFNeg: Statistically significantly lower ARFNeg at post-test in experimental condition than control condition, ($g=.51$).

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Contact		gay, 1.4% bisexual, 0.7% did not wish to respond, 0.3% other.			
Zwickert & Rieger (55)	Experimental AN/AN Education	Undergraduate students, Australia (N=135) Female only. Mean age 19.78 years. 58.6% Caucasian, 41.4% Asian.	Setting information not available. Participants randomly allocated to read one of three vignettes featuring a 19 year old female psychology student, varying whether she had AN, obesity, or skin cancer. Participants were then randomly allocated to read a vignette describing her as either blameworthy (e.g., deliberately chooses unhealthy behavior, chooses to ignore doctor's instructions for management and treatment) or non- blameworthy (e.g. feels driven towards unhealthy behavior by illness, family	Affective reaction scale, SDS ^c	Affective Reaction Scale: All blameworthy conditions had statistically significantly less positive reactions than non- blameworthy conditions (specific significance data for AN not available). ¹ SDS: All blameworthy conditions had statistically significantly higher desire for social distance than non-blameworthy conditions (specific significance data for AN not available). ¹

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics</i> <i>Exploratory meta-analysis data in italics</i>
			history of illness, tries to adhere to doctor's recommendations for treatment and management) for her condition.		
	<i>Other/unknown</i>				
Crisp (2)	Two groups cross sectional Unknown /ED In vivo awareness campaign (no specific data on whether education or contact-based)	Community sample, UK (N=1737, 1998; N= 1725, 2003) 1998: Ethnic background (95% White), employment status (stratified sample similar to overall UK, but not stated), marital status (24% single) 2003: Data not available	In vivo. Community sample surveyed at start and end of mass media campaign to reduce the stigma of mental illness, 'Changing Minds'. Campaign included de- stigmatizing material about EDs, but specific details of material not available. Other campaigns ran over course of study.	Agreement with negative statements about people with ED (Opinions scale)	Statistically significant decreases over time in belief that people with EDs are hard to talk to, feel different from us ¹ . Statistically significant increase over time in belief that they will never fully recover ¹ . No statistically significant difference over time in belief that people with EDs are a danger to others, are to blame for their condition, are unpredictable, could pull themselves together, or not improve if treated ¹ .
Kubota	Experimental	Undergraduate	Lab. Participants randomly	Opinion ratings (made	Generally more negative opinion ratings of target with AN than

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
(56)	AN/AN Mortality salience manipulation	students, US, (N=72).	allocated to one of four conditions: mortality salience manipulation (thinking about what would happen at the time of one's death) and read vignette with young woman with AN, mortality salience manipulation and read vignette with young woman with diabetes, no mortality salience and vignette with young woman with AN, no mortality salience and vignette with young woman with diabetes. Note: the manipulation was hypothesized to increase stigma.	specifically for study, including trust, personal responsibility, intelligence).	diabetes, no statistically significant effect of mortality salience manipulation on opinion ratings within AN. No data available on specific stigma opinion ratings (i.e. trust, personal responsibility, intelligence) by mortality salience manipulation and diagnosis. ¹
Tillman et al. (53)	Experimental Unknown /ED In vivo awareness campaign.	Undergraduate and postgraduate students, US (N=290) Males 18%. Females 82%.	In vivo. Participants surveyed before or after attending events at NEDAwareness (Eating disorders awareness) Week programming. Included	Some items on eating disorder stigma scale (differs from EDSS, all but one item reflect self-stigma). <i>Knowledge of help-</i>	No specific data available on stigma scale items (i.e. unable to determine changes in self-stigma as opposed to public stigma). ¹ <i>Knowledge of help-seeking resources: Students surveyed after events had statistically significantly better knowledge of campus help-seeking resources than those surveyed before events (d=.70).</i>

Study	Design ED type ^a Stigma reduction strategy	Sample (N) and description	Setting and intervention description	Outcome measures <i>Knowledge outcomes in italics</i>	Brief description of main findings <i>Knowledge outcomes in italics Exploratory meta-analysis data in italics</i>
	Included both education and contact, but specifics not available for effects of intervention.		vigil, fair, documentary, art, theatre, slam poetry focused on body image/ED.	<i>seeking resources on university campus.</i>	

Note: All effect sizes reported as Hedge's g , except where data was unavailable, in which case the effect size in the published paper was used.

