*Development and Psychopathology* (2025), **37**, 1054–1067
doi:10.1017/S0954579424000907

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**Regular Article**

# Shifting goalposts: widening discrepancies between girls' actual and ideal bodies predict disordered eating from preadolescence to adulthood

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**Abstract**

Background: Little is known regarding how disordered eating (DE) relates to perceived actual body size, ideal body size, and their discrepancy. This study examined changes in perceived actual body size, ideal body size, and actual-ideal discrepancies over time, and their relationship with subsequent DE.
Methods: Participants were 759 female twins from the Minnesota Twin Family Study who reported on body image and DE every three to five years between approximately ages 11 to 29. We used multilevel modeling to examine developmental trajectories of body mass index (BMI) and Body Rating Scale Actual, Ideal, and Actual-Ideal discrepancy scores and compared the degree to which BMI, BRS body size perceptions, and body dissatisfaction predicted DE behaviors and attitudes over time. Participants were treated as singletons in analyses.
Results: Perceived Actual body sizes and BMIs increased from age 10 to 33, whereas Ideal body sizes remained largely stable across time, resulting in growing Actual-Ideal discrepancies. Body size perceptions and Actual–Ideal discrepancies predicted subsequent DE behaviors and attitudes more strongly than did body dissatisfaction as measured by self-report questionnaires.
Conclusions: This research advances understanding of how female body size perceptions and ideals change across development and highlights their relationship with subsequent DE.

**Keywords:** body image; body size perception; development; disordered eating; females

(Received 28 September 2023; revised 2 February 2024; accepted 3 April 2024; First Published online 16 May 2024)

## Introduction

As early as age 3, girls begin to show preferences for thin bodies relative to larger bodies (Harriger et al., 2010; Ursu & Enea, 2021). Approximately 30% of girls will have tried dieting by age 11 (Balantekin et al., 2014), and by adolescence, approximately 70% of girls report a desire to change their body weight or shape (Lowes & Tiggemann, 2003; McLean et al., 2021). Unfortunately, body dissatisfaction remains prevalent in women throughout the lifespan (Tiggemann, 2011), and is associated with many adverse physical and mental health outcomes, including disordered eating (Gardner et al., 2000; Rohde et al., 2015). Disordered eating etiology and maintenance are generally best understood using a biopsychosocial model (Smolak & Levine, 2015). Specifically, biological (epigenetics, sex, gonadal hormones, neurochemistry), psychological (cognition, personality), and sociological factors (culture, gender, ethnicity, influences from parents and peers, bullying, trauma, media exposure, and thin-ideal internalization, pressures, and expectancies) confer risk for body image disturbances and disordered eating among girls and women (see Culbert et al., 2015 for review). Further, many theoretical models of disordered eating risk posit that thin-ideal internalization (i.e., "buying into" the thin-ideal (Thompson & Stice, 2001)) results in body dissatisfaction, which leads some individuals to engage in disordered eating behaviors with the goal of obtaining a body that is more closely aligned with the thin ideal (e.g., Rodgers et al., 2014; Thompson et al., 1999).

Actual body sizes, commonly operationalized by the body mass index (BMI)[1], are one contributor to body dissatisfaction. Among girls and women, body mass indices (BMI) tend to increase from age 5 through adulthood, until around age 75 (Attard et al., 2013; Belsky et al., 2012; Song et al., 2018; Warrington et al., 2015; Yang et al., 2021), moving bodies further and further away from culturally prescribed thin body ideals. In girls, puberty is a time when these changes are particularly pronounced, and body changes during puberty have been prospectively associated with increases in body dissatisfaction, disordered eating behaviors, and eating disorder prevalence (Halvarsson et al., 2002; Klump et al., 2007), particularly in those who perceive themselves as overweight (Ackard & Peterson, 2001; Hahn et al., 2023).

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**Cite this article:** Magel, C. A., Lacroix, E., Wilson, S., Iacono, W. G., & von Ranson, K. M. (2025). Shifting goalposts: widening discrepancies between girls' actual and ideal bodies predict disordered eating from preadolescence to adulthood. *Development and Psychopathology* **37**: 1054–1067, https://doi.org/10.1017/S0954579424000907

[1]We acknowledge that BMI is an inaccurate measure of adiposity as it does not consider bone density, muscle mass, other facets of body composition, or sex differences. It is also not a reliable indicator of health outcomes (e.g., Tomiyama et al., 2016).

