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Normative body image development: A longitudinal meta-analysis of mean-level change

Emilie Lacroix [a,*], Alyssa J. Smith [b], Incé A. Husain [a], Ulrich Orth [c], Kristin M. von Ranson [b]

[a] Department of Psychology, University of New Brunswick, 38 Dineen Dr., Fredericton, NB E3B 5A3, Canada
[b] Department of Psychology, University of Calgary, 2500 University Dr. NW, Calgary, AB T2N 1N4, Canada
[c] Department of Psychology, University of Bern, Fabrikstrasse 8, 3012 Bern, Switzerland

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ABSTRACT

This meta-analysis synthesized longitudinal data on mean-level change in body image, focusing on the constructs of body satisfaction and dissatisfaction, body esteem, perceived attractiveness, valuation, self-objectification, and body shame. We searched five databases and accessed unpublished data to identify studies that assessed body image at two or more time points over six months or longer. Analyses were based on data from 142 samples representing a total of 128,254 participants. The age associated with the midpoint of measurement intervals ranged from 6 to 54 years. Multilevel metaregression models examined standardized yearly mean change, and the potential moderators of body image construct, gender, birth cohort, attrition rate, age, and time lag. Boys and men showed fluctuations in overall body image with net-improvements between ages 10 and 24. Girls and women showed worsening body image between ages 10 and 16, but improvements between ages 16 and 24. Change was greatest between ages 10 and 14, and stabilized around age 24. We found no effect of construct, birth cohort, or attrition rate. Results suggest a need to revise understandings of normative body image development: sensitive periods may occur somewhat earlier than previously believed, and body image may show mean-level improvements during certain age ranges.

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* Corresponding author.
E-mail address: emilie.lacroix@unb.ca (E. Lacroix).

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1. Introduction

1.1. Body image

Body image encompasses thoughts, beliefs, feelings, and behaviors related to one's physical appearance, weight, and other body characteristics (Cash, 1994; Cash et al., 2002). It is a multidimensional psychological construct that includes an evaluative component centered on appraisals of one's body parts, shape, weight, and/or appearance, frequently operationalized by measures of body satisfaction (e.g., Wright, 1988) and dissatisfaction (e.g., Garner et al., 1983), as well as the centrality of body and appearance to one's self-evaluation or self-concept, and the extent to which one is concerned by deviations from internalized body ideals– i.e., the importance placed on appearance, termed *valuation* or *over*valuation (e.g., Cash & Smolak, 2011). Body image also encompasses more specific constructs such as body shame, the emotional experience of worthlessness that stems from perceived failure to meet internalized beauty ideals (Claudat et al., 2012); and self-objectification, a process which occurs when one views oneself through the lens of an objectifying observer (Adams et al., 2017). Recently, there has also been increased focus on *positive* body image, which is distinct from negative body image, and includes constructs such as body appreciation, body functionality, and body acceptance (Tylka & Wood-Barcalow, 2015). Past decades have seen a proliferation of research on body image, resulting in a large variety of measures available to assess these numerous and overlapping constructs of body image (Kling et al., 2019).

Disturbances in body image have been established as "the most consistent and robust causal risk factor for all forms of eating disorders (EDs) in both genders" (Dakanalis et al., 2015b, p. 87). In addition to eating disorders, negative body image predicts many other adverse outcomes including poorer overall physical and mental health (Muennig et al., 2008); depressive symptoms (Murray et al., 2018) and lower self-esteem (Blashill et al., 2016; Paxton et al., 2006; Sharpe et al., 2018); avoidance of social interactions (Mills et al., 2014); cigarette smoking initiation (Howe et al., 2017), and negative sexual health outcomes (Blashill et al., 2016). Unfortunately, negative body image is so prevalent that it has come to be understood as the norm rather than the exception, which led to the coining of the term "normative discontent" (Rodin et al., 1984). Indeed, negative body image is common in most regions and populations where it has been studied (Fiske et al., 2014). Body image concerns have been found to emerge in children as young as age 6 (Lowes & Tiggemann, 2003; McCabe & Ricciardelli, 2004; Schur et al., 2000), and although estimates have varied depending on study sample and methodology, 40–50% of school-age children (6–12 years) typically report dissatisfaction with at least one aspect of their body size or shape (Smolak, 2011). By adolescence, over 70% of girls may report a desire to change their weight or shape (Wertheim & Paxton, 2011). Estimates of the prevalence of body dissatisfaction among adults have varied widely, from 11% to 72% among U.S. adult women, and 8–61% among men (Fiske et al., 2014).

1.2. Gender differences in body image

A well-established finding is that body image is impacted by both sex (biological constructs) and gender (social constructs; Mauvais-Jarvis et al., 2020) such that people assigned female sex at birth, and people who identify as women, tend to have more negative body image than cisgender men (Hartmann et al., 2019). Boys and men tend to display more positive body image than girls and women at every age (Hilbert et al., 2012; Murnen, 2011), though this gap may be narrowing in younger generations (Hockey et al., 2021). Gender differences also influence the *types* of body image concerns reported: boys and men are more likely to desire an increase in weight or muscle mass, whereas girls and women more typically report concerns oriented toward thinness (McCabe & Ricciardelli, 2004). Though research on body image has historically focused predominantly on girls and women, there is increasing recognition that people of *all* genders can and do experience negative body image; this includes not only boys and men, but also people who identify as transgender, and other gender minorities (Hartmann et al., 2019; Matsumoto & Rodgers, 2020; Romito et al., 2021). Compared to cisgender women, people who identify as transgender may be at even higher risk for eating pathology and negative body image, though gender-affirming hormone therapy may at least partially alleviate these concerns (Sequeira et al., 2017).

1.3. Longitudinal research on body image development

How does body image typically change over the lifespan? Previous literature has characterized adolescence, specifically the ages of 12–18 years, as a sensitive period in body image development for boys and girls (Voelker et al., 2015), during which body image tends to worsen most severely, and when risk and protective factors may have the greatest impact. In addition to gender differences in absolute levels and types of body image concerns endorsed, there may also exist gender differences in how body image changes across the lifespan. Though men appear to experience lower absolute levels of body dissatisfaction and valuation of appearance, they may show stable or increasingly negative body image later in life (Brown et al., 2020). Contrastingly, it is commonly believed that women attach less importance to their bodies and appearances as they age, despite their physical appearances typically moving further away from internalized beauty ideals, and potentially reporting increasing dissatisfaction with their aging bodies over time (Grogan, 2011).

Unfortunately, no longitudinal studies have yet spanned the entire lifespan. As such, current understandings of body image development stem from longitudinal studies that have followed cohorts over particular age periods, as well as cross-sectional research comparing people of different ages. When longitudinal studies are compared closely, their findings are somewhat conflicting with regards to mean-level patterns of body image change across the life span. For example, Project Eating and Activity in Teens and Young Adults (Project EAT), one of the largest and longest longitudinal studies of body image to date, has followed several large cohorts of boys and girls, assessing body dissatisfaction at regular intervals between ages 12–31 (University of Minnesota Division of Epidemiology and Community Health, 2020). In Project EAT cohorts, body dissatisfaction increased consistently between ages 15 and 25, then showed a slight decrease by age 31, in both males and females (Neumark-Sztainer et al., 2018). Contrastingly, the Minnesota Twin Family Study found steady increases in body dissatisfaction among girls from age 11 to age 29 (Lowe et al., 2019). The Growing Up Today Study found that mean-level body dissatisfaction plateaued around age 14 for boys, but continued to increase through age 18 for girls (Calzo et al., 2012). Another large-scale cohort study is the Norwegian Longitudinal Health Behavior Study, which has followed population-based cohorts from approximately age 14–30 (Winpenny et al., 2018) and measured body *satisfaction*, rather than dissatisfaction. The observed pattern of mean-level body satisfaction development paralleled what was observed for body dissatisfaction in Project EAT: among boys, body satisfaction increased from adolescence to age 21, and then leveled off by age 30; girls showed a similar trend, with a small decrease at age 15 (Holsen et al., 2012). If body satisfaction and dissatisfaction measure opposite ends of a single continuum, or are at least negatively related, this result is surprising. Do body satisfaction and dissatisfaction change in distinct and unrelated ways across the lifespan, or might these disparate findings reflect the unique methods of these studies, as well as individual and cultural differences among the different populations sampled?

Even when considering only the reductive constructs of body satisfaction and dissatisfaction and attempting to describe normative development during the most well-studied portions of the lifespan (i.e., adolescence and young adulthood), no clear picture of normative development emerges. When we begin to consider the plethora of ways in which body image has been defined and operationalized (Kling et al., 2019), and to take stock of the paucity of longitudinal research examining change in body image among older adults (Roy & Payette, 2012) and men in particular (Matsumoto & Rodgers, 2020), it becomes clear that there is no simple answer to the deceptively simple question of what constitutes normative body image development.

1.4. Moderators of body image development

In addition to gender differences, several other methodological factors and sample characteristics may help explain disparate findings regarding normative body image development. First, patterns of change in body image may depend on the particular body image construct assessed. For example, do body dissatisfaction and valuation change in distinct ways across the lifespan? With a growing array of positively and negatively valanced body image constructs being studied (Kling et al., 2019), it is important to understand the extent to which these constructs change in parallel, or evolve differently over the lifespan.

Second, birth cohort membership may also explain differences in patterns of body image development. Participants who are similar in age at the time of data collection for a given study have lived through shared social, cultural, and historical changes (Trzesniewski & Donnellan, 2010), which may contribute to producing patterns of body image development distinct from other generations. Indeed, birth cohort effects have been shown to modulate absolute levels of body satisfaction among women (Hockey et al., 2021), as well as levels of global self-esteem (Gentile et al., 2010) such that more recent generations have reported higher body satisfaction and self-esteem. Paradoxically, the age of onset of eating disorders may be decreasing in younger generations (Favaro et al., 2019). In cross-sectional studies that have compared levels of body image constructs among people of different age groups, age and cohort effects are confounded (e.g., Watt & Konnert, 2020), and we cannot be sure whether group differences are due to age-related development or generational differences.

Third, to the extent that participants who drop out of longitudinal studies differ meaningfully from those who remain in these studies, sample attrition can bias results, threatening the representativeness of samples and consequently the external validity of the findings (Barry, 2005). For example, if participants with worsening or improving body satisfaction selectively drop out of longitudinal studies at higher rates, the emerging picture of normative body image development would be biased in one of these directions. Accordingly, it is important to investigate the potential influence of attrition in the longitudinal studies upon which we base our understandings of how body image develops over long time periods.

Fourth, when considering mean-level change in a variable over time, the magnitude of this change is partly dependent on the time lag, or amount of time that elapses between measurement intervals.

Accordingly, when considering the stability or change of a variable over time, the duration of this time lag should be examined. Developmental scientists have considered time lag important enough to warrant proposing an entire methodological framework for modeling its influence on primary studies within meta-analyses: the Lag as Moderator Meta-analysis (LAMMA) approach (Card, 2018). Examining the potential moderating roles of birth cohort, attrition rates, and time lag is critical to disentangle these factors from true age-related development of body image.

1.5. The present study

The current study represents the most comprehensive meta-analytic synthesis of longitudinal studies on body image to date. Our aim was to provide as complete as possible a picture of normative body image development across the lifespan, using meta-analytic techniques to synthesize mean-level change in body image over time, and to model the influences of age, gender, construct, birth cohort, attrition, and time lag.

Meta-analysis affords many advantages over any single longitudinal study (Roberts et al., 2001). First, synthesizing studies to estimate average developmental trends, weighted by sample size, effectively controls for the particularities of individual samples, and provides greater statistical power and precision. To the extent that mean-level change is consistent across studies, normative developmental trends may emerge, with greater potential for generalizability beyond any single primary study. Second, a meta-analysis can describe all parts of the lifespan for which primary data are available, exceeding the time span of any primary longitudinal study. To the extent that primary studies cover the lifespan, compiling this data can address important questions, such as whether body image changes more during specific time periods (e.g., early vs. late adolescence), and whether and when mean-level body image stabilizes. Third, exploring potential moderators of body image development can capture some of the complexities of this research topic and potentially clarify contradictory results. Providing a precise and evidence-based representation of normative body image development across the lifespan may inform developmental theory, as well as the timing and delivery of interventions designed to promote positive body image and prevent eating disorders.

1.5.1. Normative body image development

We sought to paint a comprehensive, broad-strokes picture of mean-level change in body image for every part of the lifespan for which sufficient data were available, across all constructs of body image. We described normative age-related development of overall body image, providing estimates of mean-level change per year pooled across all samples, as well as separately based on sample gender. In line with prior research and theoretical understandings (Voelker et al., 2015; Wertheim & Paxton, 2011), we hypothesized that the greatest magnitude of change in mean-level body image would occur between the ages of 12 and 18, representing a critical period for typically developing girls and boys. Given the conflicting findings of primary longitudinal studies, we made no hypotheses regarding when body image would stabilize.

1.5.2. Moderators of mean-level change in body image

We simultaneously examined the impact of several potential moderators (gender, construct, birth cohort, age, attrition, and time lag) to determine to what extent they influenced the magnitude and direction of mean-level change in body image. Time lag was modeled as a moderator in accordance with the LAMMA approach (Card, 2018).

In meta-analysis, one value represents the entire sample for each moderator variable at each time point. Thus, meta-analysis is appropriate for testing the effects of moderators at the sample level, but not at the individual participant level. We acknowledge that many other factors (e.g., BMI, pubertal status) influence body image development at an individual level; primary studies are better positioned to examine the effects of such moderators, for which there is substantial within-study heterogeneity.

1.5.2.1. Gender. Though there are well-established gender differences in the type and absolute levels of body image concerns endorsed, evidence is mixed regarding how gender influences the magnitude and direction of change in body image over time. Given the results of a previous longitudinal study where we found that girls were more likely than boys to demonstrate trajectories of low body esteem (Lacroix et al., 2020), we expected to find a less favourable normative pattern of body image development for girls and women than for boys and men, characterized to a greater extent by worsening body image over time.

1.5.2.2. Construct. We examined whether the specific body image constructs assessed showed different developmental trajectories, by including these constructs as moderators in a multilevel meta-analytic regression model. Wherever sufficient data were available, we also plotted mean-level change separately for each body image construct for the aggregate meta-analytic sample, as well as separately for all-male and all-female samples.

We expected that the construct of valuation would show significantly different patterns of mean-level change across the lifespan, compared to other body image constructs. Consistent with a prior scoping review of body image development among adults older than the typical age of college students (Tiggemann, 2004a), we expected to find relative stability in evaluative constructs such as body satisfaction, dissatisfaction, body esteem, and perceived attractiveness from the mid-twenties, at minimum. Conversely, based on the same review, we expected that valuation would show a decline over the lifespan, beginning in the early twenties.

1.5.2.3. Cohort. Prior studies have shown cohort differences in the absolute levels of body image concerns endorsed, but little is known about the impact of birth cohort on patterns of change over time. Thus, we made no hypotheses with regards to the impact of cohort on mean-level change over time.

1.5.2.4. Attrition and time lag. Attrition may impact study findings, to the extent that systematic attrition occurs. Similarly, it is important to model the impact of time lag to accurately represent age-related patterns of development. Thus, we examined attrition rate and time lag to increase confidence in the results of the current study.