¹ Data unavailable for effect sizes

¹¹ Effect size was less than $g = .20$

^a Content refers to EDs covered in intervention; outcome refers to ED assessed in stigma outcome measures.

^b Eating Disorder Stigma Scale

^c Social Distance Scale

^d Personal responsibility, Pity, and Anger Questionnaire

^e First Aid Knowledge Test

^f Mental Health Literacy Questionnaire – Bulimia Nervosa

^g Eating Disorder Examination - Questionnaire

^h Eating Disordered Persons Trait Survey

ⁱ Adjective Rating Form (Negative)

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[†]Used in meta-analysis

Table 2. CASP ratings for studies included in meta-analysis and/or critical narrative synthesis.

Study	Did the study				Aside from the		Were non-		Are the results generalizable to a community population?
	address a clearly focused issue? (Did the study assess the effect of an intervention on ED stigma /attitudes?)	Was the assignment of participants to conditions/ interventions randomized?	Was stigma measured with reliable and valid instruments?	Was the sample size adequate?	Was there a manipulation check, or was fidelity to intervention ensured?	experimental intervention, were the groups treated equally? OR Have authors identified all important confounds?	completers included in final analysis OR were differences in baseline characteristics measured?	Was there a follow-up at an appropriate time point?	
Bannatyne & Abel (19)	Y	Y	Y	Y	Y	Y	Y	N	S
Bannatyne & Stapleton (18)	Y	Y	Y	N	Y	S	Y	Y	N
Borenstein (20)	Y	Y	Y	S	Y	S	N	N	N
Brownlow et al. (27)	Y	N	Y	Y	Y	N	N	N	N

<i>Study</i>	<i>Did the study address a clearly focused issue? (Did the study assess the effect of an intervention on ED stigma /attitudes?)</i>	<i>Was the assignment of participants to conditions/ interventions randomized?</i>	<i>Was stigma measured with reliable and valid instruments?</i>	<i>Was the sample size adequate?</i>	<i>Was there a manipulation check, or was fidelity to intervention ensured?</i>	<i>Aside from the experimental intervention, were the groups treated equally? OR Have authors identified all important confounds?</i>	<i>Were non-completers included in final analysis OR were differences in baseline characteristics measured?</i>	<i>Was there a follow-up at an appropriate time point?</i>	<i>Are the results generalizable to a community population?</i>
Crisafulli et al., 2008 (14)	Y	Y	Y	Y	Y	Y	Y	N	N
Crisafulli et al., 2010 (21)	Y	S	Y	Y	Y	Y	Y	N	N
Crisp (2)	Y	N	N	Y	N	N	N	S	Y
Duffy & Henkel (50)	Y	N	Y	Y	N	S	S	N	N
Gratwick-Sarll &	Y	N	Y	Y	S	S	S	Y	N

<i>Study</i>	<i>Did the study address a clearly focused issue? (Did the study assess the effect of an intervention on ED stigma /attitudes?)</i>	<i>Was the assignment of participants to conditions/ interventions randomized?</i>	<i>Was stigma measured with reliable and valid instruments?</i>	<i>Was the sample size adequate?</i>	<i>Was there a manipulation check, or was fidelity to intervention ensured?</i>	<i>Aside from the experimental intervention, were the groups treated equally? OR Have authors identified all important confounds?</i>	<i>Were non-completers included in final analysis OR were differences in baseline characteristics measured?</i>	<i>Was there a follow-up at an appropriate time point?</i>	<i>Are the results generalizable to a community population?</i>
Bentley (28)									
Hart et al. (29)	Y	N	Y	Y	S	S	Y	Y	S
Iles et al. 2015 (51)	Y	Y	N	Y	Y	Y	Y	N	S
Iles et al. 2016 (54)	Y	Y	S	Y	Y	Y	Y	N	S
Katterman & Klump (52)	Y	Y	Y	Y	Y	Y	Y	N	N

