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REVIEW

Sex and Gender Differences in Weight Bias Internalization: A Systematic Review and Meta-Analysis

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ABSTRACT

Weight bias internalization (WBI) refers to individuals adopting negative stereotypes and self-derogatory beliefs about their weight. Despite substantial research on sex and gender differences in WBI, findings are mixed. To elucidate these differences, this systematic review with meta-analysis summarized and synthesized existing findings in this area and explored potential moderators contributing to the heterogeneity in previous studies. We conducted a literature search across five databases (PubMed, PsycINFO, Web of Science, ProQuest Dissertations, and Scopus) for studies published up to June 2024. A total of 100 studies were identified. Using random-effects models, we conducted four meta-analyses (i.e., biological males vs. biological females, cisgender boys and men vs. cisgender girls and women, cisgender boys and men vs. gender-diverse people, and cisgender girls and women vs. gender-diverse people). Results showed significant sex and gender differences in WBI, with biological females exhibiting higher WBI than biological males, cisgender girls and women having higher WBI than cisgender boys and men, and gender-diverse people having higher WBI than cisgender people. Geographic region and WBI measures were significant moderators in the meta-analyses for biological males versus biological females and cisgender boys and men versus cisgender girls and women. Also, the percentage of participants with overweight/obesity was a significant moderator in the meta-analysis for cisgender boys and men versus cisgender girls and women. These findings enhance our understanding of sex and gender differences in WBI, offering important theoretical and practical implications for future research and intervention.

1 | Introduction

Weight bias internalization (WBI), or self-directed weight stigma, refers to individuals' internalization of negative weight-related stereotypes and the belief that these stereotypes negatively impact their self-worth [1, 2]. Numerous studies have examined the prevalence of WBI. For instance, research indicates that at least 44% of adults in various samples exhibit significant levels of WBI, with the highest prevalence (52%) observed in adults with obesity, compared with 20% in the general population [3]. WBI has been linked to various adverse mental and physical health outcomes, including emotional disorders, body image concerns, and disordered eating [2, 4, 5]. Given the high prevalence of WBI and its health consequences, WBI has been suggested as a significant public health concern [6]. Therefore, it is crucial to conduct

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continued research to advance our understanding of WBI. An essential aspect of WBI that needs further clarification is the differences across sexes and gender identities [2, 7].

1.1 | Sex and Gender Differences in WBI

Sex refers to biological differences, while gender encompasses social and cultural roles shaped by environmental factors [8]. Gender-diverse people are individuals whose gender identity does not align with the sex they were assigned at birth [9]. Although both males and females experience WBI, previous research has shown inconsistent findings regarding sex differences (e.g., males vs. females) in WBI. For instance, a study of Italian high school students showed significantly higher WBI in females compared with males [10]. In contrast, another study of US adolescents revealed no significant differences in WBI between males and females [11]. Similarly, research on gender differences (e.g., cisgender women vs. cisgender men vs. gender-diverse people) in WBI has also yielded mixed findings. For example, in a sample of US undergraduate students, cisgender women showed significantly higher WBI than cisgender men [12], whereas another study of US adults found no significant gender differences in WBI [13].

Importantly, gender-diverse people may have prominent experiences of WBI due, in part, to experiences of gender minority stress [14]. The stress associated with gender nonconformity may place individuals at risk for stigma [15], potentially exacerbating their WBI. Indeed, in a sample of Canadian adolescents, gender-diverse adolescents reported higher levels of WBI than cisgender girls and biological and cisgender boys [16]. However, in a group of Canadian undergraduate students, no significant differences in WBI were reported between cisgender and gender-diverse students [17]. Thus, the evidence on differences in WBI between cisgender people and gender-diverse people is also mixed.

In summary, the literature on sex and gender differences in WBI is mixed and remains unclear. Moreover, sex and gender are often entangled in research [18], which is also common in WBI research [19], making it difficult to differentiate the potentially unique mechanisms between biological (i.e., sex) and social aspects of identity (i.e., gender) that lead to potential differences in WBI. Thus, we adopted a meta-analytic approach to elucidate potential sex and gender differences in WBI by estimating the overall sex and gender differences in WBI (i.e., males vs. females in sex differences, cisgender girls and women vs. cisgender boys and men, cisgender girls and women vs. gender-diverse people, and cisgender boys and men vs. gender-diverse people) and potential moderators contributing to the heterogeneity of prior findings. It is important to acknowledge that the limited number of available studies restricts the scope of our meta-analytic conclusions for the gender-diverse group and highlights a significant gap in the existing literature. Note that due to the relatively limited number of studies on WBI that included gender-diverse people, we only synthesized comparisons between cisgender people and gender-diverse people and could not conduct potential moderator analyses. Below, based on prior literature, we proposed several potential moderators that might contribute to the heterogeneity in prior findings on sex and gender differences.