1.5.3. Research Questions

1. How does mean-level body image change across the lifespan?
2. To what extent do the potential moderators of gender, construct, birth cohort, age, attrition, and time lag influence the magnitude and direction of mean-level change in body image?

2. Method

The present study was performed according to a pre-registered systematic review protocol (PROSPERO ID: CRD42020171926, registered April 28, 2020) and in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher et al., 2009).

2.1. Search strategy

Based on recommendations for database choice optimization in systematic reviews (Bramer et al., 2017), we systematically searched the databases EMBASE, Medline, Web of Science, PsycINFO, and ProQuest Dissertation & Theses in January 2020. No language or date range restrictions were applied to the search. Keywords related to body image and development were identified by reviewing relevant known studies. After testing a preliminary search strategy, search terms were modified to ensure retrieval of known relevant studies. In the final search, electronic databases were searched with comprehensive themes surrounding body image (using keywords such as "body image" and "body dissatisfaction") and longitudinal design or development over the lifespan (using keywords such as "longitudinal," "development," and "lifespan"). Appendix A presents the full search strategy. To minimize the impact of publication bias, we considered full text articles, dissertations, theses, conference abstracts, and unpublished data for inclusion. In addition to our systematic search, we circulated calls for unpublished data through Dr. Michael Levine's Body Image Prevention/Sociocultural Factors email newsletter, and through the Academy for Eating Disorders discussion communities (Main Discussion, and Body Image and Prevention).

In cases where we retrieved records but could not access full text copies of the research through academic databases or interlibrary loan, we contacted authors to request copies of full texts and sent a second follow-up email if there was no response. We identified many articles describing studies that could possibly meet inclusion criteria, but which were missing information that we required for this meta-analysis (e.g., sample size, gender composition, participant age at each wave of data collection, body image outcomes at each wave of data collection). In these cases, authors were also contacted and reminded once. In total, 110 authors were contacted, and 31 of these contacts led to authors providing data that allowed us to include their studies in the meta-analysis. To test the sensitivity of our search strategy, we reviewed the reference lists from seven chapters of a widely-used handbook on body image (Cash & Smolak, 2011); our database searches retrieved 100% of relevant articles from these reference lists.

2.2. Selection procedures and inclusion criteria

In the first phase of screening, the first author examined titles and abstracts for eligibility using purposefully liberal inclusion/exclusion criteria. At this stage, only studies that clearly did not assess body image or employ a longitudinal design were excluded. In the second phase of screening, the first and second authors both independently reviewed all full texts to determine whether records met the following criteria:

1. Scores were reported on at least one measure of body image, based on reports by participants themselves (rather than a parent or other informant). Measures of body satisfaction, esteem, perceived attractiveness, dissatisfaction (incl. visual ratings of actual vs. ideal figures), valuation (incl. weight and shape concern), self-objectification, and body shame were considered for inclusion. We excluded studies that only assessed related constructs such as eating pathology, or more narrow constructs such as drive for thinness, thin-ideal internalization, muscularity concerns, and perceptions of weight status.
2. Body image scores were reported for at least one sample, on at least two measurement occasions spanning at least six months. We excluded studies where body image was reported retrospectively (i.e., where participants were asked to estimate their body image at earlier points in time).
3. Samples were nonclinical and drawn from normative populations, including students and twins. We excluded samples of individuals diagnosed with specific mental or physical health conditions (incl. eating disorders), samples drawn from specific population subgroups (e.g., gymnasts), or samples selected based on body image or eating pathology (e.g., people with high or low body dissatisfaction).
4. Studies were observational (i.e., did not include an intervention or use an experimental design) or, if reporting the results of an intervention trial, body image changes were described separately for a no-intervention control group. We excluded samples that received an intervention or experimental manipulation.
5. The age range of the sample was sufficiently homogenous. We excluded samples that had a participant age range larger than 5 years, unless data were reported separately for smaller samples with more homogenous ages. We also excluded studies where selective attrition led to participants of a certain age more frequently dropping out of the study, resulting in a mean age that decreased across study waves (due to the developmentally sensitive nature of our research question, such studies would have introduced error to the variables of age and time lag).
6. At minimum, data were available on mean-level body image (mean and standard deviation), sample size, and age of the sample at each time point.
7. The study abstract, at minimum, was written in English, French, German, or Portuguese (the first author was sufficiently proficient to extract data from articles published in those languages).

2.2.1. Rationale for inclusion and exclusion criteria

Our choices of inclusion and exclusion criteria were driven by theory and pragmatic considerations. Regarding constructs and measures (criterion #1), rapid expansion of body image research over the past decades has resulted in a plethora of available measures to assess positively and negatively valanced constructs of body image (Kling et al., 2019), and there are no consensus boundaries delineating precisely what is and is not body image. Consistent with Cash's definition of body image (Cash, 1994; Cash et al., 2002), we wanted to capture both negative and positive aspects of the evaluative component of body image, as well as the extent of valuation (i.e., investment, emphasis, and concern placed one one's body and appearance). We aimed to include studies that captured thoughts, beliefs, feelings, and behaviors related to one's overall physical appearance and body characteristics. A theoretical assumption underlying our analytic approach is that observed scores on the plethora of included body image measures are all indicators of the hypothetical latent variable of body image (Thompson et al., 1994). To further elucidate this theoretical assumption, we draw a comparison to the construct of intelligence, where latent general mental ability (or *g* factor) partially explains observed scores on tasks assessing different mental abilities, e.g., vocabulary, spatial reasoning, arithmetic (Warne & Burningham, 2019). Current models of intelligence accommodate both *g* and specific abilities (Kovacs & Conway, 2019), just as we assume that there is an underlying latent variable of global body image, as well as more specific domains of body image (e.g., body dissatisfaction, valuation/concern, etc.). As with general mental ability versus specific domains of intelligence, narrower domains of body image are intercorrelated, but the narrower a measure of body image is, the lower we would expect its correlation with the latent global body image factor to be. Because our analytic approach entailed pooling change estimates from studies that examined various constructs, we aimed to include only those body image constructs and measures that we believed would load somewhat strongly onto the hypothetical latent variable of global body image. For this reason, we chose to exclude the narrower constructs of drive for muscularity and drive for thinness. Prior studies examining conceptual relationships among body image constructs have provided evidence that the construct of drive for thinness is conceptually aligned with, but distinct from, body image (Sands, 2000); we consider drive for muscularity to be conceptually related to body image in the same way.

A pragmatic consideration that also impacted which constructs could be included, was the number of longitudinal studies available. Specifically, in order to generate a meta-analytic estimate for a given age range, at least two effect sizes are needed for that age range. We also initially intended to include studies that assessed body functionality and body appreciation, but the number of longitudinal studies that reported on these constructs was also too small to generate meta-analytic estimates, and thus these studies were excluded. This was also the case for muscularity concerns. We considered excluding the constructs of weight esteem, weight concerns, and weight satisfaction for theoretical reasons. However, there was a great deal of literature on these constructs, as well as more global body image measures that included items on weight, so in this case, we included those studies to maximize statistical power and our ability to represent the lifespan.

Regarding study duration (criterion #2), we included studies were at least six months long to emphasize the developmental nature of our research questions. If a study only assessed body image twice at measurement intervals three months apart, for example, it would be unclear whether any observed changes in body image represented developmental changes or rather, fluctuations in body image due to other reasons, such as different mood states at data collection. Prior longitudinal meta-analyses of mean-level change have employed this criterion (e.g., Orth et al., 2021; Orth et al., 2018), and in some cases, had an even longer study duration requirement (e.g., Roberts et al., 2006).

Our reason for excluding samples with participant age ranges larger than 5 years (criterion #5) was to ensure homogeneity of samples with regard to age, such that the included studies could provide valid, developmentally sensitive estimates of age-related change in body image. If a sample had higher variability in age (e.g., data were lumped together for participants from age 12–25), it would be unclear whether observed changes in body image were related to the average age in the sample. This cut-off aligned with a previous study that employed a similar design (Orth et al., 2018).

In many cases, multiple articles reported on data from the same sample. In such cases, we included the study that included the largest number of participants from the sample, covered the longest total time span, and/or contained the most precise information about subgroups (e.g., separate data by gender).

2.2.2. Training and agreement among screeners

For the second author to become familiar with screening procedures, she was able to view the first author's decisions and consult her when screening the first 50 records during full-text review. Except for these first 50 articles, the first and second authors were blind to each other's decisions during screening. Excluding non-English-language articles ($k = 16$) and articles that could not be located ($k = 13$), as well as the first 50 articles, Kappa for the 567 full texts screened in Phase 2 was .85 (considered in the "almost perfect agreement" range; McHugh, 2012). Disagreements were resolved by consensus.

2.3. Data extraction and coding

2.3.1. Sample size and attrition

Studies handled attrition in various ways. In cases where attrition was reported but data were only provided for participants who had complete data at all time points, we extracted these data as well as attrition rates for the total sample (between each wave, where available), and reported the N as the number of participants with complete data (i.e., the smaller number). In cases where imputed data were reported, we extracted imputed data and attrition rates for the total sample and reported the N as the number of participants without missing data. In cases where only complete data were reported, with no imputation, we computed attrition rates based on the number of participants for whom data were available at each wave. When only one attrition rate was reported across three or more study waves, this rate was divided by n-1, where n = the number of study waves, to spread attrition out equally over the study waves. Using a four-wave study as an example, if a sample size of 200 was reported at Time 1, and overall retention was reported as 80%, but sample size was not reported at Times 2 or 3, we estimated that 6.66% of participants were lost between each wave– in this case, the n would be extracted as 200 for Time 1, 187 at Time 2, 173 at Time 3, and 160 at Time 4.

2.3.2. Gender

Although we recognize the distinction between sex and gender, many empirical research studies tend to conflate these constructs. For example, studies often phrase questions to ask about biological sex, but only include response options that reflect subjective gender identity (i.e., man, woman; e.g., Sullivan, 2020), and at that, only these two gender identities. Constrained by the information reported in primary studies, many of which collected data decades earlier, when there was less awareness of best practices for collecting sex and gender data, we coded effect sizes based on whether they represented "all-male," "all-female," or mixed samples.

2.3.3. Ethnicity

Studies described the ethnocultural composition of samples in diverse ways, including participant ethnicity, nationality, and parental immigration status. The most commonly reported characteristic was the sample's ethnic composition. Due to the overwhelming majority of predominantly White samples, we coded effect sizes as '1' for predominantly White samples, and '0' for predominantly Non-White samples.

2.3.4. Age and measurement interval

For each study, we recorded the mean age of participants at each wave of data collection. In cases where precise ages were not given at each wave of data collection, we estimated ages at follow-up data collections by adding the follow-up interval to the mean age reported at baseline (e.g., if a study reported mean age at baseline was 14.5 years, and there were three waves of data collection spaced one year apart, age would be recorded as 15.5 at Time 2 and 16.5 at Time 3). Some studies only provided the age range of participants at baseline; in such cases, if we were unable to successfully contact the study authors, we kept the studies in our dataset, and assigned age values for each time point based on the midpoint of the age range reported for that time point.

Some studies did not report sample age, but provided descriptive information linked to age, and in some cases, the time of year that data were collected. In such cases, we assigned ages to the samples based on the typical age of individuals from that group. For example, American college freshmen who completed surveys in the middle of the Fall and Winter academic semesters would be assigned age values of 18.33 and 18.66 for each respective wave of data collection.

Given that our goal was to describe mean-level change in body image constructs across the lifespan, we conducted effect size analyses within age group. As in Orth et al. (2021) and Hoff et al. (2018), we assigned age categories (or age "bins") to each effect size estimate based on the midpoint of the sample's age between the times at which mean-level body image data were collected. These age bins enabled us to derive separate meta-analytic effect size estimates for different age periods, resulting in a description of average mean-level change across the lifespan. Each measurement interval within each study (e.g., Time 2 to Time 3 within a study) was categorized into an age bin by taking the midpoint of the measurement interval. Our choice of age bins was driven in part by the pool of included studies: we aimed to construct age bins that contained enough effect sizes to permit some confidence in our meta-analytic estimates. Below age 10 and above age 24, few studies were available for most body image constructs. Therefore, we constructed a single age bin from age 6 (i.e., the lowest age midpoint) to age 10, which contained only 9 studies and 18 effect sizes– this age bin could have been widened to include more studies, but this would have sacrificed developmental sensitivity by lumping in a wider range of ages into a single estimate. Data were denser between ages 10.1 and 24, so we constructed 2-year age bins within this age range– each bin contained 6–35 studies and 32–167 effect sizes. We constructed a single bin from age 24.1 to age 30, containing 8 studies and 43 effect sizes. No measurement intervals had a midpoint between age 30 and age 38. Our final bin included ages 38–54 years and contained four studies and thirteen effect sizes. Three effect size estimates from a single sample were based on an age midpoint that fell on the cusp of two bins; these effect sizes were assigned to the lower age bin (in this case, 16.1–18), because over 50% of the measurement interval fell within that age bin.

The time lag between assessments was coded separately for each interval within each sample. This variable reflected the time lag (in years) between each wave of data collection; for example, if age was 15.5 at Time 2 and 16.5 for Time 3, the measurement interval would be coded as 1. In cases where time interval was reported in months, the corresponding fraction of a year was coded.

2.3.5. Body image constructs

Rather than categorizing these assessment methods based on an a priori taxonomy of body image constructs, we coded constructs in a data-driven manner, reflecting the ways in which body image was measured in our meta-analytic sample. The first author extracted the names and items of body image measures from individual studies. We created a nominal variable reflecting the construct of body image that was assessed. Seven constructs captured the domains of body image for which the most longitudinal data are available, but not necessarily the most important constructs of body image. Body image has been measured in terms of positively valanced constructs, for which it would be considered desirable or healthy to have a higher absolute score and show increases over time (e.g., body satisfaction); or negatively valanced constructs, for which higher and/or increasing scores would be considered undesirable, pathological, or indicative of disturbances in body image (e.g., body dissatisfaction). The three positively valanced body image constructs represented in our dataset were: (a) Body Satisfaction, defined as the degree of satisfaction with specific areas or other characteristics of the body, including weight and appearance (as in the Body Image Questionnaire, Penelo et al., 2012); (b) Perceived Attractiveness, defined as self-perceptions about the attractiveness of one's body or appearance (as in the Body Attractiveness subscale of the Physical Self-Perception Profile for Children; Whitehead, 1995); and (c) Body Esteem, defined as the broader attitudes, evaluations, and feelings an individual holds about their body (as in the Body Esteem Scale; Franzoi & Shields, 1984). The four negatively valanced body image constructs represented in our dataset were: (d) Body Dissatisfaction, defined as dissatisfaction with specific areas or characteristics of the body (as in the Body Dissatisfaction subscale of the Minnesota Eating Behavior Survey; von Ranson et al., 2005); (e) Valuation, defined as the importance that someone places on their body, weight, and/or appearance, including distress and concern about body, weight, and/or shape (as in the Stanford Weight Concerns Scale; Killen et al., 1994); (f) Self-objectification, defined as viewing one's body as an outside observer, often in a critical or sexualizing way that reduces one's personhood and other aspects of their identity (as in the Body Surveillance subscale of the Objectified Body Consciousness Scale; McKinley & Hyde, 1996); and (g) Body Shame, capturing the emotional experience that may arise when the body does not conform to internalized ideals (as in the Body Shame subscale of the Objectified Body Consciousness Scale; McKinley & Hyde, 1996).