Objective body size (i.e., BMI) is not the only factor that influences how individuals perceive their bodies: body size *perception* may be at least as important. Although children can generally accurately estimate their body size by approximately age 5 (Williamson & Delin, 2001), distortions in perceptions of body size (i.e., under- or over-estimation) are apparent in a substantial proportion of children, adolescents, and adults (Duncan et al., 2011; Stapleton et al., 2016; Steinsbekk et al., 2017). Perceiving oneself as "overweight" prior to puberty or in late adolescence is a stronger predictor of disordered eating behavior than objective body size (Ackard & Peterson, 2001; Hahn et al., 2023; Kim et al., 2008). Similarly, girls have exhibited greater levels of body dissatisfaction when they perceive their bodies as larger, regardless of their actual body size (Dion et al., 2016). This may be particularly true during puberty, when girls tend to experience unparalleled increases in weight and changes in shape (Smolak, 2012).

### *Measurement of body size perception*

Body size perception and body dissatisfaction are two distinct but interconnected components of body image (Cash & Deagle, 1997; Cornelissen et al., 2019). Whereas body dissatisfaction is typically measured using self-report questionnaires, body size perception is usually measured using figural drawing scales (Gardner & Brown, 2010). Using a series of frontal line drawings arranged from smaller to larger body size, individuals are asked to select which body most closely resembles their own (*Actual* body size) as well as their *Ideal* body size. The difference between these two scores is known as the *Actual-Ideal discrepancy*. The Actual-Ideal discrepancy is widely used as a measure of body dissatisfaction (Vartanian, 2012). Although figural drawing scales have many limitations (e.g., they do not directly assess the distress that one may experience when their body deviates from their ideal, they often depict unrealistic and Eurocentric representations of the proportions and definition of the human form, and may have only a small number of available figures to choose from (Altabe, 2001; Gardner et al., 1998; Thompson & Gray, 1995)), there are many reasons why these scales are valuable resources in the field of body image. For example, they are brief and easy to complete, which makes them ideal to administer in both individual and group settings, and they may be more accommodating to children and others with literacy or language limitations.

### *Development of body size perception*

Although many studies have examined BMI and body image development (Attard et al., 2013; Belsky et al., 2012; Lacroix et al., 2023; Song et al., 2018; Warrington et al., 2015; Yang et al., 2021), little is known about how body size perceptions change over time. Cross-sectional studies have demonstrated the presence of significant Actual-Ideal discrepancies beginning around age 6 (Collins, 1991) and continuing into adolescence and early adulthood (Cooley & Toray, 2001; Solomon-Krakus et al., 2017). Some studies suggest that it is more common for girls to exhibit significant Actual-Ideal discrepancies than boys (Nomura et al., 2021) and these discrepancies tend to widen with increasing body size (Robbins et al., 2017). In a longitudinal study of children aged six to 13 years, Gardner et al., (1999) found that both girls and boys wanted to be thinner, with girls choosing increasingly thin ideal body sizes as they aged. Thus, thin-ideal internalization occurs even in young children and increases from childhood to early adulthood (Rohde et al., 2015; Suisman et al., 2014). The thin-ideal prevails across the female lifespan, with girls and women tending to rank "ideal" bodies as being significantly thinner than "normal" bodies (Brown & Slaughter, 2011).

Given the simultaneous increases in actual body size and decreases in ideal body size ratings that occur across through early adulthood, there is likely to be a resulting increase in the discrepancy between these ratings (Actual-Ideal discrepancies) across time. The larger these discrepancies, the more likely it is that one will experience body dissatisfaction and disordered eating behaviors and attitudes (e.g., dieting, eating restraint, bulimic symptoms, preoccupation with food and weight, and fear of weight gain; Argyrides & Sivitanides, 2017; Cooley & Toray, 2001; Jankauskiene & Baceviciene, 2019; Valutis et al., 2009). Thus, gaining an understanding of how body size perception and ideal body size change across development may provide crucial insight into periods of risk for body image and eating concerns. Although body dissatisfaction is a well-established risk factor for disordered eating behaviors (Culbert et al., 2015), the potential role of body size perception is less well-understood. The failure to include body size perception in theoretical models of disordered eating is problematic, as perceptions and attitudes toward the body have been stronger predictors of disordered eating behavior than objective body size (Kim et al., 2008). To understand the impact of body size perception on disordered eating behaviors and attitudes, an investigation comparing the impact of BMI, body size perception, and body dissatisfaction on disordered eating symptoms is warranted.