<i>Study</i>	<i>Did the study address a clearly focused issue? (Did the study assess the effect of an intervention on ED stigma /attitudes?)</i>	<i>Was the assignment of participants to conditions/ interventions randomized?</i>	<i>Was stigma measured with reliable and valid instruments?</i>	<i>Was the sample size adequate?</i>	<i>Was there a manipulation check, or was fidelity to intervention ensured?</i>	<i>Aside from the experimental intervention, were the groups treated equally? OR Have authors identified all important confounds?</i>	<i>Were non-completers included in final analysis OR were differences in baseline characteristics measured?</i>	<i>Was there a follow-up at an appropriate time point?</i>	<i>Are the results generalizable to a community population?</i>
Kubota (56)	Y	Y	N	N	Y	N	N	N	N
Shepherd (33)	Y	Y	Y	Y	Y	S	Y	N	N
Tillman et al. (53)	Y	N	S	Y	N	N	N	N	N
Wingfield et al. (15)	Y	S	N	Y	Y	Y	Y	N	N
Zwickert & Rieger (55)	Y	S	Y	S	Y	Y	Y	N	N

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Note: N (No) indicates not present or low quality, S (Somewhat) indicates present to some extent or medium quality, Y (Yes) indicates present or high quality.

Figure captions

Figure 1. Flow diagram showing results of search and screening process for interventions containing ED stigma outcomes measures.

Figure 2. Random effects model meta-analysis comparing the effects of biological and sociocultural explanations of the etiology of ED on attitudinal stigma.

Note: EDSS – Eating Disorder Stigma Scale

Figure 3. Funnel plot for studies comparing biological with sociocultural explanations of ED on the attitudinal domain of stigma.

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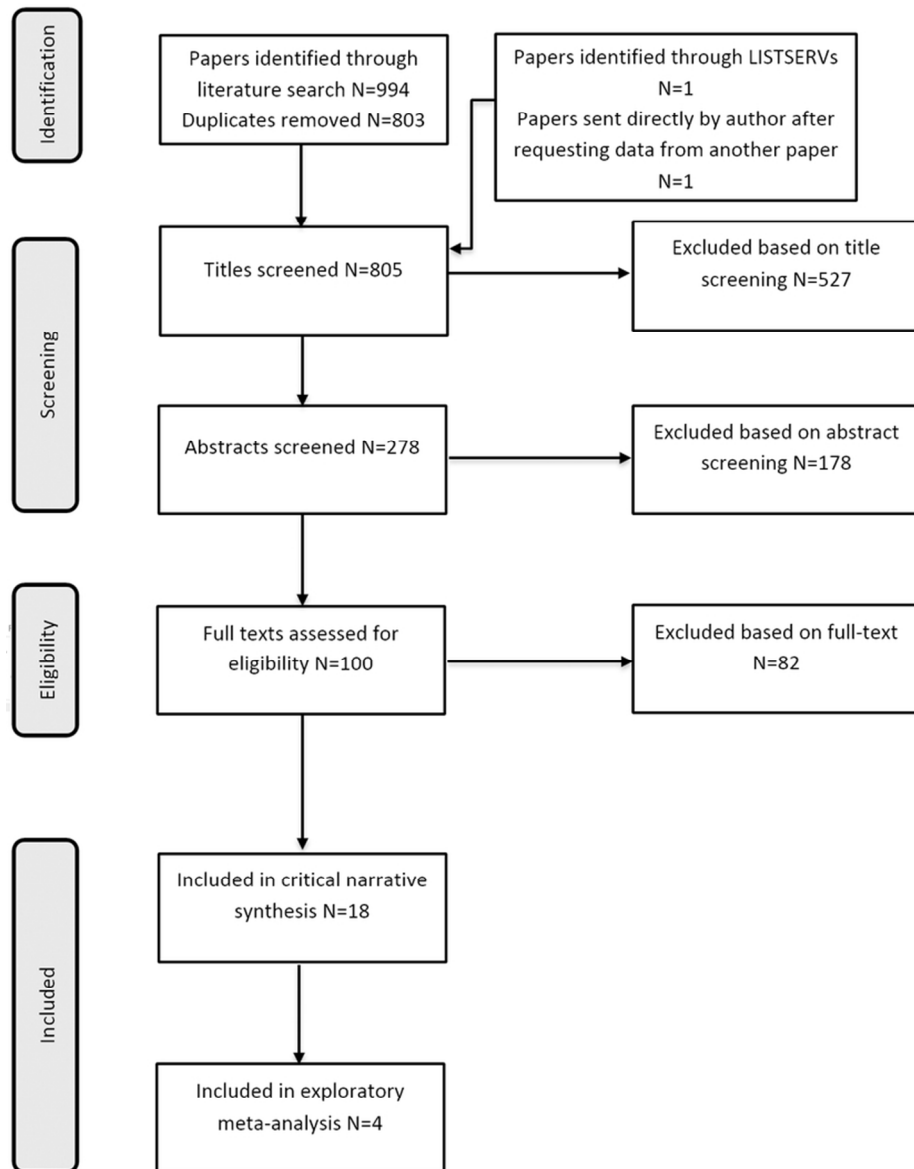