1.2 | Potential Moderators

1.2.1 | Body Mass Index (BMI)

Individuals' weight status (e.g., BMI) may help explain sex and gender differences in WBI. Findings on associations between WBI and BMI across sexes and genders have been inconsistent [20]. One study revealed a stronger positive association between WBI and BMI in biological females than biological males [21]; in other words, females' WBI may be more affected by elevated BMI than males. Other research has revealed a similar pattern, with greater WBI detected in biological females, not biological males, with high BMIs [22]. In contrast, WBI was not significantly associated with BMI, regardless of gender, in a study conducted with the Weight Bias Internalization Scale (WBIS), suggesting that WBI captured by this instrument is less related to BMI [23]. Indeed, the WBIS scores of individuals with overweight/obesity are independent of BMI [1], suggesting that the degree of WBI is not related to weight status in biological males and females. Still, BMI was examined as a moderator of the relationship between gender and WBI in the present study to further clarify this mixed literature.

1.2.2 | Geographical Region

The geographical region where study populations reside may help explain sex and gender differences in WBI. For example, a cross-country study of WBI in six Western countries (the United Kingdom, Australia, France, Germany, the United States, and Canada) overall revealed that biological females had higher mean WBI scores than biological males [24]. Attitudes toward weight often reflect cultural and social contexts that influence individuals' weight status. More specifically, such cultural and social contexts may influence food choices or one's perceptions of the ideal weight or shape [25], both of which, in turn, may influence weight status. One study showed that adults in North America reported a strong tendency for WBI: 40% of American adults with overweight/obesity reported WBI, and 20% showed high levels of WBI [3]. This phenomenon is related to a greater emphasis on thinness in Western culture and values, as this attribute has become a symbol of personal qualities such as self-discipline, control, self-confidence, sexual liberation, and competitiveness, as well as affiliation with higher socioeconomic status [25]. However, few cross-country studies of sex and gender differences in weight bias have been published [26]; thus, geographical region (i.e., Eastern vs. Western countries) was examined as a moderator of the relationship between gender and WBI in the present study.

1.2.3 | Clinical Status

Research on the relationship between clinical status (e.g., clinical vs. community samples) and sex and gender differences

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in WBI has yielded inconsistent results. In clinical contexts, Lawson et al. [13] found no significant gender differences in WBI among bariatric surgery patients. In contrast, studies by Lillis et al. [27] and Magallares et al. [28] reported significantly higher levels of WBI in females compared with males among individuals with overweight or obesity in weight loss programs. Conversely, in nonclinical populations, some studies [29, 30] identified higher WBI in females, while others [31, 32] observed no notable differences between genders. Clinical populations, especially at intersections of female/women sex/gender identity, such as those in weight loss programs or bariatric surgery, may experience heightened weight-related stigma. For example, research has shown that doctors are one of the most common sources of stigma reported by individuals with overweight and obesity, with over half of women in one large sample reporting inappropriate comments from their physicians about their weight. This experience of stigma from healthcare providers is prevalent across various clinical contexts, including bariatric surgery programs and dietetic clinics [33]. This differential exposure to weight-related stigma in clinical versus nonclinical settings may moderate sex and gender differences in WBI. Therefore, this study investigates clinical status as a potential moderator of sex and gender differences in WBI.

1.2.4 | Measurement of WBI

At present, the main self-report measurements of WBI are the WBIS, the modified WBIS (e.g., WBIS-M, WBIS-3, and WBIS-C), and the Weight Self-Stigma Questionnaire. The WBIS is the first psychometrically validated self-report measure of internalizing negative weight-related stereotypes and attitudes [1]. The WBIS-M incorporates slight adjustments to the wording of certain items to make them more acceptable to individuals in different weight categories. For example, the item "I feel anxious about being overweight because of what people might think of me" was changed to "I feel anxious about being my weight because of what people might think of me." The WBIS-3 is a shorter version of WBIS-M containing three items [34]. The WBIS-C has been reworded to make it easier for children aged 9–13 years to understand [35]. The Weight Self-Stigma Questionnaire consists of a self-depreciation subscale, which measures weight-related self-devaluation, and a fear of enacted stigma subscale [36]. Although these instruments have been validated in many studies, the psychological characteristics measured by different WBI scales are somewhat inconsistent [2]. For example, the stigma assessed with the WBIS-M includes anticipated stigma from others, which differs from the internalized stigma assessed in previous work [37]. Thus, WBI measurement was examined as a potential moderator of the relationship between gender and WBI in the present study.