### *The current study*

Using data from the Minnesota Twin Family Study (MTFS), a population-based, prospective study of 1,359 reared-together female twins aged 11 to 29, the current study aimed to: (a) identify developmental trajectories of BMI, Actual and Ideal body size ratings, and Actual-Ideal Discrepancy scores in a sample of females over a span of approximately 18 years; and (b) examine the degree to which each of these factors, as well as self-reported body dissatisfaction, predicted disordered eating behaviors and attitudes. We hypothesized that participants would: endorse larger Actual body size ratings over time, in parallel with linear increases in actual BMI based on measured weight and height; select increasingly thin Ideal bodies until approximately age 14, followed by slowed growth; and show linear increases in Actual-Ideal discrepancy scores over time. Additionally, we hypothesized that higher levels of body dissatisfaction and greater Actual-Ideal discrepancy scores would most strongly predict disordered eating behaviors and attitudes.

## Method

### *Ethical considerations*

Secondary use of the data was approved by the University of Calgary Conjoint Faculties Research Ethics Board (REB 20-1251).

### *Participants*

The sample consisted of 759 same-sex female twins drawn from the Minnesota Twin Family Study (MTFS; Iacono & McGue, 2012), a population-based, prospective study of reared-together same-sex twins and their parents. Twins were identified using State of Minnesota birth records during specified years; more than 90% of twins born between 1971 and 1985 were located. Of these, 83%

**Table 1.** Descriptive statistics at each assessment timepoint

| Assessment Timepoint | 1<br>n = 706–762<br>M (SD) | 2<br>n = 648–710<br>M (SD) | 3<br>n = 506–675<br>M (SD) | 4<br>n = 600–705<br>M (SD) | 5<br>n = 556–684<br>M (SD) | 6<br>n = 39–677<br>M (SD) |
|---|---|---|---|---|---|---|
| **Age (years)** | 11.70 (0.46) | 14.77 (0.56) | 18.28 (0.72) | 20.99 (0.62) | 25.26 (0.79) | 29.13 (0.62) |
| **BMI (kg/m²)** | 19.36 (3.72) | 22.16 (4.20) | 23.73 (4.91) | 24.47 (5.24) | 25.62 (6.00) | 27.32 (6.68) |
| **BMI Percentile** | 56.07 (28.94) | 62.87 (25.57) | 60.31 (26.49) | – | – | – |
| **BRS Actual Rating** | 4.76 (1.07) | 5.49 (1.02) | 5.29 (1.12) | 5.39 (1.18) | 5.69 (1.27) | 5.88 (1.33) |
| **BRS Ideal Rating** | 4.34 (0.90) | 4.77 (0.74) | 4.30 (0.85) | 4.37 (0.88) | 4.46 (0.91) | 4.57 (0.89) |
| **BRS A-I Discrepancy Score** | 0.42 (1.06) | 0.73 (1.02) | 0.98 (1.01) | 1.01 (0.98) | 1.24 (1.01) | 1.31 (1.10) |
| **MEBS Body Dissatisfaction Score** | 1.16 (1.70) | 1.88 (2.09) | 2.11 (2.13) | 2.21 (2.17) | 2.55 (2.19) | 2.68 (2.20) |
| **MEBS Weight Preoccupation Score** | 2.52 (2.26) | 2.37 (2.46) | 2.48 (2.36) | 2.44 (2.33) | 2.69 (2.29) | 3.10 (2.36) |
| **MEBS Compensatory Behaviors Score** | 0.08 (0.33) | 0.23 (0.65) | 0.27 (0.68) | 0.26 (0.69) | 0.21 (0.62) | 0.22 (0.61) |
| **MEBS Binge Eating Score** | 1.09 (1.42) | 0.88 (1.34) | 1.00 (1.39) | 1.03 (1.40) | 1.07 (1.45) | 1.40 (1.60) |
| **MEBS Modified Total Score (disordered eating)** | 3.68 (3.29) | 3.49 (3.63) | 3.78 (3.59) | 3.70 (3.59) | 3.97 (3.53) | 4.72 (3.72) |

*Note.* BMI = body mass index; BRS = body rating scales (self-report; Preadolescent version used at timepoints 1 and 2 and Adolescent+ version used thereafter); BRS A-I Discrepancy Score = body rating scale Actual-ideal Discrepancy Score; MEBS = Minnesota Eating Behavior Survey (self-report); MEBS Modified Total Score = score comprising the total of MEBS Weight Preoccupation, Compensatory Behavior, and Binge Eating subscale scores). The range of *N*s at each timepoint reflects the available data for each measure (e.g., BMI data were not available for most participants at timepoint 6 ($n = 39$)).

agreed to participate. The sample was over 95% white, consistent with the demographic makeup of Minnesota during this period. Details regarding the study design and participant demographic information can be found elsewhere (Iacono et al., 1999; Iacono & McGue, 2012). The MTFS includes male and female same-sex twins. However, only girls completed body image measures and thus are included in this study. Female twins were first assessed at approximately age 11 ($n = 759$, $M_{age} = 11.70$ ($range = 10.75$–$12.68$), $SD_{age} = 0.46$), with five subsequent assessments every three to five years. A total of 471 participants completed all six timepoints, whereas 156 participants completed five, 66 completed four, 34 completed three, 21 completed two, and 11 completed just one. The youngest participant was 10.75 years of age at intake and the oldest was 33.14 years of age at final follow-up (see Table 1 for means and age ranges at each assessment timepoint).