Figure 1. Search and screening process for articles for inclusion in systematic review and exploratory meta-analysis.

Figure 1

36x45mm (600 x 600 DPI)

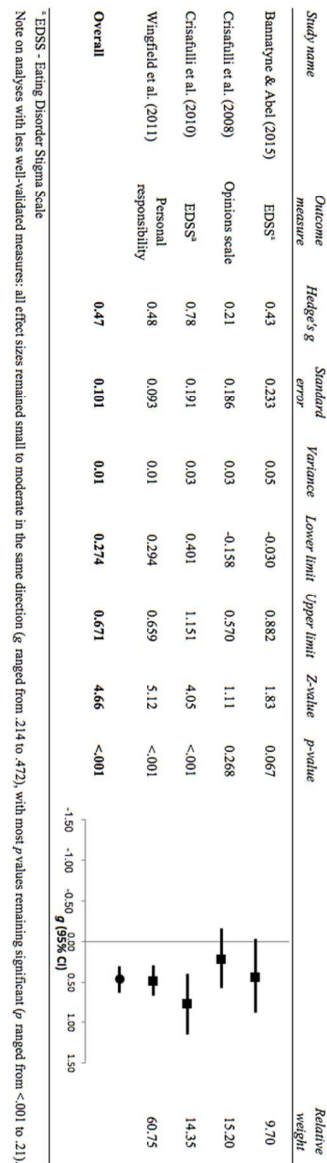


Figure 2. Random effects model meta-analysis comparing the effects of biological and sociocultural explanations of the etiology of ED on attitudinal stigma. Note: EDSS – Eating Disorder Stigma Scale

Figure 2
 49x111mm (300 x 300 DPI)