In cases where the first author was unfamiliar with the body image measure used, scale development articles and study method sections were read closely, to examine the content and purpose of the measure, and code the type of body image construct they assessed. In some cases, this coding was straightforward: for example, a study that used the Body Esteem Scale for Adolescents and Adults (Mendelson et al., 2001) would be coded as "body esteem" because the items and articulated purpose of the measure clearly align with this construct. In other cases, coding was less straightforward because the study assessed body image using a less common measure, or more specific concept. For example, the Appearance Anxiety Inventory (Veale et al., 2014) is a self-report measure that focuses on cognitive processes and safety-seeking behaviours that characterize distorted body image and associated shame. This measure arguably maps onto multiple constructs, including body image and body shame. However, upon inspection, the majority of this measure's items assess behaviours that map most closely onto the construct of valuation (i.e., over-concern with appearance and body), e.g., "I am focused on how I feel I look rather than on my surroundings," "I avoid situations or people because of my appearance." So, studies that employed the Appearance Anxiety Inventory were coded as assessing the construct of valuation. In yet other cases, body image was assessed using purpose-built measures: rather than using previously validated measures, a question or series of questions was written to assess body image. In these cases, we examined the questions to determine which construct they aligned most closely with.

Some studies reported data for multiple body image measures; in such cases, data for all body image measures were extracted. In addition to coding the specific construct assessed, we also coded whether the construct was positively or negatively valanced.

2.3.6. Mean body image change

To compute mean-level change in body image, we first extracted the mean and standard deviation of each body image measure at each wave of data collection. If studies provided body image data separately for independent subsamples (e.g., girls and boys), we extracted this data separately.

2.3.7. Cohort

Generational cohort reflected the estimated year of birth of each sample. Few studies reported birth year, and thus we approximated this value using the calculation provided by Hoff et al. (2018): for each study, we subtracted the age of participants at final data collection from the year of publication, minus 2 years (to account for the delay prior to publication). A similar formula was also used by Jin and Rounds (2012).

2.4. Data analysis

2.4.1. Effect size & sampling variance

Mean-level change between each wave of data collection was quantified using the standardized mean difference (Cohen's *d*), a single-group, pretest-posttest raw score effect size (Morris & DeShon, 2002). This metric is standardized in the units of the original scale and facilitates comparisons across independent samples with different assessment methods. We calculated standardized mean difference effect size using the formula provided by Morris and DeShon (2002), and also used by many others (e.g., Hoff et al., 2018; Orth et al., 2021; Roberts et al., 2006): for each data collection interval (e.g. Time 3 to Time 4), we subtracted the mean of the body image scores at the earlier time point (Time 3) from the mean at the later time point (Time 4) and divided this raw mean difference by the standard deviation of the raw scores at the earlier time point. We then standardized this variable as mean change per year (d_{year}) by dividing it by the time interval between Time 1 and Time 2. Accordingly, the effect size measure used in the present meta-analysis is expressed as a change-to-time ratio in *d* per year units (as in Orth et al., 2021; Orth et al., 2018), reflecting the magnitude of yearly change in standard deviation units of original scales. When meta-analyzed across many studies using diverse assessment methods, d_{year} can be said to represent the average yearly change that could be expected in standard deviation units of any given body image measure. Negative effect sizes denote a decrease, and positive effect sizes denote an increase, in the construct over time. For analyses that pooled all body image constructs (i.e., Research Question 1), we used inverse scores for effect sizes based on negatively valanced body image measures, to ensure that positive effect sizes (e.g., d_{year} =0.140) consistently indicated improvements in body image and negative effect sizes (e.g., d_{year} = −0.140) indicated worsening body image. For example, a d_{year} value of 0.140 for the age range of 14–16 would suggest that during this period, the average adolescent, all else being equal, could be expected to improve by 0.140 standard deviations per year on whatever measure of body image is used. From age 14–16, we would expect a cumulative improvement of 0.280 standard deviations.

For studies which reported data at three or more time points, effect sizes were computed for each sequential pair of measurements. For example, a study with three waves of data collection would have two effect sizes: one effect size representing change between the first and second waves, and a second effect size representing change between the second and third waves of data collection. Effect sizes were computed separately by gender, whenever studies provided sufficient data to do so. Some studies reported on separate subsamples, e.g., ethnic subgroups, or the body dissatisfaction of parents and children; in these cases, we extracted these data separately and retained any data that met our inclusion criteria.

We calculated within-study variance using a formula provided by Morris and DeShon (2002). This formula incorporates information about test-retest correlation to adjust the standard errors of the effect size estimates such that, all else being equal, effect sizes with higher test-retest correlation would have smaller standard errors (Roberts et al., 2006). Unfortunately, few studies in our sample reported test-retest correlation coefficients for body image measures. A previous review of body image measures (Kling et al., 2019) reported test-retest correlation coefficients for some of the measures represented in our review, however, the test-retest intervals were much shorter than the measurement intervals of studies included our meta-analytic dataset (i.e., typically 6 weeks at most, compared to our average time lag of approximately two years). To avoid inflating confidence in the results of the current meta-analysis, we assumed a conservative test-retest correlation of.50 across studies in our variance calculations, as in Orth et al. (2021), based on meta-analytic estimates of the longer-term test-retest correlation (i.e., rank-order stability) of measures of global self-esteem (Trzesniewski et al., 2003). To evaluate the impact of this choice, we compared estimates of d_{year} for overall body image calculated using within-study variance based on test-retest correlations of r = .25, .50, and .75. The influence of different test-retest correlation values was negligible, resulting in a maximum difference in d_{year} of .013 (M =.003; see Appendix B), indicating this choice had little impact on our results. As with d_{year}, we adjusted the variance for time lag, in this case dividing it by the squared time lag (Viechtbauer, 2019).

2.4.2. Preliminary analyses

We used two methods to assess whether publication bias impacted our data. First, we examined funnel plots for each body image construct. Funnel plots show the relationship between effect size and the precision of estimates (i.e., standard error of the effect size; Sutton, 2009); in the absence of publication bias, effect sizes can be expected to concentrate in a symmetrical funnel around the true population effect size. Funnel plots were also visually inspected to identify outlier effect sizes. Second, we employed Egger's regression test (Egger et al., 1997) of funnel graph asymmetry. Egger's regression test examines whether the funnel graph deviates significantly from a symmetrical shape, which would indicate publication bias.

We also conducted sensitivity analyses to examine the impact of outliers on our data. In addition to visually inspecting funnel plots, we used the "influence" function in the metafor package (Viechtbauer, 2010). This package computes and plots Cook's distance, which estimates the effect of deleting one observation from the dataset; to identify outliers, we used the common rule of thumb that any Cook's value above $4/n$ is deemed influential, where n is the number of effect sizes (Viechtbauer & Cheung, 2010). We examined potential outliers separately for each gender and age bin. For the purpose of sensitivity testing, we repeated meta-analytic computations of change in global body image without outlier effect sizes.

2.4.3. Meta-analytic structural equation modeling

Meta-analytic structural equation modeling enabled us to examine aggregate effect sizes, representing mean-level change during the different age periods across all included samples, for each body image construct. We used the meta-analytic structural equation modeling framework of Cheung (2008) to fit three-level meta-analytic models, estimating effect sizes of mean-level change in body image. To model within- and between-study variance, we followed multilevel meta-analytic modeling approach outlined by Assink and Wibbelink (2016). We estimated multi-level random-effects metaregression models (for weighted mean effect sizes across each age period) and mixed-effects metaregression models (to test moderators). Data were prepared in SPSS Version 28.0, and statistical analyses were performed in R version 4.2.0 using the rma.mv function of the metafor package (Viechtbauer, 2010). Effect sizes were weighted using the inverse variance method (Nyaga et al., 2014), which is standard practice in contemporary longitudinal meta-analyses (e.g., Briley & Tucker-Drob, 2013; Hoff et al., 2018; Orth et al., 2021; Orth et al., 2018). The inverse variance method weights effect sizes by the inverse of the sampling variance and the number of effect sizes drawn from sample; effect sizes that have greater precision and larger sample sizes are weighted more heavily. This method ensures that samples which contributed many effect sizes do not unduly influence the results, and that samples are not over-represented in the dataset when they reported scores on multiple body image measures, or multiple scores within an age category/body image construct. This approach allowed us to correct for non-independence of estimates wherever multiple effect sizes were drawn from the same sample (Hoff et al., 2018; McNeish et al., 2017).

2.4.3.1. Research question 1. To address our first research question (How does mean-level body image change across the lifespan?), we fit metaregression models to aggregate effect sizes (d_{year}) within age categories. These models investigated the average magnitude and direction of change per year across all body image constructs, during each age period. We estimated pooled change across the entire meta-analytic sample, as well as separately for all-male and all-female samples.

2.4.3.2. Research question 2. To address our second research question (Do gender, construct, birth cohort, attrition, and time lag moderate mean-level change in body image?), we examined whether mean-level change in body image constructs was moderated by gender, construct, cohort, attrition rate, and time lag, controlling for the linear and quadratic effects of age. To increase statistical power and reduce the possibility of Type I error (Hoff et al., 2018), we conducted an omnibus test to simultaneously investigate the unique impact of each of these potential moderators on overall effect sizes across all

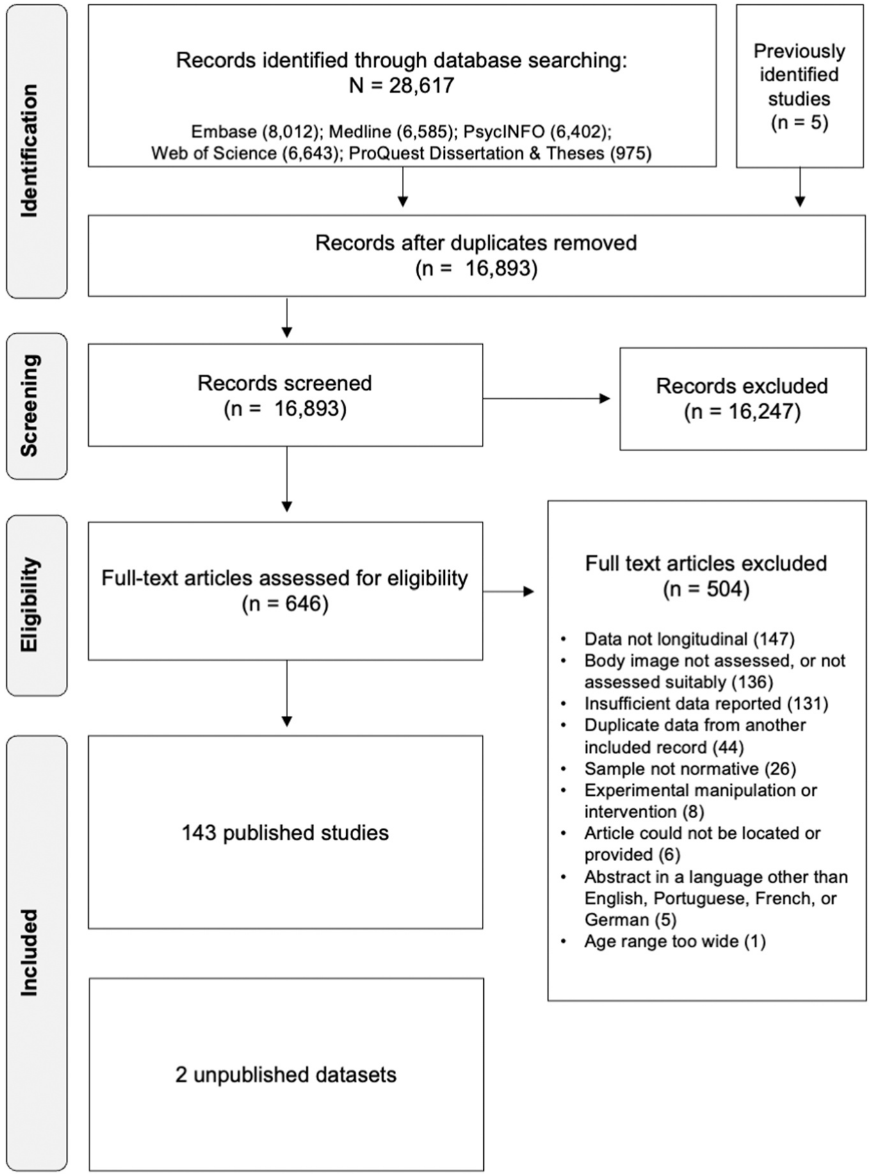

Fig. 1. PRISMA Flowchart of Screening Process to Identify Studies of Body Image Development.

body image constructs. For the categorical variables of construct and gender, we used dummy variables to facilitate specific comparisons, following the procedure outlined by Assink and Wibbelink (2016). We created mutually exclusive dummy variables for each body image construct, as well as to denote whether samples were all-male, all-female, or mixed gender, allowing us to examine the mean effect of reference categories tested against all other categories.

We compared each construct separately to the remainder of the meta-analytic sample; and compared female-only samples to the rest of the meta-analytic dataset (i.e., to all-male and mixed-gender samples). The null hypothesis of this omnibus test was that all regression coefficients (i.e., betas) would be equal to zero; we expected at least one regression coefficient would not be equal to zero, and specifically hypothesized that gender and the construct of valuation would have significant effects.

For descriptive purposes, regardless of the significance of potential moderators, we fit models separately for each of the seven specific body image constructs, to depict change in these body image constructs during courses of the lifespan where sufficient data were available. We described developmental patterns across all studies, and for male-only and female-only samples separately.

3. Results

3.1. Study identification

A PRISMA flow diagram (Fig. 1) depicts progress through stages of screening. The initial search yielded almost 17,000 results, 646 of which were considered for inclusion at the stage of full-text review. In total, the present meta-analysis included 143 articles and 2 additional datasets, describing 142 unique samples[1] and yielding 717 effect sizes. Table 1 presents the basic characteristics of included studies and datasets. The 135 published studies and eight dissertations were published between 1989 and 2020, with a median publication year of 2012; results from two unpublished datasets were included. Total sample sizes ranged from 14 to 21,129 participants (*M* = 952.65, Median = 410, *SD* = 2109.64). Fifty-two of the studies only included female samples, 3 were male-only, 70 included separate samples of males and females, and 52 pooled male and female

[1] The number of samples is smaller than the number of included studies because some data were compiled from multiple studies that published on the same sample.

Table 1
Longitudinal studies of mean-level change in body image.