1.2.5 | Survey Method

Given the popular use of online surveys in social science research, questions have been raised about the equivalence of online and hard-copy survey models [38]. Online surveys, in this context, refer to research instruments administered via digital platforms (e.g., web-based questionnaires), while hard-copy surveys refer to paper-and-pencil questionnaires administered in person. These methods may influence response patterns due to differences in participant engagement, anonymity, and accessibility. Although data collected through online surveys can be useful, some considerations, such as low response rates [39], may impact their validity. The consistent acquisition of more responses from study participants increases researchers' likelihood of answering questions and minimizes error [40]. In addition, response rates across study modalities may differ according to gender, although findings have been inconsistent. Some studies suggest that males respond to online surveys more than females [41], whereas other studies have revealed the opposite pattern [42]. Online surveys may offer greater anonymity, potentially encouraging more honest responses about sensitive topics like WBI, which could affect reported sex and gender differences. Conversely, hard-copy surveys, often administered in controlled settings, may elicit different response patterns due to social desirability or the presence of the interviewer. Thus, the survey method (online vs. face-to-face) was examined as a moderator of the relationship between gender and WBI in the present study.

1.2.6 | Age

Age may help to explain sex and gender differences in WBI. Gender differences in body dissatisfaction (especially concerning weight) emerge in childhood and early adolescence [43]. Furthermore, the proportion of females with body dissatisfaction does not change significantly from late adolescence to middle age, whereas the proportion of males with body dissatisfaction increases slightly during this period [44]. Existing research suggests that sex and gender differences play a role in the magnitude and direction of body dissatisfaction as a function of age (adolescence–young vs. adulthood–middle age) [45]; thus, age was examined as a moderator of the relationship between gender and WBI in the present study.

1.2.7 | Publication of Study Results

Finally, the publication of study results may help explain observed sex and gender differences in WBI. For example, published studies yield larger effect sizes than unpublished studies, and the effect size difference has been larger in meta-analyses that included a wide range of unpublished literature [46]. This phenomenon potentially reflects publication bias, a well-documented threat to the effect sizes of results [47]. Thus, the publication of study results (published journal articles vs. unpublished dissertations) was examined as a moderator of the relationship between gender and WBI in the present study.

2 | Method

2.1 | Study Selection

To conduct the current meta-analysis, we initially searched for relevant studies published up to June 20, 2024. We referenced previous literature to determine the databases searched,

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keywords used, and exclusion criteria applied [2]. PubMed, PsycINFO, Web of Science, ProQuest Dissertations, and Scopus databases were searched using the keywords "weight bias internalization" OR "internalized weight bias" OR "internalised weight bias" OR "internalized weight stigma" OR "internalised weight stigma" OR "self-directed weight stigma" OR "self-directed weight bias" OR "weight-related self-stigma" OR "weight self-stigma" OR "weight-directed self-stigma" OR "Weight Self-Stigma Questionnaire" OR "WSSQ" OR "Weight Bias Internalization Scale" OR "WBIS" OR "WBIS-M." In addition, to identify relevant studies that were not included in the searched databases, we also used Google Scholar to find articles containing the keywords in the title or abstract, and we also reviewed the reference lists of the studies that were finally included in the current meta-analysis. Studies meeting the following three criteria were included in the meta-analysis: (1) written in English, (2) journal publication or unpublished dissertation, and (3) presentation of data from which an effect size (Cohen's d) can be calculated to estimate sex and gender differences in WBI.

2.2 | Data Coding

Four research assistants trained in meta-analytical coding (i.e., with practice in coding data from a set of articles) were divided into two groups that independently coded all data. Intercoder reliability (Krippendorff's α) values ranged from 0.79 to 1.00. The following information was extracted from each included study as coded content: author(s) and year of publication, type of report (journal article or dissertation), geographic region (Eastern or Western), total sample size, percentage of biological and/or cisgender girls and women in the sample, survey method (online or hard-copy survey), percentage of Caucasian participants, mean age, clinical status (clinical or nonclinical), age category (children/adolescents or adults), weight status (overweight/obese or not), proportion of participants with overweight/obesity, mean BMI, WBI measurement method (WBIS, modified WBIS such as WBIS-M and WBIS-C, or Weight Self-Stigma Questionnaire), and Cohen's d, other statistics that can be converted to Cohen's d (e.g., correlation between sex and gender and WBI), or the information needed to compute Cohen's d (e.g., sample size of cisgender and gender-diverse groups and means and standard deviations of WBI scores for sex and gender groups). Studies were categorized into biological sex (male vs. female) or gender identity (cisgender men vs. cisgender women, cisgender men vs. gender-diverse, and cisgender women vs. gender-diverse) based on the definitions provided in each study. In cases where studies used mixed or unclear definitions of sex and gender, categorization was determined by the primary variable reported. Specifically, "male/female" was coded as biological sex unless gender identity was explicitly specified. Similarly, "cisgender women," "cisgender men," and "gender-diverse" were coded as gender identity unless sex was explicitly specified. The geographic region was coded as either Western or Eastern based on the country or region where the study was conducted, as reported in the study. Western countries included those in North America (e.g., the United States and Canada), Europe (e.g., Germany and the United Kingdom), and other regions with predominantly Western cultural influences (e.g., Australia). Eastern countries included those in Asia (e.g., China and Japan), the Middle East (e.g., Saudi Arabia), and other regions with predominantly Eastern cultural influences. For survey method, studies were coded as "online" if the methodology section explicitly described administration via digital platforms (e.g., web-based surveys), "paper and pencil" if administered in hard-copy format (e.g., in-person questionnaires), or "NA" if the survey method was not specified. For group comparisons between biological or cisgender males and biological or cisgender females, positive values represented greater WBI in biological or cisgender boys and men and negative values represented greater WBI in biological and/or cisgender girls and women. For group comparisons between biological or cisgender men/women and gender-diverse people, positive values represented greater WBI in biological or cisgender men/women, and negative values represented greater WBI in gender-diverse people. Absolute values of $d = 0.20$, 0.50, and 0.80 were considered to represent small, medium, and large effect sizes, respectively [48].