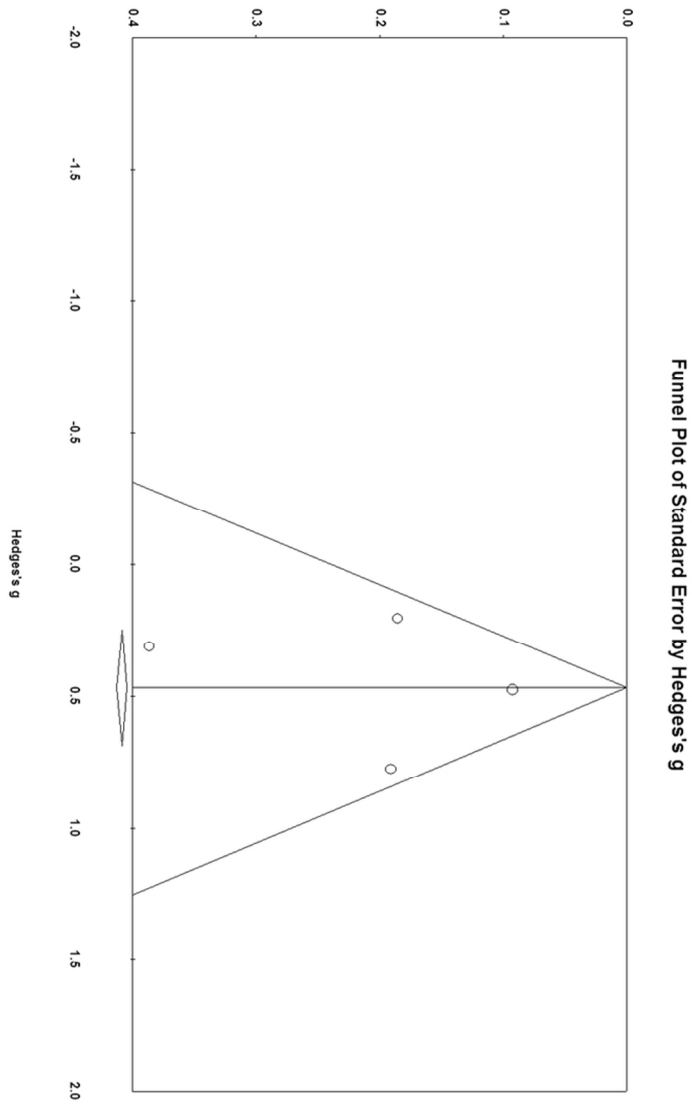


Figure 3. Funnel plot for studies comparing biological with sociocultural explanations of ED on the attitudinal domain of stigma.

Figure 3
32x49mm (600 x 600 DPI)

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INTERVENCIONES PARA REDUCIR EL ESTIGMA DE LOS TRASTORNOS DE LA CONDUCTA ALIMENTARIA: UNA SINTESIS NARRATIVA CRITICA Y META-ANALISIS

Doley, Joanna (contacto); Hart, Laura; Stukas, Arthur; Petrovic, Katja; Bouguettaya, Ayoub; Paxton, Susan

Resumen: Objetivo: El estigma es un problema para los individuos con un trastorno de la conducta alimentaria (TCA), lo que constituye una barrera para divulgar el problema y buscar ayuda. Las intervenciones para reducir el estigma de los TCA pueden ayudar a eliminar estas barreras; sin embargo, se desconoce qué estrategias (por ejemplo, explicar la etiología para reducir la culpa, el contacto con una persona con un TCA o educar sobre el TCA) son eficaces para reducir el estigma y los resultados relacionados. En esta revisión se describió la eficacia de las estrategias de intervención y se identificaron vacíos en la literatura. Método: Se realizó una búsqueda en cuatro bases de datos utilizando los términos (trastorno de la conducta alimentaria * OR bulimi * OR anorexia * O trastorno por atracón) Y (estigma * O estereotipos * OR creencias O actitudes negativas) Y (programa O experimento O intervención O educación), con textos adicionales solicitados a través de LISTSERVs (Listas de correo electrónico). Dos evaluadores examinaron documentos, extrajeron los datos y evaluaron la calidad. Las estrategias de reducción del estigma y las características del estudio se examinaron en la síntesis narrativa crítica. El metaanálisis exploratorio comparó los efectos de las explicaciones biológicas y socioculturales de los TCA sobre el estigma actitudinal. Resultados: Dieciocho artículos fueron elegibles para la síntesis narrativa, con cuatro también elegibles para su inclusión en un meta-análisis. Las explicaciones biológicas redujeron el estigma en relación con otras explicaciones, incluidas las explicaciones socioculturales en el meta-análisis ($g = 0,47$, $p < 0,001$). La educación combinada y las intervenciones de contacto mejoraron el estigma en relación con los grupos de control o con el tiempo. La mayoría de los estudios examinaron el estigma de la Anorexia Nervosa (AN) y tuvieron en su mayoría participantes femeninos y universitarios. Discusión: A pesar de la eficacia aparente, la investigación debe verificar que las explicaciones biológicas no causen daño no intencional. Las investigaciones futuras deben evaluar el contacto in vivo, comparar directamente las estrategias de educación y contacto, y apuntar a generalizar los hallazgos entre las poblaciones de la comunidad.