Study authors (year)	Gender	*n* at T1	Age range	Waves	Construct (s)
Andrew et al. (2016)	F	298	14.03–15.02	2	SO
Archibald et al. (1999)	F	127	12.14–13.15	2	BE
Attie and Brooks-Gunn (1989)	F	193	13.93–16.09	2	BE
Aubrey and Taylor (2009)	M	152	19.70–20.70	2	V, SO
Bearman et al. (2006)	M, F	176; 240	13.57–15.57	2	D
Belanger and Marcotte (2011)	M, F	262; 237	11.22–12.29	2	BE
Benjet and Hernández-Guzmán (2002)	M, F	439; 512	11.67–12.32	2	S
Bird (2013)	F	612	20.24–21.07	2	D
Bookhout (2019)	M&F	924	10.09–13.63	2	D, V
Boone et al. (2011)	M&F	559	13.88–15.88	2	D
Boone et al. (2014)	F	455	13.24–13.74	2	D, V
Bradford and Petrie (2008)	F	236	18.20–18.70	2	S
Brosof and Levinson (2017)	F	190	18.00–18.50	2	V
Bruning Brown (2003)	F	51	14.90–15.40	2	V
Buddeberg-Fischer and Klaghofer (2002)	M, F	325	17.00–20.50	3	S, V
Burrmann (2004)	M&F	403	12.50–16.00	2	D, V
Byely et al. (2000)	F	77	12.21–13.10	2	BE
Calvete et al. (2015)	M, F	371; 523	15.43–15.93	2	S
Calzo et al. (2012)	M, F	3045; 3438	9.90–17.90	3	V
Cantin and Stan (2010)	M, F	288; 306	13.1–14.1	2	D
Carlson Jones (2004)	M, F	139; 165	12.5–16.5	2	D
Chen and Jackson (2009)	M, F	131; 181	13.95–18.7	2	BE
Clark and Tiggemann (2008)	F	150	10.30–11.30	2	D, BE
Craigen (2014)	F	136	18.00–18.75	2	V, SO, BS
Crespo et al. (2010)	M, F	851; 923	12.13–14.13	3	S
Dakanalis et al. (2015a)	M, F	324; 361	14.54–16.54	3	SO, BS
Davison et al. (2003)	F	197	5.40–9.40	3	D, V
Davison et al. (2008)	F	163	9.34–13.33	3	BE
De Caro and Di Blas (2016)	M, F	74; 65	15.36–16.32	2	D
de Vries et al. (2016)	M, F	298; 306	14.70–16.20	2	D
Dion et al. (2015)	M, F	258; 152	14.50–18.50	2	D
Donovan et al. (2006)	F	797	12.83–14.83	3	D
Duarte et al. (2017)	F	290	13.73–15.63	3	BS
Duncan et al. (2007)	M, F	177; 130	12.50–13.60	2	BE
Espinoza et al. (2013)	M, F	75; 126	13.48–15.40	2	S, D
Evans et al. (2017)*	M, F	797; 1042	7.45–18.45	4	D, BE
Fawkner et al. (2014)	F	143	11.80–13.28	4	PA
Fay and Lerner (2013)	M&F	521	14.90–16.90	3	D
Ferreiro et al. (2011)	M, F	404; 399	12.80–14.90	2	D
Ferreiro et al. (2012)	M, F	445; 437	10.83–12.85	2	D
Frisén et al. (2015)	M, F	445; 515	10.00–18.00	5	BE
Gattario, and Lindwall, and Frisén (2019)	M, F	316; 394	10.36–18.36	2	BE
Gervais and Jose (2020)	M, F	854; 920	12.11–14.14	3	S
Gestsdottir et al. (2015)	M, F	195; 190	15.00–23.00	2	S
Gilbert and Meyer (2005)	F	143	18.70–19.29	2	D
Gillen and Lefkowitz (2012)	M, F	179; 211	19.44–20.04	2	V
Gillison et al. (2011)	M, F	169; 176	14.05–14.89	2	S
Girard et al. (2018)	F	192	20.97–21.97	2	D
Gondoli et al. (2011)	F	88	11.60–13.60	3	D
Goossens et al. (2012)	M&F	601	9.05–10.05	2	V
Guerin et al. (2017)	F	102	49.85–54.02	5	BE
Halpern et al. (1999)	F	202	13.80–15.80	5	D
Hochgraf et al. (2019)	M, F	602; 592	10.12–18.88 (children), 38.62–44.54 (parents)	5	V
Hoffmann and Warschburger (2019)	M, F	481; 492	14.09–18.21	3	V
Holsen et al. (2012)	M, F	615; 517	13.30–30.30	6	S
Homan (2010)	F	231	23.30–30.30	2	S
Hunger and Tomiyama (2018)	F	2036	14.00–19.00	2	D
Jackson and Chen (2008)	M, F	217; 376	15.25–16.75	3	V
Jackson et al. (2020)	F	1836	18.69–19.69	2	V
Jackson and Chen (2014)	M, F	1271; 1415	12.66–17.57	2	D
Jackson and Chen (2015)	M, F	1017; 2144	18.87–19.97	2	D, SO, BS
Johnson (2006)	F	219	18.00–18.91	4	D
Jones et al. (2008)	M	154	12.60–13.60	2	D
Knowles et al. (2009)	F	204	11.83–12.79	2	PA
Kvalem et al. (2011)*	M, F	5407; 5645	12–32	4	BE
Lee and Vaillancourt (2019)	M, F	291; 340	12.91–16.91	3	D
Lemoyne and Girard (2018)	M, F	87; 169	17.60–19.10	6	PA
Linville et al. (2011)	F	444	17.50–20.50	4	D
Low et al. (2003)	F	16	19.00–19.50	2	D, V
Low et al. (2006)	F	14	19.00–19.96	3	D, V
Lowe et al. (2019)	F	762	11.00–29.00	6	D, V
Lunde et al. (2007)	M, F	400; 474	10.36–13.58	2	BE
Luszczynska and Abraham (2012)	M&F	551	16.43–17.45	2	S
Martins and Harrison (2011)	M&F	429	8.72–9.75	2	D
McCabe and Ricciardelli (2005)	M, F	344; 246	13.08–14.49	3	D, V

(*continued on next page*)

Table 1 (*continued*)

Study authors (year)	Gender	*n* at T1	Age range	Waves	Construct (s)
McKinley (2006a)	F	72 (younger); 74 (older)	18.58–28.58, 47.41–57.41	2	BE, SO, BS
McKinley (2006b)	M, F	163; 303	18.97–29.40	2	BE, SO, BS
McVey and Davis (2016)	F	113	10.88–11.88	3	BE
Mendelson et al. (1996)	M&F	76 (younger); 85 (older)	8.90–10.80, 11.90–14.00	2	BE
Mendes et al. (2014)	M, F	897; 985	13.67–16.80	2	D
Mills et al. (2012)	F	79	19.60–22.10	6	D
Mora et al. (2015)	M&F	88	13.40–14.48	3	D
Morin et al. (2011)	M&F	1001	12.62–16.04	5	PA
Murdey et al. (2005)	M, F	43; 40	11.00–19.00	3	PA
Murphy et al. (2019)	M, F	442; 479	13.10–13.70	2	BE
Murray et al. (2018)	M, F	245; 251	14.31–15.56	2	V
Nelson et al. (2018)	M&F	967	10.36–24.36	6	BE
O'Dea and Abraham (2000)	M&F	195	12.94–13.94	2	S, D, V
Ohring et al. (2002)	F	120	14.30–16.00	2	D
Olive et al. (2019)	M&F	376	8.16–12.07	3	BE
Patalay et al. (2015)	M, F	4767; 5136	8.70–13.71	3	D
Perkins and Brausch (2019)	M, F	186; 223	13.04–14.19	3	D
Petersen and Hyde (2013)	M, F	196; 207	11.52–15.50	3	SO
Plumed et al. (2019)	M, F	3361; 3711	13.60–15.70	2	D
Presnell et al. (2004)	F	293	17.00–17.75	2	BE
Rawana and Morgan (2014)	M, F	2237; 2122	12.00–21.00	10	D
Rayner et al. (2013)	F	1094	12.30–14.20	3	D, V
Rehkopf et al. (2011)	F	2198	12.03–19.09	5	D
Ricciardelli et al. (2006)	M	237	9.25–10.57	3	D
Rodgers et al. (2015)	F	230	12.77–13.80	3	D
Rodgers et al. (2020)	M, F	106; 138	7.50–8.50	2	BE
Rollins et al. (2011)	F	177	9.50–11.50	2	V
Rousseau et al. (2017)	M&F	1621	14.76–15.26	2	D
Rousseau et al. (2018)	M, F	1037; 934	11.30–12.30	3	V, SO
Rousseau et al. (2020)	F	1037; 934	11.30–12.30	3	S
Sala and Levinson (2016)	F	299	18.71–19.71	3	D
Schaffhuser et al. (2016)	M, F	120; 126	10.61–12.64	3	BE
Schooler (2012)	F	171	13.30–17.30	3	BE
Schooler and Trinh (2011)	M, F	387; 454	14.70–16.70	2	BE
Sehm and Warschburger (2018)	M, F	516; 523	14.37–16.04	2	V
Seiffge-Krenke and Stemmler (2002)	M, F	51; 64	14.90–17.20	3	S
Seiffge-Krenke et al. (2015)	M, F	114; 144	14.27–16.95	2	S
Shomaker and Furman (2010)	M, F	95; 98	17.90–19.11	2	BE
Shomaker and Furman (2009)	M, F	98; 98	17.90–19.11	2	S
Simmons (1998)	F	239	12.84–17.87	5	D
Sinton (2007)	M, F	192 (girls); 197 (fathers); 197 (mothers)	9.34–13.33 (girls), 37.37–41.58 (parents)	3 (girls), 2 (parents)	V
Slap et al. (1994)	F	54	12.22–13.22	2	BE
Stice and Whitenton (2002)	F	496	13.01–14.01	2	D
Striegel-Moore et al. (2000)	F	2379	11.00–16.00	6	D
Stutts and Blomquist (2021)	M, F	157; 394	18.50–21.50	2	V
Swarr (1998)	F	103	11.50–15.50	3	BE
Tiggemann (2005)	F	242	14.00–16.00	2	S, D
Tiggemann (2004b)	M, F	19; 58	25.12–33.12	2	S
Tiggemann and Slater (2017)	F	438	13.60–15.60	2	SO
Trompeter et al. (2019)	M, F	443; 595	14.25–16.25	3	V
Valois et al. (2019)	M&F	1197	13.51–15.62	3	BE
Vandenbosch and Eggermont (2016)	M&F	1504	15.35–16.35	3	SO
Vangeel et al. (2018)	M&F	355	21.17–27.17	4	SO
Verschueren et al. (2018)	M, F	262; 268	15.00–16.34	3	D
Viborg et al. (2014)	F	445	13.00–14.05	2	BE
Viira and Raudsepp (2003)	M, F	105; 92	13.00–14.00	2	D
Wade et al. (2015)	M, F	160; 257	13.46–14.53	3	V
Wang, Xie, et al. (2019)	M&F	767	15.78–16.36	2	D, SO
Wang, Haynos, et al. (2019)	M, F	597; 858	12.64–31.96	4	S, V
Warschburger and Zitzmann (2018)	M&F	544	12.90–13.90	2	D
Waszczuk et al. (2019)	M&F	2629	15.20–19.60	3	D
Webb, Zimmer-Gembeck, and Mastro (2016)	M, F	167; 200	12.01–13.01	2	V
Webb and Zimmer-Gembeck (2016)	M, F	172; 215	11.97–13.68	4	BE
Wertheim et al. (2001)	F	316	12.84–16.39	2	D
Wichstrom and von Soest (2016)	M, F	1482; 1769	14.88–28.49	4	BE
Woelders et al. (2010)	M, F	1041; 982	13.80–15.80	3	D, V
Wojtowicz and Von Ranson (2012)	F	393	15.80–16.80	2	D
Zimmer-Gembeck et al. (2018)	M, F	175; 212	12.00–14.00	5	BE, V
[Two unpublished datasets] (Atkinson, 2020)	M, F	419; 317	11.46–14.61	5	BE
	M, F	259; 232	13.23–14.25	3	S, BE

Note. “M, F” indicates that data were reported separately for these two genders; “M&F” indicates that data were pooled across genders. S = satisfaction; D = dissatisfaction; PA = perceived attractiveness; BE = body esteem; V = valuation; SO = self-objectification; BS = body shame. In the “*n* at T1” column, multiple *n* values indicate, with a few noted exceptions, the size of independent subsamples of boys and girls. In service of conciseness, some subgroups have been pooled in this table, although their data were extracted and analyzed separately. Some data needed to be extracted from multiple publications reporting on a single sample; in these cases, both papers are cited for completeness, but we assigned the same sample ID number and weighted these studies accordingly. In some cases, authors graciously provided additional data and information about their study samples; the data in this table (as well as the data extracted and analyzed) may accordingly differ somewhat from what has been described in publications.

Table 2
Results of Egger's Tests Examining Publication Bias in Mean-level Change in Body Image Constructs.

Construct	k	N_{ES} (M)	N_{ES} (F)	N_{ES} (M&F)	z	p
Overall Body Image	142	260	396	61	-2.632	.008
Satisfaction	23	62	67	5	2.520	.012
Perceived Attractiveness	5	11	15	4	1.057	.290
Body Esteem	38	69	96	20	-1.302	.193
Dissatisfaction	61	48	118	14	-2.972	.003
Valuation	33	59	80	7	0.985	.325
Self-Objectification	13	9	12	11	-1.177	.239
Body Shame	6	2	8	0	-2.773	.006

Note. Unstandardized regression coefficients.
k = number of samples; N_{ES} = number of effect sizes. M = male samples; F = female samples; M&F = mixed male and female samples.
The sum of the number of studies (k) for body image constructs is larger than the total number of included samples (k = 142), because some studies reported on multiple body image constructs.

participant data together. Of the effect sizes obtained from studies that reported sample ethnic composition, 93.6% (441 effect sizes) represented predominantly White samples, and 6.4% (30 effect sizes) represented predominantly Non-White samples. The time lag between measurements ranged from.25 years (i.e., 3 months) to 11.69 years (M = 2.13, SD = 2.17). Mean age at the midpoint between testing intervals ranged from 6.35 years to 53.53 years (M = 16.97, SD = 5.91). Mean estimated year of birth ranged from 1946 to 2008 (M = 1991.76, SD = 8.73). The number of effect size estimates per construct was 185 for Body Esteem, 180 for Body Dissatisfaction, 134 for Satisfaction, 146 for Valuation, 32 for Self-objectification, 30 for Perceived Attractiveness, and 10 for Body Shame.

3.2. Preliminary analyses

Two characteristics of the current meta-analysis reduce the possibility that systematic publication bias influenced our results. First, unpublished data and dissertations were included in the current meta-analytic dataset. Second, most studies included did not focus on body image development but instead happened to report this data in the context of testing other hypotheses. We cannot imagine that the authors of primary studies would have been incentivized to publish research demonstrating greater stability or change in body image.

To assess the possibility of publication bias in our included studies, we created and inspected funnel plots, and performed Egger's regression test of funnel graph asymmetry (Egger et al., 1997) for overall body image, and for each of the seven body image constructs in our dataset. To correct for multiple comparisons (we conducted 8 Egger's tests), we used a Bonferroni-corrected p value of .006 (.05 divided by 8). As reported in Table 2, Egger's tests were non-significant (i.e., no evidence of publication bias) when we employed the Bonferroni correction. Funnel graphs are displayed in Fig. 2.