2.3 | Quality Assessment

We adopted the quality assessment tool used by Chen et al. [49] and He et al. [50]. This tool has four items covering sample qualification and definition, sample representativeness, measurement tool validity, and the scale used to measure sex and gender differences [49]. The first two authors independently assessed study quality, reaching a consensus on any differences through discussion.

2.4 | Data Analyses

In the present meta-analysis, we first conducted overall analyses by sex and gender, including (1) biological males versus biological females in prior studies reporting sex differences in WBI ($n = 33$) and (2) cisgender boys and men versus cisgender girls and women ($n = 67$), cisgender boys and men versus gender-diverse people ($n = 5$), and cisgender girls and women versus gender-diverse people ($n = 5$), in prior studies reporting gender differences. We divided studies by sex or gender identity according to their descriptions. Note that given the small number of studies including differences in WBI between cisgender boys and men/females and gender-diverse people, we only conducted moderator analyses for biological males versus biological females and cisgender boys and men versus cisgender girls and women. All data analyses were conducted using the R 4.0.0 software [51] with the *metafor* package [52]. The average effect size and its 95% confidence interval (CI) were calculated using a random-effects model. To examine heterogeneity, we used the Cochrane Q method to determine whether significant heterogeneity was present ($p < 0.05$) [53] and explored the strength of any heterogeneity identified by using I^2 values. We also examined R^2 values to assess the proportion of heterogeneity explained by each moderator and

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to identify other factors potentially contributing to heterogeneity [50]. In addition, we examined outliers using Baujat plots and influential case diagnostics [52, 54]. For evaluating publication bias, we used funnel plots [55] and Egger's linear regression test to examine the significance of such bias ($p < 0.05$) [56].

3 | Results

3.1 | Study Selection

The study selection process is illustrated in Figure S1. Of 1395 records identified, 616 studies remained after the exclusion of duplicates. After the screening of titles and abstracts, the full texts of 304 reports were reviewed. A total of 100 reports fulfilled the inclusion criteria. Examination of these reports' reference sections yielded no other relevant studies.

3.2 | Characteristics of the Selected Studies

Of the 100 studies published between 2011 and 2024, 33 studies (33 effect sizes) reported the biological sex of participants ($N = 60{,}758$) and 67 studies (73 effect sizes) reported the gender identity of participants ($N = 53{,}579$). Regarding geographic region, most studies were conducted in Western countries. Specifically, for the biological sex comparisons, 27 studies were conducted in Western countries and 6 in Eastern countries. For the cisgender comparisons, 58 studies were conducted in Western countries, and 9 were conducted in Eastern countries. Five articles included data from gender-diverse people, all of which were conducted in Western countries. The characteristics of the studies are summarized in Tables S1–4.

3.3 | Study Quality and Outliers

The results of the quality assessment are presented in detail in Table S5. The samples were defined clearly in 95% of the studies and were representative in 40% of the studies. Valid and reliable measures were used in 94% of studies, and the same scale was used to measure WBI in all sex and gender groups in all studies. The examination of Baujat plots and influential case diagnostic graphs led to the identification of one outlier in cisgender groups [57]. Due to the limited number of studies that included gender-diverse people, potential outliers in comparisons between cisgender and gender-diverse people were not examined.

3.4 | Overall Analysis Results

3.4.1 | Biological Males Versus Biological Females: Sex Differences

For the biological sex samples, the overall effect size was small (pooled $d = -0.27$; 95% CI, -0.34, -0.19; $p < 0.001$), indicating that biological females reported higher WBI than biological males (Figure S2a). Substantial heterogeneity was detected ($Q_{(32)} = 273.66$ [$p < 0.001$], $I^2 = 88.51\%$).

3.4.2 | Cisgender Boys and Men Versus Cisgender Girls and Women: Gender Differences

For the cisgender samples, the overall effect size was small (pooled $d = -0.29$; 95% CI, -0.33, -0.25; $p < 0.001$), indicating that cisgender girls and women reported higher WBI than cisgender boys and men (Figure S2b). Substantial heterogeneity was detected ($Q_{(71)} = 188.88$ [$p < 0.001$], $I^2 = 67.30\%$).