Using the "influence" command, we identified 26 potential outlier effect sizes when computing pooled effect sizes across all samples (i.e., 717 total effect sizes). There were 12 potential outlier effect sizes when examining male-only samples, and 20 potential outlier effect sizes when examining female-only samples. To examine whether these potential outlier effect sizes would alter the conclusions from this meta-analysis, we conducted sensitivity analyses without these samples (Appendices C and D). The results were similar whether or not the outliers were included. Inspection of the data and codings did not suggest that there were any errors or implausible values– these outliers appeared to represent valid data points. At the risk of widening the confidence intervals around our estimates, we chose to keep these outliers in the dataset for the remainder of meta-analytic computations, consistent with prior studies (e.g., Bühler et al., 2021) and literature advising against deletion, in meta-analysis, of outliers with particularly large or small effect sizes (Viechtbauer & Cheung, 2010).

3.3. Mean-level change in overall body image

We fitted multi-level meta-analytic models to estimate effect sizes of mean-level change in overall body image across portions of the lifespan where sufficient data were available. We used the weighted mean-level change per year (d_{year}) to capture the magnitude and direction of change in each age range, regardless of whether these effect sizes were significantly different from zero. These effect size analyses were conducted within age groups, modeling heterogeneity within and between samples.

Table 3 describes the meta-analytic findings for mean-level change across all body image constructs, for the entire meta-analytic sample and separately for all-male and all-female samples. Fig. 3 shows the findings on body image development as a function of age, between ages 6 and 30. Cumulative d values are plotted along the vertical axis; the estimate of weighted mean-level change per year (d_{year}) was used for each year included in each age group. No effect sizes were available from measurement intervals with a midpoint between 30 and 38, and only five studies reported on body image between 38 and 54. Thus, we were limited in our ability to draw conclusions about normative patterns of mean-level change in body image past the age of 30. We have not plotted mean-level change past age 30, but have reported these estimated d_{year} values in Table 3. These values were based on a small number of studies, and thus have wider confidence intervals; they should be interpreted with caution.

Given the preponderance of all-female (396 effect sizes), versus all-male (260 effect sizes) and mixed (61 effect sizes) samples in our data, aggregate mean-level effect sizes across all samples were skewed heavily towards representing female body image development, which could be misleading. Accordingly, we focus on describing patterns of age-related change in overall body image separately for male and female samples.

Note that all but two d_{year} estimates are non-significant, as indicated by confidence intervals that cross zero. We were primarily interested in the magnitude and direction of estimated yearly change, rather than the significance of these estimates. The power of null-hypothesis significance tests of mean-level change would have been greater if we constructed broader age groups (i.e., compiled meta-analytic effect-size estimates based on larger numbers of samples and effect sizes), but such an approach would have reduced our precision in describing age-related trends in normative body image development. Accordingly, null-hypothesis significance testing of mean-level change was not the focus of the current meta-analysis, but we report these results in service of completeness, as in Orth et al. (2018, 2021).

Male samples showed a pattern of fluctuating, but overall slightly improving, body image with increasing age. Body image worsened slightly between ages 6 and 10 (cumulative d = -0.016, representing total average change during these four years); improved between ages 10 and 16 (cumulative d = 0.260); worsened slightly between ages 16 and 18 (cumulative d = -0.048); improved between age 18

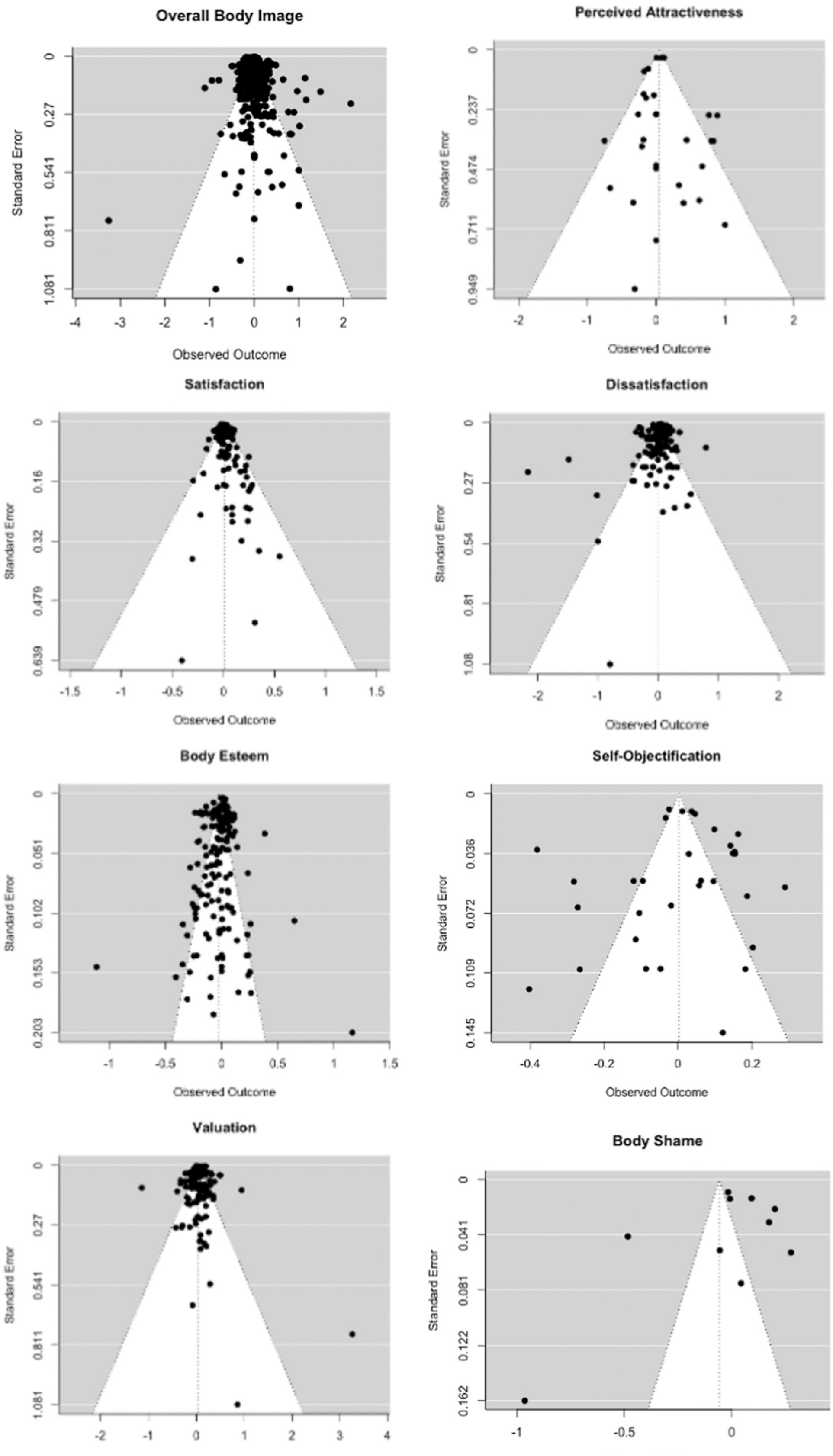

Fig. 2. Funnel graphs displaying the association between effect size and precision.

Table 3
Yearly Mean-Level Change in Overall Body Image.

	All samples					Male samples					Female samples				
Age range	k	N_{ES}	d_{year}	95% CI	Q	k	N_{ES}	d_{year}	95% CI	Q	k	N_{ES}	d_{year}	95% CI	Q
6–10	9	18	0.008	[- 0.081, 0.096]	190.36[a]	4	4	-0.004	[- 0.074, 0.067]	7.73	4	8	0.062	[- 0.105, 0.229]	119.28[a]
10.1–12	23	48	-0.041	[- 0.130, 0.047]	1061.78[a]	12	16	0.090	[- 0.054, 0.233]	408.99[a]	19	27	-0.097	[- 0.199, 0.005]	386.83[a]
12.1–14	57	167	**-0.053**	[- 0.103, - 0.003]	2232.13[a]	31	60	0.026	[- 0.064, 0.115]	431.66[a]	49	96	**-0.095**	[- 0.145, - 0.046]	1203.73[a]
14.1–16	61	158	**-0.021**	[- 0.039, - 0.004]	1445.43[a]	35	56	0.014	[- 0.009, 0.037]	385.87[a]	50	88	**-0.049**	[- 0.071, - 0.026]	763.63[a]
16.1–18	30	90	0.005	[- 0.029, 0.039]	694.69[a]	16	34	-0.024	[- 0.067, 0.020]	194.32[a]	23	46	0.020	[- 0.025, 0.065]	426.46[a]
18.1–20	31	111	0.009	[- 0.018, 0.036]	783.08[a]	16	40	0.012	[- 0.035, 0.058]	340.19[a]	28	64	0.010	[- 0.024, 0.044]	421.60[a]
20.1–22	11	37	0.052	[- 0.035, 0.139]	379.53[a]	6	14	0.071	[- 0.103, 0.244]	40.54[a]	8	19	0.041	[- 0.082, 0.164]	326.12[a]
22.1–24	6	32	0.061	[- 0.080, 0.203]	546.67[a]	3	12	-0.019	[- 0.040, 0.001]	22.52[a]	5	18	0.091	[- 0.077, 0.258]	462.01[a]
24.1–30	8	43	-0.003	[- 0.014, 0.009]	115.77[a]	6	21	-0.001	[- 0.018, 0.015]	45.72[a]	6	20	0.001	[- 0.011, 0.014]	48.32[a]
38–54	4	13	-0.026	[- 0.063, 0.010]	32.22[a]	2	3	-0.035	[- 0.103, 0.034]	2.64	4	10	-0.015	[- 0.068, 0.038]	29.47[a]

Note. Effect sizes were meta-analyzed using random-effects multilevel models. The first k column does not sum to 142 (i.e., the total number of included samples), because many studies contributed multiple effect sizes in multiple age categories and body image constructs. k = number of samples; N_{ES} = number of effect sizes in the k samples; d_{year} = Weighted mean effect size expressed as mean-level change per year; CI = confidence interval; Q = heterogeneity test statistic. Positive d_{year} values indicate that body image improved during an age period, whereas negative d_{year} values indicate that body image worsened. Bolded = significant effect sizes.

[a] Q statistic significant, $p < 0.05$.

and 22 (cumulative d = 0.166); and worsened again between age 22 and 24 (cumulative d = -0.038). The largest improvements tended to take place between ages 10 and 12 (d_{year} = 0.090), followed by ages 20–22 (d_{year} = 0.071). As with female samples, male samples showed a plateau between ages 24 and 30, with negligible worsening between these age midpoints (cumulative d = -0.006). The four studies (and four effect sizes) with measurement interval midpoints after age 30 showed a weighted average effect size of d = -0.035, suggesting that males may show worsening body image later in adulthood, perhaps to a larger extent than females.

In female samples, changes were larger in magnitude, and in the direction opposite male samples until age 18. Body image tended to improve slightly between ages 6 and 10 (cumulative d = 0.248), though notably, this estimate was based on only four studies and eight effect sizes. Body image then worsened between ages 10 and 16 (cumulative d = -0.482), with cumulative mean change culminating in a nadir around age 16. The magnitude of decrement was largest between ages 10–12 (d_{year} = -0.097), and 12–14 (d_{year} = -0.095), but smaller in magnitude between ages 14 and 16 (d_{year} = -0.049). Based on relative magnitude of change, age 10–14 may represent a sensitive period for body image among typically developing girls. Between age 16 and 24, female samples tended to show improvements in mean-level body image (cumulative d = 0.330). Mean-level body image then appeared to plateau, with very minor improvements between ages 24 and 30 (cumulative d =0.006). Only four studies (10 effect sizes) assessing body image in female samples had measurement interval midpoints after age 30. Their weighted average effect size was d = -0.015 per year, suggesting that females may show worsening body image as middle age wears on.

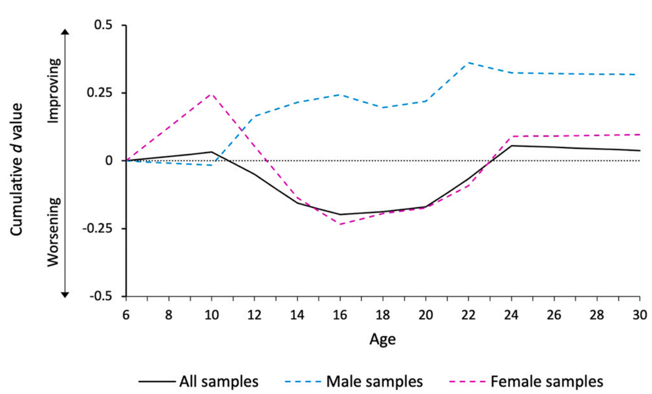

Fig. 3. Mean-level Change in Overall Body Image from Age 6–30. *Note.* This figure shows cumulative d values; the point of origin (i.e., zero) is arbitrary. The black line (all samples) also included mixed-gender samples.

3.4. Moderators of mean-level change in body image

We tested whether the categorical variables of sample gender and construct, and the continuous variables of cohort (i.e., sample's estimated birth year), retention rate (an indicator of attrition expressed for each effect size as the proportion of participants from Time 1 who were also assessed at Time 2), and time lag (i.e., time elapsed between Time 1 and Time 2 for each effect size) moderated mean-level change in overall body image development. Categorical variables were dummy coded to examine the main effect of sample gender (all-female vs. all-male or mixed samples), and of each body image construct separately. Continuous variables were mean-centered. To gain information about the unique effects of moderators on effect sizes, we simultaneously entered these moderators into the multilevel model. We also controlled for the linear and quadratic effects of age of the sample at the midpoint of each measurement interval.

Table 4 describes the findings of the omnibus moderator analysis. The construct of body shame was determined to be redundant and was dropped from the model. None of the body image constructs had significant main effects, failing to support our hypothesis that

Table 4
Mixed-effects meta-regression models examining moderators of overall body image development.

Moderator	Estimate [CI]	*SE*	*p*
Gender (F)	-0.033 [-0.051, -0.016]	0.009	<.001
Construct			
Satisfaction	0.034 [-0.041, 0.110]	0.039	.110
Perceived attractiveness	0.060[-0.128, 0.249]	0.096	.249
Body esteem	0.044 [-0.030, 0.118]	0.038	.247
Dissatisfaction	0.036 [-0.038, 0.111]	0.038	.340
Valuation	0.037 [-0.038, 0.113]	0.038	.331
Self-objectification	-0.004 [-0.079, 0.071]	0.038	.923
Cohort	0.000 [-0.003, 0.004]	0.002	.785
Retention rate[a]	-0.024 [-0.074, - 0.027]	0.026	.364
Age (linear)[b]	0.023 [0.016, 0.031]	0.004	<.001
Age (quadratic)[c]	-0.000 [-0.001, -0.000]	0.000	<.001
Time lag[d]	-0.013 [-0.020, -0.006]	0.004	<.001

Note. Body shame was identified as a redundant predictor and dropped from the model. Regression coefficients are unstandardized, and based on a meta-analytic sample of 717 effect sizes. $Q(570) = 6340.27$, $p < 0.001$. CI = 95% confidence interval.

[a] The retention rate reflects, for each effect size, the portion of the sample from Time 1 that was measured at Time 2. Retention rate data were only available for 591 of 717 effect sizes.

[b] Linear effect of the age of the sample at the midpoint of observed data collection interval.

[c] Quadratic effect of the age of the sample at the midpoint of observed data collection interval.