3.4.3 | Cisgender Boys and Men Versus Gender-Diverse People: Gender Differences

For the cisgender boys and men versus gender-diverse people analysis, the overall effect size was medium (pooled $d = -0.50$; 95% CI, -0.60, -0.40; $p < 0.001$), indicating that gender-diverse people reported higher WBI than cisgender boys and men (Figure S2c).

3.4.4 | Cisgender Girls and Women Versus Gender-Diverse People: Gender Differences

For the cisgender girls and women versus gender-diverse people analysis, the overall effect size was small (pooled $d = -0.17$; 95% CI, -0.31, -0.02; $p = 0.029$), indicating that gender-diverse people reported higher WBI than cisgender girls and women (Figure S2d).

3.5 | Moderator Analysis

For the biological sex samples, the moderator analyses indicated that two variables contributed to the heterogeneity of effect sizes: geographic region ($Q = 12.52$, $p < 0.001$), accounting for 35.50% of the heterogeneity, and measures used to assess WBI ($Q = 17.79$, $p < 0.001$), accounting for 43.01% of the heterogeneity. The absolute pooled d value for studies from Eastern countries (e.g., China; $d = -0.02$; 95% CI, -0.17, 0.14; $p = 0.838$) was not significant, while that from Western countries (e.g., North America and Europe; $d = -0.32$; 95% CI, -0.39, -0.25; $p < 0.001$) was significant. These results indicated that biological females reported higher WBI than biological males in Western countries, while the sex differences were minimal in Eastern countries. The absolute pooled d value for studies using the original WBIS ($d = -0.45$; 95% CI, -0.57, -0.32; $p < 0.001$) was higher than the modified WBIS (i.e., WBIS-M, WBIS-3, and WBIS-C; $d = -0.30$; 95% CI, -0.35, -0.19; $p < 0.001$). The absolute pooled d value for studies using the WSSQ ($d = -0.03$; 95% CI, -0.18, 0.11; $p = 0.664$) was nonsignificant. These results indicated that sex differences (biological females reported higher WBI than biological males) were higher when the measure was the original WBIS than the modified WBIS, and there was no evidence of sex differences when using the WSSQ. The moderating roles of other variables were not significant (Table 1).

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TABLE 1 | Results of moderator analyses (biological sex groups).

	k	Parameter	SE	z	95% CI Lower limit	95% CI Upper limit	Q	df	R^2
Publication year	33	$B=0.01$	0.01	0.57	−0.02	0.03	0.32	1	0.00%
Percentage of Caucasian	21	$B=-0.22$	0.16	−1.35	−0.53	0.10	1.82	1	5.36%
Mean age	29	$B=-0.001$	0.004	−0.19	−0.01	0.01	0.03	1	0.00%
Percentage of participants with overweight/obesity	25	$B=-0.07$	0.18	−0.39	−0.43	0.29	0.14	1	0.00%
Mean BMI	25	$B=0.01$	0.01	1.36	−0.004	0.02	1.84	1	8.17%
Publication type							0.07	1	0.00%
Journal	30	$d=-0.26$***	0.04	−6.44	−0.34	−0.18			
Dissertation	3	$d=-0.31$*	0.15	−1.98	−0.61	−0.004			
Region							12.52***	1	35.50%
Western	27	$d=-0.32$***	0.04	−8.86	−0.39	−0.25			
Eastern	6	$d=-0.02$	0.08	−0.20	−0.17	0.14			
Survey method							3.08	1	5.45%
Online	22	$d=-0.21$***	0.05	−4.65	−0.30	−0.12			
Paper and pencil	9	$d=-0.36$***	0.07	−5.02	−0.50	−0.22			
Weight status							3.56	1	7.05%
Obesity/overweight sample	16	$d=-0.33$***	0.06	−5.99	−0.44	−0.22			
Mixed	16	$d=-0.19$***	0.05	−3.87	−0.29	−0.09			
Clinical status							0.0002	1	0.00%
Clinical	4	$d=-0.27$*	0.13	−2.05	−0.52	−0.01			
Nonclinical	29	$d=-0.27$***	0.04	−6.41	−0.35	−0.19			
Age category							0.002	1	0.00%
Children and adolescents	3	$d=-0.29$*	0.12	−2.45	−0.52	−0.06			
Adults	29	$d=-0.28$***	0.04	−7.08	−0.36	−0.20			
Measures							17.79***	2	43.01%
WBIS-original version	10	$d=-0.45$***	0.06	−6.97	−0.57	−0.32			
WBIS-modified versions	17	$d=-0.30$***	0.04	−6.46	−0.35	−0.19			
WSSQ	6	$d=-0.03$	0.07	−0.43	−0.18	0.11			

*$p<0.05$.
***$p<0.001$.

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For the cisgender samples, the moderator analyses indicated that three variables contributed to the heterogeneity of effect sizes: percentage of participants with overweight/obesity ($Q = 4.35$, $p = 0.037$), accounting for 17.09% of the heterogeneity, geographic region ($Q = 4.02$, $p = 0.045$), accounting for 11.19% of the heterogeneity, and measures used to assess WBI ($Q = 10.65$, $p = 0.005$), accounting for 20.30% of the heterogeneity. The percentage of participants with overweight/obesity was negatively associated with the observed gender differences in WBI ($b = -0.14$; 95% CI, −0.27, −0.01; $p = 0.037$), indicating that the gender differences in WBI (i.e., cisgender girls and women reporting higher WBI than cisgender boys and men) were heightened as the percentage of participants with overweight/obesity increased. The absolute pooled d value for studies from Eastern countries ($d = -0.20$; 95% CI, −0.30, 0.10; $p < 0.001$) was significantly lower than that from Western countries ($d = -0.31$; 95% CI, −0.35, −0.27; $p < 0.001$), indicating that cisgender girls and women reported higher WBI than cisgender boys and men in Western countries than in Eastern countries. The absolute pooled d value for studies using the original WBIS ($d = -0.3183$; 95% CI, −0.38, −0.25; $p < 0.001$) was slightly higher than the modified WBIS ($d = -0.3179$; 95% CI, −0.37, −0.27; $p < 0.001$), followed by studies using the WSSQ ($d = -0.14$; 95% CI, −0.24, −0.03; $p = 0.009$), indicating that gender differences (cisgender girls and women reported higher WBI than cisgender boys and men) were the highest when the original WBIS was used, followed by the modified WBIS, and then the WSSQ. The moderating roles of other variables were not significant (Table 2).

3.6 | Publication Bias

The funnel plots constructed were symmetrical (Figure S3). Egger's regression tests identified no significant publication bias (biological sex groups: $z = -0.96$, $p = 0.336$; cisgender groups: $z = -0.55$, $p = 0.585$; cisgender boys and men vs. gender-diverse people: $z = -0.92$, $p = 0.357$; cisgender girls and women vs. gender-diverse people: $z = 1.86$, $p = 0.062$).

4 | Discussion

In this systematic review with four meta-analyses based on 100 studies, we quantitatively reviewed sex and gender differences in WBI and potential moderators. The random-effects models showed that biological/cisgender girls and women reported higher WBI than biological/cisgender boys and men, with small pooled effects. Furthermore, gender-diverse people reported higher WBI than both biological/cisgender boys and men and biological/cisgender girls and women, with medium and small effects, respectively. Geographic region and WBI measures emerged as significant moderators contributing to the heterogeneity of prior findings on sex and gender differences between biological/cisgender boys and men and biological/cisgender girls and women in WBI. The percentage of participants with overweight/obesity was a significant moderator of gender differences between cisgender comparisons in WBI.

The higher WBI among biological/cisgender girls and women compared with biological/cisgender boys and men may reflect greater exposure to weight-based stigmatization and a stronger tendency to internalize negative weight stereotypes, partly due to cultural factors [58] and societal pressures that emphasize thinness for women [59]. For instance, women with larger body sizes face disproportionate social stigma, including discrimination in employment, lower income, and harsher workplace treatment [60], which may intensify internalized weight stigma. These experiences likely contribute to the observed sex and gender differences in WBI, as females/women may internalize societal biases against larger body weights more readily than males/men. Regarding the comparisons between biological/cisgender groups and gender-diverse people, one possible explanation for heightened WBI among gender-diverse people is the intersection of weight concern with gender identity-related concerns. Research has demonstrated that gender-diverse people may experience distress in response to gender dissociation and body size and subsequent body dissatisfaction [61], which may in turn lead to and/or reinforce WBI. This dual concern may lead to a more profound internalization of negative weight-related attitudes, as these individuals may feel a compounded pressure to conform to both gender and body norms.

The percentage of participants with overweight/obesity was a significant moderator of gender differences between cisgender comparisons in WBI. One potential explanation for this pattern is the differential societal pressures and body image ideals imposed on men and women. Women, and particularly those with overweight or obesity, are often subject to more intense scrutiny and negative evaluations regarding their body size and shape compared with men [33]. These societal pressures can exacerbate internalized weight bias, as women may feel a greater need to conform to unrealistic body standards, leading to higher levels of WBI. The media also plays a significant role in perpetuating these gendered differences. Research has shown that media representations of ideal body types are more rigid and narrowly defined for women, often portraying thinness as a critical component of beauty [62]. This chronic exposure to idealized body images may increase body dissatisfaction and internalized weight bias among women, particularly those with overweight or obesity who are furthest from thinness-oriented body ideals.