[d] Effect of the duration of the observed data collection interval.

the construct of valuation would change in ways that differed systematically from other body image constructs. The effects of cohort and retention rate were also non-significant.

Effect sizes were significantly moderated by gender. As hypothesized, the main effect of female sample gender was negative (b = -0.033), indicating that at any given time, samples composed entirely of girls and women were more likely than other samples to show worsening body image; this moderator had the largest effect of all those tested.

Time lag had a small negative relationship with change (b = -0.013), such that longer data collection intervals were associated with larger negative changes in overall body image.

The linear effect of age was positive (b = 0.023), such that samples with older mean ages were more likely to show improvements in body image over time. The quadratic effect of age (representing a U-shaped relationship between effect sizes and age), though significant, was so negligible in magnitude that it is not worth interpreting.

3.5. Mean-level change in specific body image constructs

Despite construct not being a significant moderator of yearly mean-level body image change, we estimated change across studied portions of the lifespan separately for each construct to maximize the informativeness and utility of the current meta-analysis. Table 5 describes meta-analytic effect size estimates stratified based on the construct of body image, across all samples and separately for all-male and all-female samples. These aggregate estimates were based on smaller numbers of samples, and as such, confidence intervals were wider than when d_{year} was aggregated across body image constructs.

In Fig. 4, we plotted d_{year} separately for each construct, across all samples and separately for all-male and all-female samples, for each age range that had at least two available effect sizes upon which to base meta-analytic estimates. There were missing data for certain constructs and phases of the lifespan, indicated by discontinuities in our plots.

3.5.1. Body satisfaction (Age 10–30)

In male samples, mean body satisfaction showed incremental increases from age 12–20. The largest increases were observed between age 12 and 14 (d_{year} = 0.060), but the magnitude of increases diminished across the adolescent years. At approximately age 20, the direction of change in mean-level body satisfaction reversed in male samples: for age midpoints above 20, mean body satisfaction declined, with the steepest decline occurring between ages 22 and 24 (d_{year} = -0.018).

In female samples, mean body satisfaction declined from age 10–16, with the steepest decline occurring from age 10–12 (d_{year} = -0.097), a magnitude substantially larger than what was observed among male samples. At approximately age 16, the direction of change in mean-level body satisfaction reversed for female samples; for age midpoints above 16, mean body satisfaction increased. However, the magnitude of change was small after age 20 (d_{year} ≤.008), suggesting that on average, mean-level body satisfaction was stable in samples of adult women.

3.5.2. Perceived attractiveness (age 10–20)

In male samples, estimates of yearly mean-level change in perceived attractiveness were positive at every age range for which data were available, suggesting the average adolescent male finds himself better-looking every year (cumulative d for ages 10–16 = 1.592; cumulative d for ages 18–20 = 0.664). In female samples, mean-level perceived attractiveness increased between ages 10 and 12 (cumulative d =0.226), declined from 12 to 16 (cumulative d = -0.400), and increased between ages 18 and 20 (cumulative d = 0.252).

3.5.3. Body esteem (male samples: age 10–30; female samples: age 10–54)

In male samples, mean-level body esteem was relatively stable, with small fluctuations: it increased slightly between ages 10 and 16 (cumulative d = 0.092), decreased between age 16 and 18 (cumulative d = -0.052), increased from 18 to 22 (cumulative d = 0.056), and then increased from age 24–30 (cumulative d = 0.018). In female samples, mean-level body esteem declined from age 10–16 (cumulative d = -0.452) but increased from age 16–30 (cumulative d = 0.488). Two longitudinal studies examined body esteem in female samples between ages 38 and 54, yielding a pooled effect size of d_{year} = -0.028; this value suggests women may, on average, experience declines in body esteem later in adulthood.

3.5.4. Body dissatisfaction (male samples: age 6–20; female samples: age 6–22)

In male samples, mean body dissatisfaction increased between ages 6 and 10 (cumulative d = 0.048), decreased between ages 10 and 16 (cumulative d = -0.466), increased very slightly between ages 16–18 (cumulative d = 0.016), and decreased from age 18–20 (cumulative d = -0.136). In female samples, change occurred in the opposite direction: mean body dissatisfaction decreased between ages 6 and 10 (cumulative d = -0.284), increased between ages 10 and 16 (cumulative d = 0.364), decreased slightly between ages 16 and 18 (cumulative d = -0.120), increased between ages 18 and 20 (cumulative d = 0.078), and decreased between ages 20 and 22 (cumulative d = -0.096).

3.5.5. Valuation (male samples: age 10–30 and 38–54; female samples: age 6–30 and 38–54)

In male samples, mean-level valuation decreased between ages 10 and 16 (cumulative d = -0.368), increased slightly between ages 16 and 18 (cumulative d = 0.034), decreased between ages 18 and 22 (cumulative d = -0.242), and increased between ages 22 and 30 (cumulative d = 0.164). Two studies reported on change later in adulthood; these studies were pooled to yield an effect size of d_{year} = 0.035, suggesting that for men, valuation may increase later in adulthood.

In female samples, mean valuation decreased between ages 6 and 10 (cumulative d = -0.772), increased between ages 10 and 18 (cumulative d = 0.870), decreased slightly between ages 18 and 20 (cumulative d = -0.016), and increased between ages 20 and 30 (cumulative d = 0.204). Two studies reported on change later in adulthood; these studies were pooled to yield an effect size of d_{year} = -0.015, suggesting that for women, valuation may decrease later in adulthood.

3.5.6. Self-objectification (incomplete data)

Few longitudinal studies examined self-objectification. When pooled across all samples, mean levels of self-objectification decreased between ages 10 and 12 (cumulative d = -0.380), increased between ages 12 and 20 (cumulative d = 0.750), and decreased between ages 20 and 30 (cumulative d = -0.800). Available data suggested increases in self-objectification between the ages of 12 and 16 for both male (cumulative d = 0.132) and female (cumulative d = 0.532) samples. For female samples, data were also available for ages 18–20, and suggested an increase in mean-level self-objectification during this age range (cumulative d = 0.196). Available data suggested that female samples decreased in mean self-objectification between ages 22 and 24 (cumulative d = -0.404).

3.5.7. Body shame (incomplete data)

Only five longitudinal studies examined body shame, and none of these studies reported mean-level change separately for male samples (one effect size was based on a mixed sample, and six effect sizes were based on female-only samples). On average, body shame

Table 5
Yearly Mean-Level Change in Body Image Constructs.

Construct and age	All samples				Male samples				Female samples			
	k	N_{ES}	d_{year} [95% CI]	*Q*	*k*	N_{ES}	d_{year} [95% CI]	*Q*	*k*	N_{ES}	d_{year} [95% CI]	*Q*
Satisfaction												
10.1–12	2	3	-0.019 [- 0.392, 0.354]	8.74[a]					2	2	-0.097 [- 1.023, 0.829]	1.86
12.1–14	7	19	0.011 [- 0.019, 0.042]	42.45[a]	6	9	0.060 [- 0.022, 0.142]	23.07[a]	5	9	-0.017 [- 0.046, 0.012]	8.78
14.1–16	9	19	0.005 [- 0.030, 0.040]	92.52[a]	8	9	0.031 [- 0.031, 0.093]	41.94[a]	9	10	-0.024 [- 0.076, 0.028]	31.79[a]
16.1–18	6	21	**0.038** [0.016, 0.060]	58.40[a]	4	9	0.041 [- 0.004, 0.087]	28.15[a]	5	10	**0.037** [0.005, 0.069]	27.94[a]
18.1–20	9	31	**0.034** [0.013, 0.055]	66.80[a]	7	13	0.008 [- 0.015, 0.032]	21.77[a]	8	16	**0.055** [0.029, 0.082]	20.21
20.1–22	4	11	-0.004 [- 0.027, 0.019]	29.92[a]	4	6	-0.014 [- 0.033, 0.006]	2.59	3	5	0.004 [- 0.054, 0.062]	21.53[a]
22.1–24	3	12	**-0.004** [- 0.036, - 0.028]	64.70[a]	3	6	**-0.018** [- 0.033, - 0.003]	5.07	3	6	0.008 [- 0.047, 0.063]	46.03[a]
24.1–30	4	18	-0.002 [- 0.015, 0.011]	27.47[a]	4	9	-0.009 [- 0.032, 0.014]	16.92[a]	4	9	0.002 [- 0.006, 0.011]	5.52
Perceived attractiveness												
10.1–12	1	4	0.156 [- 0.925, 1.238]	4.44	1	2	0.239 [- 4.466, 4.944]	0.67	1	2	0.113 [- 10.454, 10.679]	3.54
12.1–14	4	9	-0.054 [- 0.185, 0.077]	15.58[a]	1	2	0.525 [- 3.934, 4.984]	0.22	3	5	-0.154 [- 0.336, 0.028]	0.55
14.1–16	2	7	0.057 [- 0.067, 0.180]	6.61[a]	1	2	0.032 [- 5.431, 5.496]	0.73	1	3	-0.046 [- 1.605, 1.514]	0.09
16.1–18	1	2	0.380 [- 6.435, 7.170]	5.89[a]								
18.1–20	1	8	0.218 [- 0.243, 0.679]	22.31	1	4	0.332 [- 0.849, 1.512]	12.61[a]	1	4	0.126 [- 0.578, 0.829]	8.82[a]
Body esteem												
6–10	3	5	0.037 [- 0.127, 0.201]	11.78[a]								
10.1–12	11	22	-0.027 [- 0.170, 0.116]	233.06[a]	5	7	0.033 [- 0.322, 0.388]	70.03[a]	9	12	-0.053 [- 0.262, 0.156]	107.40[a]
12.1–14	18	49	-0.076 [- 0.130, 0.022]	263.73[a]	9	18	0.010 [- 0.072, 0.092]	61.98[a]	16	27	-0.139 [- .0216, - 0.063]	98.20[a]
14.1–16	13	30	-0.022 [- 0.061, 0.016]	321.18[a]	8	11	0.003 [- 0.059, 0.066]	142.95[a]	10	15	-0.034 [- 0.093, 0.025]	138.71[a]
16.1–18	6	21	-0.019 [- 0.073, 0.035]	188.37[a]	4	8	-0.026 [- 0.145, 0.093]	88.78[a]	5	11	0.004 [- 0.056, 0.065]	57.78[a]
18.1–20	6	22	0.014 [- 0.014, 0.042]	66.37[a]	5	10	0.010 [- 0.010, 0.030]	12.53	5	10	**0.041** [0.003, 0.079]	21.04[a]
20.1–22	1	6	0.026 [0.000, 0.052]	11.26[a]	1	3	0.018 [- 0.022, 0.058]	1.15	1	3	0.029 [- 0.059, 0.116]	6.78[a]
22.1–24	4	12	0.091 [- 0.120, 0.302]	156.53[a]	1	4	-0.003 [- 0.024, 0.018]	2.49	3	6	0.137 [- 0.174, 0.448]	120.34[a]
24.1–30	3	13	0.003 [- 0.007, 0.014]	28.62[a]	3	7	0.003 [-0.029, 0.036]	12.50	2	6	**0.011** [0.003, 0.019]	2.69
38–54	2	5	-0.028 [- 0.006, 0.004]	1.63					2	5	-0.028 [- 0.060, 0.004]	1.63
Dissatisfaction												
6–10	5	9	-0.027 [- 0.170, 0.120]	99.00[a]	3	3	0.012 [- 0.074, 0.098]	2.05	3	5	-0.071 [- 0.345, 0.204]	90.98[a]
10.1–12	6	9	0.001 [- 0.128, 0.129]	185.96[a]	3	3	-0.161 [- 0.486, 0.164]	41.66[a]	4	5	0.069 [- 0.070, 0.209]	41.36[a]
12.1–14	27	55	0.046 [- 0.056, 0.148]	645.84[a]	12	17	-0.047 [- 0.341, 0.247]	228.78[a]	23	35	0.067 [- 0.017, 0.152]	394.52[a]
14.1–16	26	54	0.021 [- 0.005, 0.048]	414.77[a]	11	15	-0.025 [- 0.062, 0.011]	64.26[a]	20	34	**0.046** [0.007, 0.084]	209.68[a]
16.1–18	14	22	-0.035 [- 0.092, 0.021]	172.07[a]	5	6	0.008 [- 0.057, 0.073]	31.26[a]	10	13	-0.060 [- 0.138, 0.018]	121.99[a]
18.1–20	11	21	0.010 [- 0.059, 0.079]	317.60[a]	2	3	-0.068 [- 0.592, 0.455]	170.80[a]	10	17	0.039 [- 0.019, 0.096]	77.43[a]
20.1–22	5	9	-0.037 [- 0.203, 0.130]	245.40[a]								
Valuation												
6–10	2	4	-0.021 [- 0.569, 0.527]	78.68[a]					1	2	-0.193 [- 0.706, 0.320]	2.25
10.1–12	6	8	0.176 [- 0.104, 0.456]	321.85[a]	2	2	-0.124 [- 0.271, 2.463]	34.54[a]	5	5	0.218 [- 0.149, 0.586]	133.24[a]
12.1–14	12	31	0.086 [- 0.032, 0.203]	1104.70[a]	7	12	-0.043 [- 0.186, 0.100]	36.93[a]	11	18	0.114 [- 0.076, 0.304]	540.73[a]
14.1–16	14	38	0.030 [- 0.016, 0.077]	439.25[a]	11	17	-0.017 [- 0.070, 0.035]	61.66[a]	12	20	**0.076** [0.018, 0.134]	159.10[a]
16.1–18	6	19	**0.027** [0.004, 0.049]	47.45[a]	5	9	0.017 [-0.005, 0.039]	3.42	6	10	0.027 [- 0.025, 0.080]	40.65[a]
18.1–20	10	23	0.000 [- 0.035, 0.034]	54.70[a]	4	8	-0.001 [- 0.069, 0.066]	9.68	8	13	-0.008 [- 0.056, 0.040]	36.73[a]
20.1–22	4	6	-0.059 [- 0.348, 0.229]	15.65[a]	3	3	-0.120 [- 0.930, 0.690]	13.52[a]	3	3	0.036 [- 0.007, 0.079]	1.99
22.1–24	1	4	0.022 [- 0.005, 0.050]	19.52[a]	1	2	0.031 [-0.145, 0.206]	6.55[a]	1	2	0.015 [- 0.143, 0.173]	7.92
24.1–30	2	7	0.020 [- 0.016, 0.055]	28.66[a]	1	3	0.017 [- 0.014, 0.048]	4.74	2	4	0.017 [- 0.041, 0.075]	21.44[a]
38–54	2	6	0.007 [- 0.041, 0.054]	8.23[a]	2	3	0.035 [- 0.034, 0.103]	2.64	2	3	-0.015 [- 0.095, 0.066]	1.20
Self-objectification												
10.1–12	1	2	-0.190 [- 1.247, 0.867]	2.77								
12.1–14	2	4	0.108 [- 0.079, 0.295]	8.89[a]	2	2	0.029 [- 1.633, 1.691]	7.58[a]	2	2	0.159 [- 0.260, 0.577]	0.25
14.1–16	5	8	0.036 [- 0.082, 0.153]	66.18[a]	2	2	0.037 [- 0.350, 0.425]	0.18	4	4	0.107 [- 0.015, 0.228]	8.57[a]
16.1–18	3	4	0.119 [- 0.265, 0.503]	40.49[a]								
18.1–20	2	3	**0.112** [0.036, 0.188]	1.30					2	2	0.098 [- 0.174, 0.370]	0.02
20.1–22	2	5	-0.189 [- 0.659, 0.282]	16.18[a]								
22.1–24	2	2	-0.202 [- 2.474, 2.071]	103.09[a]					2	2	-0.202 [- 2.474, 2.071]	103.09[a]
24.1–30	2	3	-0.003 [- 0.126, 0.120]	14.67[a]								
Body shame												
14.1–16	1	2	**-0.023** [- 0.621, - 0.567]	1.16					1	2	-0.023 [- 0.621, 0.576]	1.16
18.1–20	2	3	-0.376 [- 0.283, 2.111]	50.53[a]					2	2	-0.372 [- 7.771, 7.028]	50.50[a]
22.1–24	2	2	-0.249 [- 3.218, 2.719]	117.52[a]					2	2	-0.249 [- 3.218, 2.719]	117.52[a]

Note. To create a meta-analytic effect size estimate, each age range and construct required a minimum of two effect sizes, from at least one study; empty age range rows were omitted, and columns were left blank where data were insufficient. Effect sizes were meta-analyzed using random-effects multilevel models. k = number of samples; N_{ES} = total number of effect sizes in the k samples; d_{year} = Weighted mean effect size expressed as mean-level change per year; CI = confidence interval; Q = heterogeneity test statistic. Many studies contributed multiple effect sizes in multiple age categories and body image constructs. Bolded = significant effect sizes.

[a] Q statistic significant, $p < .05$.

decreased in the predominantly female samples at all age ranges during which data were available: cumulative d values were -0.023 for age 14–16, -0.752 for age 18–20, and -0.498 for age 22–24. Given the scant and discontinuous nature of available data on body shame, and the wide confidence intervals of resulting yearly change estimates, we were not confident in these change estimates, and thus we did not plot the development of body shame.

4. Discussion

The primary goal of the current meta-analysis was to describe normative body image development across the lifespan. We also examined the impact of construct, gender, cohort, attrition, and time lag on the magnitude and direction of mean-level change in overall body image. We synthesized available longitudinal data on mean-

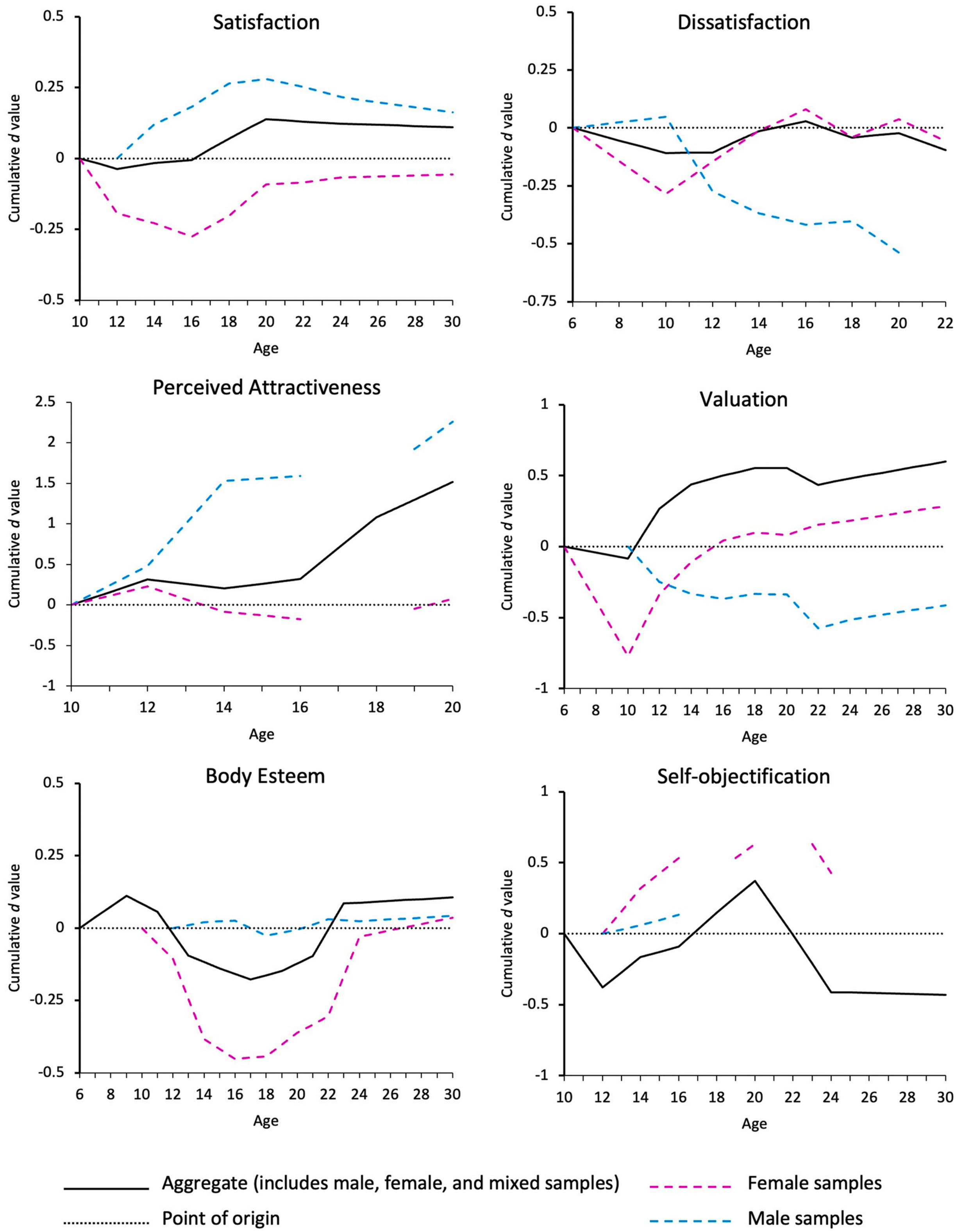

Fig. 4. Mean-level Change in Body Image Constructs During Represented Age Ranges. *Note*. These figures show cumulative *d* values relative to the starting ages, which differ based on the represented age ranges for each construct. The point of origin (i.e., zero) is arbitrary.

level change across the most studied constructs of body image, and provided separate estimates of mean-level change for the specific constructs of body satisfaction, body esteem, perceived attractiveness, body dissatisfaction, valuation, self-objectification, and body shame. The meta-analytic dataset included 142 samples, 717 effect sizes, and a total of 128,254 participants. Although sample mean age between testing intervals ranged from 6.35 to 53.53 years, ages younger than 10 and older than 24 were not well-represented in primary studies. Analyses were based on mean effect size of change in body image per year, providing a description of yearly change in the average sample across represented age ranges. We used a multilevel meta-analytic approach to model dependency of effect size estimates within samples.

This study provided a comprehensive and evidence-based description of normative body image development during phases of the lifespan where this development has been studied. Age significantly moderated mean-level change in body image: the later in life data collection took place, the more positive the change in body image tended to be, though this effect appeared to be driven by ages under 30. Moderator analyses showed that patterns of mean-level change over time differed systematically between male and female samples. Male samples fluctuated in the direction of mean-level change over time, but overall showed improvements in mean body image. Female samples changed in the opposite direction of male samples until age 16, with worsening mean-level body image in the preteen and early adolescent years, culminating in a nadir around age 16 before improving, on average, during the late adolescent years and early twenties. For men and women, the largest changes in body image occurred between ages 10 and 14, and mean-level body image appeared to stabilize by approximately age 24. Due to a scarcity of longitudinal data for samples with age midpoints over age 30, we are less certain about what constitutes normative body image development in middle and late adulthood. Available data on middle-adulthood (i.e., age 38–54) suggested that samples of men and women may show decreasing mean-level in body esteem. On average, studies from this age period suggested that the importance attached to body and appearance may increase for men while declining for women. Neither cohort nor attrition rate significantly impacted mean-level change over time.

4.1. Body image development across the lifespan

4.1.1. Age 6–10

It has been posited that the foundations of body image development are laid during the preschool years, when children first develop awareness of their bodies and physical appearances, and begin to compare themselves to other children (Smolak, 2011). Though prevalence estimates have ranged widely, previous research has suggested that body dissatisfaction appears in a substantial minority of preschool children (Tatangelo et al., 2016), and may appear in the majority of children by age 10 (Dion et al., 2016). These studies have established that negative body image is not uncommon in children. Less clear is how much change characterizes normative body image development in childhood, and whether girls and boys differ in the direction or magnitude of normative change in childhood.

Our estimates of mean-level change in body image from age 6–10 were based on a small meta-analytic sample ($k = 9$ samples, 18 effect sizes). The studies assessed the constructs of body esteem, body dissatisfaction, and valuation using figure rating tasks, questionnaires, and in one case, a single item. The effect sizes of change during this age range were small in magnitude ($d_{\text{year}} = 0.008$, -0.004, and 0.062 for all samples, male-only samples, and female-only samples, respectively), though they appeared more substantial when compounded to visually depict cumulative change during this four-year period.

Prior literature has suggested that children have either shown worsening body image, or no meaningful change during this age period (Nichols et al., 2018; Smolak, 2011). Contrastingly, we found that on average, samples of girls showed improvements in body image between ages 6 and 10, whereas boys showed worsening body image. Given the small meta-analytic sample for this age period, and the diversity of constructs and assessment methods, it is unlikely that our estimates of mean-level change accurately represent normative body image development in childhood– rather than reflecting genuine and meaningful change in body image, we believe these findings to be spurious. It can be difficult to validly assess body image in children, as children may interpret figure rating tasks and questionnaire items in different and often unintended ways, introducing measurement error. Indeed, as a previous review highlighted, assessment methods that purport to measure the same underlying body image construct can produce uncorrelated results in children (Tatangelo et al., 2016). Though it is difficult to study body image in children, this pursuit is of critical importance, given research suggesting that negative body image may already be entrenched by age 11 (Lacroix et al., 2020). Additional longitudinal research is needed to better characterize patterns of normative body image development in children under 10 years old. Given the potential impact that measurement can have, particularly at young ages, we recommend using more than one measure of body image. Future longitudinal research can elucidate how different body image constructs change over time in younger children, and the extent of continuity in absolute levels of body image constructs from childhood to adolescence.

4.1.2. Age 10–16

The pre- to mid-adolescent period was well-represented by 373 effect sizes in our meta-analytic dataset. Accordingly, we can be somewhat confident in our findings regarding this age period. Our results suggest that between ages 10 and 16, normative body image development looks markedly different for boys and girls. Samples of boys tended to show improving body image, resulting in cumulative mean-change of $d = 0.260$ during this age period. Improvements were of greatest magnitude between the ages of 10 and 14. Although we found that on *average* boys tended to experience improvements in body image between ages 10 and 16, we wish to highlight that many individual boys may deviate from this pattern.

Conversely, samples of girls tended to show worsening body image, resulting in cumulative mean change of $d = -0.482$ during this age period. Among girls, effect sizes were also of largest magnitude between ages 10 and 14. The confidence intervals for yearly change estimates for 12–14 and 14–16 for girls did not cross zero, indicating these are the only age ranges that definitively showed worsening mean-level overall body image. As with boys, it is worth highlighting that many individual girls may deviate from the average pattern of mean-level change. Among girls, cumulative mean-level change in body esteem and satisfaction showed nadirs around age 16; increases in body dissatisfaction also peaked at this age. Consistent with these results, prior studies examining the age of onset of eating disorders have also found peak incidence rates around age 14–15 for anorexia nervosa (Javaras et al., 2015), and age 16–20 for bulimia nervosa (Stice et al., 2013).

Previous literature has characterized adolescence, specifically the ages of 12–18 years, as a critical period in body image development for boys and girls (Voelker et al., 2015). Results of the current meta-analysis suggest that this critical period may take place earlier than previously believed, with the largest changes taking place between ages 10 and 12 or possibly earlier.

4.1.3. Age 16–24

The late adolescence to young adulthood period (16–24) was also well-represented, with 270 effect sizes in our dataset. For male samples, average yearly change was small in magnitude ($d_{\text{year}} =$ -0.024 to 0.071) and estimated to be negative for ages 16–18 and 22–24, but positive for 18–20 and 20–22. Given the confidence intervals of these estimates, we cannot be certain whether these yearly change estimates reflect true, meaningful fluctuations in body image, or idiosyncrasies and measurement error within our meta-analytic dataset– in other words, whether the values represent signal or noise. Rather than over-interpreting the small fluctuations in our yearly change estimates for male samples, we turn our attention to the total change within this age period: from age 16–24, the cumulative average change in overall body image among male samples can be summarized as a small net-positive improvement (cumulative d = 0.080). So, on average, boys may show stability or minor improvements in body image during late adolescence and young adulthood. We highlight once again that many individual boys may deviate from this normative pattern of development.

Female samples also showed improvements in body image from age 16–24 (cumulative d = 0.330), with the largest magnitude of change occurring in the age range of 22–24 (cumulative d = 0.182). This finding contradicts the commonly held notion that body image is typically stable or worsens among girls during these years. As depicted in Fig. 3, however, cumulative improvements from age 16–24 did not fully reverse the average worsening of body image that took place in female samples from age 10–16 (cumulative d = -0.482). Given the detrimental and wide-ranging consequences of negative body image (e.g., Bornioli et al., 2021; Shagar et al., 2017), we underscore that the observed mean-level improvements, particularly in light of high *absolute* levels of body image concerns and dissatisfaction among women (Fiske et al., 2014), do not negate the need for intervention or suggest that girls will naturally overcome negative body image through simple development. Trends observed in the current meta-analysis represent normative development in non-clinical samples– individuals with the greatest disturbances in body image deviate, by definition, from this normative trajectory. Nonetheless, we are cautiously optimistic about the mean-level improvements in body image that were observed in female samples during emerging adulthood. This finding indicates that, all else being equal, typically developing girls can expect body image to improve somewhat during the transition to adulthood.

Our understanding of this encouraging result can be enriched by looking to personal accounts of individuals' journeys to overcome negative body image. In a prime example of how qualitative and quantitative studies can complement and inform each other, Gattario and Frisen (2019) interviewed 15 men and 16 women who had taken part in their quantitative longitudinal study (included in the current meta-analysis; Gattario et al., 2019). Participants were selected to participate in the qualitative study based on their trajectories of scores on the Body Esteem Scale for Adolescents and Adults (Mendelson et al., 2001): relative to the total sample, these participants showed low body esteem in early adolescence, but improved over time to eventually attain body esteem scores in the top quartile of the total sample. Quantitative data indicated that these participants' body esteem scores began to improve prior to age 18, but it took until the final measurement at age 24 for them to move into the top quartile of body esteem scores. To explain how they overcame negative body image, participants described turning points such as entering different social groups, experiencing increased agency and empowerment, and intentionally using cognitive strategies to counteract negative body image. These participants are not representative of the norm– in fact, they were specifically selected to participate in the study *because* of their unique body esteem trajectories, which deviated from the sample norm and evidenced full recovery from negative body image. However, the factors to which these individuals attributed their positive body image journeys are shared by many people of this age range, and may help explain why emerging adults, on average, experience improvements in body image.