Geographic region (Western countries vs. Eastern countries) was a significant moderator in both biological sex and cisgender groups. The pooled effect size for Western samples was higher than that in Eastern samples in cisgender groups. In addition, the pooled effect size was significant in Western samples while not significant in Eastern samples, in both biological sex groups. In Western regions, cultural and societal pressures often emphasize thinness and the importance of physical appearance, particularly for women [63]. The pervasive media representations and beauty standards that prioritize slimness can lead to higher levels of WBI among women [63]. These standards are reinforced by social bias in settings such as the workplace that associate higher weight with lower work-related qualities and professional success [64], disproportionately affecting women and contributing to significant sex and gender differences in WBI. In contrast, Eastern countries such as China and Arabic nations may not emphasize thinness to the same extent. Additionally, collectivist cultural values

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TABLE 2 | Results of moderator analyses (cisgender groups).

	k	Parameter	SE	z	95% CI Lower limit	95% CI Upper limit	Q	df	R^2
Publication year	72	$B = 0.01$	0.01	1.49	−0.003	0.02	2.21	1	5.58%
Percentage of Caucasian	52	$B = -0.10$	0.08	−1.25	−0.25	0.06	1.56	1	7.40%
Mean age	65	$B = 0.001$	0.002	0.37	−0.003	0.004	0.14	1	0.00%
Percentage of participants with overweight/obesity	49	$B = -0.14$*	0.18	−2.09	−0.27	−0.01	4.35*	1	17.09%
Mean BMI	60	$B = 0.0003$	0.004	0.08	−0.01	0.01	0.01	1	0.00%
Publication type							0.86	1	3.62%
Journal	61	$d = -0.29$***	0.02	−13.49	−0.33	−0.24			
Dissertation	11	$d = -0.34$***	0.06	−6.16	−0.45	−0.23			
Region							4.02*	1	11.19%
Western	64	$d = -0.31$***	0.02	−14.78	−0.35	−0.27			
Eastern	8	$d = -0.20$***	0.05	−3.94	−0.30	−0.10			
Survey method							0.66	1	0.27%
Online	42	$d = -0.28$***	0.03	−10.97	−0.33	−0.23			
Paper and pencil	23	$d = -0.32$***	0.04	−8.37	−0.39	−0.24			
Weight status							1.94	2	0.00%
Obesity/overweight sample	28	$d = -0.34$***	0.03	−10.00	−0.41	−0.27			
Not obesity/overweight sample	4	$d = -0.27$***	0.08	−3.30	−0.42	−0.11			
Mixed	36	$d = -0.28$***	0.03	−10.09	−0.34	−0.23			
Clinical status							0.76	1	0.00%
Clinical	11	$d = -0.12$***	0.06	−3.86	−0.37	−0.12			
Nonclinical	60	$d = -0.26$***	0.02	−14.43	−0.34	−0.26			
Age category							1.34	1	2.85%
Children and adolescents	11	$d = -0.17$***	0.04	−5.85	−0.33	−0.17			
Adults	59	$d = -0.26$***	0.02	−13.77	−0.35	−0.26			
Measures							10.65**	2	20.30%
WBIS-original version	24	$d = -0.32$***	0.03	−9.72	−0.38	−0.25			
WBIS-modified versions	37	$d = -0.32$***	0.03	−12.31	−0.37	−0.27			
WSSQ	10	$d = -0.14$**	0.05	−2.60	−0.24	−0.03			

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

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prevalent in many Eastern societies might buffer against the internalization of weight bias by emphasizing community and family over individual physical appearance [65]. However, it is important to note that this difference may also result from the underrepresentation of studies in Eastern cultural contexts. This highlights the need for further research in diverse cultural settings to better understand the global patterns of WBI. Furthermore, the impact of body-related content on social media can result in less pronounced sex and gender differences in WBI. For example, recent analyses of body-positive content on Xiaohongshu, a popular Chinese social media platform, reveal a predominance of positive body image themes (79.84%) [66]. This result highlights the need for culturally tailored interventions and public health strategies considering these differences.

The variable of WBI measurement was another significant moderator in both biological sex and cisgender groups. The pooled effect sizes for studies using the WBIS-original version [10, 67] and studies using the WBIS-modified versions (e.g., WBIS-M [68] and WBIS-C [35]) were similar and significantly larger than the pooled effect sizes of studies using the WSSQ [69] in cisgender groups. The findings were similar in biological sex groups, except that the pooled effect sizes for studies using the WSSQ were not significant. This difference may be attributed to the WSSQ's Fear of Enacted Stigma subscale, which partly assesses anticipated stigma (i.e., fear of future discrimination) rather than solely internalized stigma (i.e., personal acceptance of negative weight-related stereotypes). As internalized stigma is the primary focus of this meta-analysis, the WBIS and its modified versions, which more directly measure WBI, likely capture sex and gender differences more effectively, contributing to larger effect sizes in these analyses. Furthermore, a study assessing the reliability, convergent validity, and predictive values for psychosocial health outcomes between the WSSQ and WBIS found the latter measure to have superior internal consistency [70]. Notably, this research did not include other modified versions of the WBIS. Therefore, for future research focusing on sex and gender differences in WBI, the WBIS and its modified version may yield more sensitive results.