4.1.4. Age 24–30

For male and female samples, mean-level body image plateaued by age 24, with no changes observed in studies with measurement interval midpoints between ages 24 and 30 (d_{year} = -0.001 and 0.001 for male and female samples, respectively). Primary longitudinal studies have shown diverse results with regards to the age at which mean-level body image stabilizes. For instance, the Growing Up Today Study found that mean-level body dissatisfaction stabilized by age 14 for boys, but continued to increase through to age 18 for girls (Calzo et al., 2012); the Norwegian Longitudinal Health Behavior Study (Holsen et al., 2012) and Project EAT (S. B. Wang et al., 2019) showed ages of mean-level stabilization largely consistent with our meta-analytic results; and in the Minnesota Twin Family Study, body dissatisfaction continued to increase among girls from age 11 to age 29 (Lowe et al., 2019). It is not surprising that studies with varying methodological characteristics and samples drawn from diverse populations have yielded different results– meta-analysis affords a viable way of resolving the conflicting findings of primary longitudinal studies. Results of the current study suggest that mean-level body image stabilizes, on average, by approximately age 24– when results are averaged across primary longitudinal studies, there is little appreciable mean-level change past this age.

4.1.5. Age 30+

Scant longitudinal research has examined how body image changes over time in adults past the age of 30. Consequently, our understanding of body image development in middle- and late-adulthood stems from cross-sectional studies that have compared people in different age groups (Grogan, 2011; Matsumoto & Rodgers, 2020). It has been posited that as men age, they may experience a widening gap between their appearance and unrealistic appearance ideals, as well as age-related declines in body muscularity and functionality, which may increase their risk for body image disturbances (Grogan, 2011; Matsumoto & Rodgers, 2020). Accordingly, men may show stable or increasingly negative body image later in life (Grogan, 2011), as well as increases in drive for thinness (Brown et al., 2020). Results of the current meta-analysis are consistent with the notion that men may show worsening body image as they age: the average mean-level yearly change in overall body image was negative for male samples (d_{year} = -0.035). However, this finding was based on three effect sizes from only two studies, which reported on men in their early forties. Examining body image in adult men was not the goal of either of these studies: Sinton (2007) and Hochgraf et al. (2019) both collected data on fathers' body image concerns in the context of studies focused on their adolescent daughters.

Although women tend to report more negative *absolute* levels of body image than men at every age (Hilbert et al., 2012), it is commonly believed that women attach less importance to their bodies and appearances as they age, despite their physical appearances moving further away from internalized beauty ideals and potentially reporting greater dissatisfaction with their bodies (Grogan, 2011). Results of the current meta-analysis, though based only on four studies and 10 effect sizes, are consistent with this understanding: estimates of yearly mean-level change in body esteem and valuation were both negative for samples of women with age midpoints between 38 and 54 (d_{year} = -0.028 and -0.015, respectively), suggesting that on average, older samples of women evaluated their bodies less positively over time, but also became less concerned about it.

Men and women may be at risk for worsening body image in adulthood, even if these changes tend to be of small magnitude. Additional longitudinal research may clarify this possibility, and better characterize normative body image development in older adults. It will be critical to examine body image concerns in ways that adequately capture gendered body ideals– for example, it would be pertinent to examine the development of muscularity concerns, as well as weight and shape concerns.

4.2. Magnitude of mean-level change in body image

The mean-level changes we observed in overall body image were all small in magnitude, and with the exception of for ages 12–16, non-significant. Thus, it could be argued that mean-level body image development is characterized by stability, rather than change. We note that the aim of the current study was primarily descriptive, rather than centered on null-hypothesis significance testing– our focus was on estimating the direction and magnitude of change in mean-level body image for specific age periods, and on describing the lifespan as precisely and comprehensively as possible, rather than on testing whether this change was statistically significant. To this end, we employed somewhat liberal inclusion criteria for our systematic review, and the result was a highly heterogeneous pool of included studies; we also examined mean-level change estimates separately for each age period, rather than aggregated across the lifespan, which reduced our statistical power to detect significant effects. Accordingly, it is not surprising that the confidence intervals around our change estimates are wide, and that most of these estimates are non-significant. The resulting yearly mean-level change estimates are small, but when we consider their cumulative magnitude, these changes may be less trivial– for example, a decrement in body image of nearly half a standard deviation between ages 10 and 16 would typically be considered a medium (Cohen, 1988) or large (Gignac & Szodorai, 2016) effect, depending how one chooses to interpret effect sizes. This magnitude is similar to what has been observed in longitudinal meta-analyses of vocational interests (Hoff et al., 2018) and self-evaluations (Orth et al., 2021), and smaller than what has been observed in mean-level personality trait change across the lifespan (Roberts et al., 2006). Given the numerous and wide-ranging impacts that body image may have (e.g., Bucchianeri et al., 2016), a change of half a standard deviation could have profound consequences.

4.3. Moderators of mean-level change in body image

We found support for the notion that mean-level change in body image is moderated by gender, age, and time lag, but there were no discernable effects of construct, birth cohort, or attrition rate on mean-level body image change over time. Changes in overall body image tended to be more negative among female samples, and in studies where data were collected at younger ages. The effect of gender appeared to be driven by the many studies that examined body image development in adolescence. Strikingly, for every age range we examined between ages 6 and 18, male and female samples changed, on average, in opposite directions. Gender differences in yearly mean-level change were largest between ages 10 and 14.

Mean-level changes in body image may be explained by individual-level variables. Specifically, the years between ages 10 and 14 are characterized by many social, biological, and physical changes which differ by gender, but also on a person-to-person basis. Although puberty tends to coincide with increases in BMI irrespective of gender (Yang et al., 2021), puberty may move boys and girls in different directions from gendered body ideals, with different consequences for body image. In boys, puberty is accompanied by increases in height, shoulder width, and muscle mass, which may move them, on average, closer to cultural ideals (Voelker et al., 2015). Indeed, prior longitudinal research has found that boys with *late* pubertal timing may experience more body dissatisfaction in early adolescence (Neumark-Sztainer et al., 2018). In the current meta-analysis, samples of boys tended to increase in mean-level body satisfaction, perceived attractiveness, and body esteem, and decrease in dissatisfaction during adolescence. Conversely, female puberty tends to be associated with alterations in body shape, and increases in fat deposits and body hair, which move girls further away from societal ideals of beauty and specifically the thin ideal (Fonseca & Matos, 2011). The onset of puberty and associated weight gain for girls of this age range likely contributes to the worsening of body image that has been observed in female samples between ages 10 and 14. Higher BMI has been associated with earlier pubertal timing (Brix et al., 2020), and the age of puberty onset has been decreasing worldwide (Eckert-Lind et al., 2020). It will be important for primary longitudinal studies to investigate the impact of BMI and pubertal timing on trends in body image development, while considering potential cohort effects.

Important gender differences may continue to influence body image development across the lifespan, as men and women experience different biological changes, role transitions, and sociocultural pressures (Guerin et al., 2017; Kilpela et al., 2015). Furthermore, body size may have a stronger influence on women's body image than on men's (Ålgars et al., 2009). In addition to examining differences between men and women later in adulthood, future longitudinal research may aim to better represent individuals who inhabit gender identities beyond the binary of man or woman. Indeed, transgender adolescents have been identified being at high risk for body dissatisfaction and disordered eating (Romito et al., 2021), yet little is known about what constitutes normative body image development among transgender people.

Longer measurement intervals (i.e., where body image was measured at more distal time points) were associated with greater negative changes in mean-level body image. Previous longitudinal meta-analyses in the areas of personality and interest development have observed similar trends– larger changes may accumulate over time in one direction, and can thus be captured more readily in studies with longer measurement intervals (Hoff et al., 2018; Roberts et al., 2006). When planning longitudinal studies and evaluating the impacts of interventions aimed to prevent or reverse negative body image, it will be important to consider the magnitude and direction of expected normative change for a given age range, and how the timing of a study aligns with expected normative changes. It would also be pertinent to consider that longer measurement intervals may result in larger estimates of change for intervention and control groups alike.

We did not find a measurable impact of body image construct on mean-level change over time. Rather than suggesting that body image is unidimensional, we speculate that the lack of significant effect of construct was due to two factors. First, few effect sizes were available for some constructs, particularly at later age ranges, meaning that we were likely underpowered to detect significant moderator effects. Second, within each construct, there was considerable heterogeneity in measurement, with a variety of measures of differing psychometric strength (Kling et al., 2019). As such, the lack of effect of construct on mean-level change may reflect measurement problems of the constructs as constituted for this meta-analysis. From visually inspecting Fig. 4 and examining the magnitude and direction of yearly mean-level change estimates, we cannot confidently say that all constructs change in the same ways over time. Additional longitudinal research is needed to determine whether meaningfully different age-related changes occur in different constructs of body image, such as constructs of an evaluative nature (e.g., body satisfaction) versus those related to the importance and concern placed on body and appearance (i.e., valuation).

Patterns of mean-level body image change were consistent across samples from different generations–birth cohort did not explain variability in the effect sizes. The mean estimated year of birth ranged from 1946 to 2008 in our meta-analytic dataset, and age and time lag were statistically controlled for in these analyses, which allowed us to examine the unique effects of birth cohort over several generations while holding age constant. Our findings do not support claims that body image is either worsening or improving for younger generations, but it is worth emphasizing that our results pertain to average developmental trajectories, and *not* absolute levels of body image. As such, our findings do not contradict prior research that *has* identified cohort effects in absolute levels of body image constructs (e.g., Hockey et al., 2021). Attrition also did not appear to systematically bias characterizations of normative body image development, increasing our confidence in findings of the current meta-analysis; longitudinal studies should still, of course, aim to retain as many participants as possible (Barry, 2005).

4.4. Limitations and future directions

The current meta-analysis summarizes what longitudinal studies have told us about normative body image development. Unfortunately, there are glaring gaps in this knowledge. Longitudinal research has disproportionately focused on earlier phases of the lifespan, so current understandings of how body image develops past age 30 are based largely on cross-sectional data and retrospective personal accounts. Furthermore, although boys and men have been included in longitudinal studies, many of these studies have assessed body image in ways that may not capture the types of body image disturbances that men tend to experience. With the increasing availability of gender-appropriate measures (Kling et al., 2019), future longitudinal studies will be better positioned to investigate the development of body image constructs such as muscularity concerns across the lifespan. In addition to measuring body image constructs more relevant to men's experiences, there has also been an increasing focus on *positive* body image constructs such as embodiment, body functionality, and body appreciation (Tylka & Wood-Barcalow, 2015), for which few longer-term longitudinal data were available. Another major gap concerns our understanding of how body image develops in different countries, cultural contexts, and ethnic groups. Of the studies that described participant ethnicity, 93.6% of analyzed effect sizes represented majority-White samples. Though most studies did not report on other ethnocultural characteristics, we suspect that our meta-analytic dataset was composed overwhelmingly of studies conducted with Western, Educated, Industrialized, Rich, and Democratic (WEIRD) samples. Thus, it is unknown whether our findings generalize to populations that diverge from this description. We hope that the results of our review will motivate researchers to conduct longitudinal studies that can help tease apart how different constructs of body image change over time beyond young adulthood, in more diverse samples, and across different parts of the world.

Another set of limitations concerns our inclusion and exclusion criteria, and categorization of measures. Body image research has expanded rapidly over the past decades, resulting in a wide variety of measures available to assess body image constructs (Kling et al., 2019). Because there is no consensus or hard-and-fast rule about what is and is not body image, it was difficult to decide on inclusion and exclusion criteria concerning the types of constructs and measures we would include in our review. Ultimately, our choices of inclusion and exclusion criteria were driven by both theory and pragmatic considerations: we tried to balance theoretical specificity and clarity (i.e., including only those longitudinal studies that clearly assessed body image), with maximal representation of body image development across the lifespan. Implicit in our approach of aggregating effect sizes across constructs and measures (i.e., to answer Research Question 1), is the assumption that different body image measures all show convergent validity, and that there is a single underlying latent construct of body image. Recognizing that this assumption may not hold, we also examined the moderating role of construct, and provided yearly change estimates separately for different body image constructs wherever sufficient data were available. Categorizing measures into broad constructs of body image allowed us to synthesize findings, but inevitably resulted in some loss of information about the particular measures that represent each of these constructs. Furthermore, many studies used purpose-built body image measures, and some studies used measures that could arguably cross-load onto two or more body image constructs. Thus, there was heterogeneity in the psychometric quality of measures used to assess body image, and in many cases it was difficult to categorize measures. As more longitudinal data emerge, additional meta-analyses that focus on specific measures or constructs of body image could enable a more nuanced understanding of normative body image development.

Finally, the current meta-analysis describes mean-level patterns of normative body image development based on study and sample characteristics, but does not provide any information on individual differences. Characteristics such as adiposity (approximated using BMI) and pubertal timing exhibit substantial inter-individual (i.e., within-study) heterogeneity, and are thus more suitably examined by primary studies. We acknowledge that many such factors play critical roles in body image development. Furthermore, as primary longitudinal studies have demonstrated (Lacroix et al., 2020; Nelson et al., 2018; S. B. Wang et al., 2019), there are in fact multiple patterns of body image development, which are obscured when only average mean-level change is examined, as in the current meta-analysis. Finally, our results pertain to how body image changes, and not to absolute levels of body image constructs. Absolute levels of body image constructs are at least as important as patterns of change over time: for example, an individual can demonstrate a trajectory of steadily increasing body satisfaction over time, but intervention may still be indicated if they exhibit a low absolute level of body satisfaction. This same argument extends to the aggregate level: a population that, on average, shows improvements in body image over time (e.g., men), can still be at risk if the absolute level of body image concerns is high in that population. Indeed, recognizing that negative body image is quite normative, many preventative interventions take a universal, rather than selective approach (Kusina & Exline, 2019).

4.5. Conclusion

This meta-analysis synthesized longitudinal data from 142 samples and 128,254 participants to characterize normative body image development across studied portions of the lifespan. Though there remain large gaps in knowledge, our approach enabled a more comprehensive and precise description of body image development than has been afforded by individual longitudinal studies or narrative reviews. Male and female samples showed distinct trajectories of mean-level change: male samples showed fluctuations with a net-improvement in overall body image between ages 10 and 24; whereas female samples showed worsening body image between ages 10 and 16, but improvements between ages 16 and 24. Mean-level change was of greatest magnitude between ages 10 and 14, and stabilized around age 24. We found no discernable effects of construct, birth cohort, or attrition rate on mean-level change in body image. These findings highlight a need to revise current understandings of normative body image development: sensitive periods may occur somewhat earlier than previously believed, and body image generally improves among women during the transition from adolescence to adulthood. Additional longitudinal research is needed to clarify normative patterns of body image development in middle and late adulthood, and in more diverse populations.

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CRediT authorship contribution statement

Emilie Lacroix: Conceptualization, Methodology, Software, Formal analysis, Investigation, Resources, Data curation, Writing –

original draft, Writing – review & editing, Visualization. **Alyssa Smith:** Investigation, Data curation. **Incé A. Husain:** Investigation, Writing – original draft. **Ulrich Orth:** Statistical consultation, Writing – review & editing. **Kristin M. von Ranson:** Conceptualization, Writing – review & editing, Supervision.

Data availability

Data will be made available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.bodyim.2023.03.003.

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