Overall, the findings of this meta-analysis underscore the importance of tailored interventions that address the unique pressures and experiences related to sex and gender differences in WBI. Notably, gender-diverse individuals appear to be particularly vulnerable to WBI, with pronounced differences observed when compared with cisgender individuals. This highlights the necessity of culturally sensitive public health strategies that consider geographic variations in WBI and the distinct needs of gender-diverse populations. Careful selection of measurement tools is also crucial to accurately capture the nuances of WBI across different gender identities. Interventions should promote healthy body image and self-acceptance and address the impact of social comparisons and media influences as potential targets in reducing WBI. Additionally, longitudinal research is essential for understanding the long-term effects of WBI, and policymakers should implement anti-discrimination policies and create supportive environments that promote body diversity and acceptance, ultimately fostering positive body image and well-being across diverse populations.

Although the present meta-analysis helps elucidate the literature on the role of sex and gender differences in WBI, there are several limitations and future research directions. First, data from ongoing research, non-English publications, and unpublished literature, aside from doctoral dissertations, were not included in the analyses. The limited number of available studies also restricts the scope of our meta-analytic conclusions for gender-diverse groups. Including all available sources may reduce the likelihood of missing relevant studies. Second, although this meta-analysis examined several potential moderators, other potential factors (e.g., socioeconomic status) warrant further consideration. For example, studies examining sex and gender and socioeconomic status in relation to WBI-related constructs found that higher socioeconomic status was associated with a lower risk of obesity [71] but a higher odds ratio of perceived overweight status in both men and women [72]. Recent research reveals that WBI is higher among females and individuals with lower socioeconomic status [68], highlighting the importance of exploring the interaction between sex and gender and socioeconomic status on WBI. Third, future research on WBI should focus more on observed differences among gender-diverse groups, such as transwomen, transmen, and nonbinary individuals. Given that WBI may be more pronounced in groups that internalize the thin ideal more strongly, such as transwomen [14], this area warrants significant attention in both academic research and clinical practice [73]. Fourth, the use of sex and gender in some studies was mixed or unclear [74–76], which may impact the findings in the current study. Future research should describe sex *and* gender more clearly to further clarify sex and gender differences in WBI. Finally, tailored clinical interventions to address WBI across sex and gender groups are needed. For biological/cisgender women, interventions may consider targeting internalized weight stigma by addressing societal pressures and discriminatory experiences, such as workplace bias. For gender-diverse individuals, who exhibited the highest WBI, interventions may consider incorporating gender-affirming care alongside WBI reduction strategies, such as mindfulness-based approaches to mitigate the impact of dual stigmas. It is also likely that oppressive messages that reinforce WBI (e.g., fatphobia) among gender-diverse individuals interact in complex ways with other oppressive messages around gender identity (e.g., gender minority stress), which may introduce important ways in which WBI interventions can become more culturally adapted for this vulnerable group. Importantly, longitudinal research is needed to evaluate the efficacy of these interventions and their long-term impact on mental health outcomes, such as depression and disordered eating, which are linked to WBI.

5 | Conclusions

The present meta-analysis showed that biological/cisgender girls and women report higher WBI than biological/cisgender boys and men, and gender-diverse people reported higher WBI than both cisgender women and men. Sex and gender differences between biological/cisgender people in WBI were moderated by geographic region (Eastern vs. Western countries) and WBI measurements (WBIS vs. WBIS modifications vs. WSSQ), and gender differences in WBI were also moderated

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by the percentage of participants with overweight/obesity. More research is warranted to further explore the mechanisms underlying sex and gender differences in WBI, which can contribute to the development of effective resources to help reduce WBI in individuals of different sexes and gender identities.

Author Contributions

Tianxiang Cui: formal analysis, writing – original draft, writing – review and editing. **Jiaxuan Xi:** writing – original draft. **Wesley R. Barnhart:** writing – original draft, writing – review and editing. **Hongyi Sun:** investigation, writing – review and editing. **Shuqi Cui:** investigation, writing – review and editing. **Wanzi Li:** investigation, writing – review and editing. **Yining Lu:** investigation, writing – review and editing. **Jason M. Nagata:** writing – review and editing. **Jinbo He:** conceptualization, supervision, funding acquisition, methodology, project administration, writing – original draft, writing – review and editing.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

These data are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Figure S1:** Flow diagram of search strategy and study selection. **Table S1:** Study characteristics of biological sex samples. Table S2: Study characteristics of cisgender samples. **Table S3:** Study characteristics of cisgender boys and men and gender-diverse people. **Table S4:** Study characteristics of cisgender girls and women and gender-diverse people. **Figure S2:** Forest plot of the four comparisons. **Figure S3:** Funnel plot of the four comparisons. **Table S5:** Quality assessment table.

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