## Measures

### Body mass index (BMI)

The BMI roughly indicates adiposity and is highly correlated (Cohen, 1992) with more precise measures of body mass such as total abdominal fat area ($r = .73$) and visceral fat area ($r = .67$; Hung et al., 2012). At each assessment, MTFS psychophysiologists used an anthropometer to measure participant height and a level platform scale with a beam and moveable weights to measure participant weight. BMI (kg/m$^2$) was calculated using these measurements. Information regarding mean BMI percentiles for timepoints one through three can be found in Table 1.

### Body Rating Scales (BRS; Sherman et al., 1995)

The BRS are two sets of figural drawing scales that consist of a set of nine line drawings depicting a preadolescent (Preadolescent) female and a set depicting an adolescent/adult (Adolescent+) female. In each set, each drawing is identified by a number (one through nine), with figures' body sizes ranging from very thin to very fat. Participants completed the Preadolescent version at the first two assessments (e.g., approximate ages of 11 and 14 years), and completed the Adolescent+ version at all subsequent assessments. Participants were presented with the age-appropriate set of drawings and asked to select the figure drawing(s) that most closely resembled "how you think you look" (*Actual*) and "how you would like to look" (*Ideal*) (Sherman et al., 1995). The *Actual-Ideal discrepancy* is calculated by subtracting the participant's Ideal score from their Actual score. We evaluated the psychometric properties of these ratings in a separate examination of the same sample, which supported its validity as a measure of body size perception in girls and women (Magel, 2023; Magel et al., 2024).

### Minnesota Eating Behavior Survey[2] (MEBS; von Ranson et al., 2005)

The MEBS measured a second component of body image—body dissatisfaction—as well as disordered eating behaviors and attitudes. The MEBS is 30-item self-report questionnaire that assesses current disordered eating attitudes and behaviors among community individuals and can be reliably completed by children as young as 10 years of age (von Ranson et al., 2005). A simplified True/False version of the MEBS was administered at intake, whereas at subsequent timepoints, participants selected one of four responses (Definitely True, Probably True, Probably False, Definitely False). To compute MEBS scores with consistent ranges across timepoints, we collapsed each follow-up timepoint responses into one of two categories (True/False).

The MEBS yields four subscale scores: Body Dissatisfaction (six items; discontent with body size or shape), Compensatory Behavior (six items; use of, or thoughts of using, self-induced vomiting and other inappropriate compensatory behaviors for

[2]The Minnesota Eating Behavior Survey (MEBS; previously known as the Minnesota Eating Disorder Inventory (M-EDI)) was adapted and reproduced by special permission of Psychological Assessment Resources, 16204 North Florida Avenue, Lutz, Florida 33549, from the Eating Disorder Inventory (collectively, EDI and EDI-2) by Garner, Olmstead, Polivy, Copyright 1983 by Psychological Assessment Resources. Further reproduction of the MEBS is prohibited without prior permission from Psychological Assessment Resources.

weight loss), Binge Eating (seven items; binge eating, secretive eating, and preoccupation with food), and Weight Preoccupation (eight items; preoccupation with weight, eating, and dieting). To investigate the effect of "body dissatisfaction" component of body image, we examined the Body Dissatisfaction subscale separately in this study (i.e., as a predictor of disordered eating). Thus, a modified total score that excluded the Body Dissatisfaction subscale described total disordered eating behaviors and attitudes (referred to hereafter as the "Modified Total Disordered Eating Symptom Score"). In MTFS participants, the MEBS has demonstrated acceptable factor congruence (factor congruence coefficients = 0.48–0.97), internal consistency (McDonald's omegas = .42–.86; see Appendix A); and test-retest reliability across the study period ($r$ = .27–.69 for Modified Total Score; see Appendix B for temporal stability of all subscales).

## Statistical analyses

### Modeling development of body size and body size perception

Growth curve modeling is a technique to describe individuals' change over time on a variable by testing whether the trajectory is linear, curvilinear, cubic, or another functional form. It also allows for the inclusion of all study participants, regardless of missing data at specific time points (Panik, 2014). Growth curve models were fitted to BRS Actual, Ideal, and Actual-Ideal discrepancy scores, as well as the log of BMI (transformed to normalize the distribution) across time to identify the trajectories that most accurately captured the changes in these scores in our sample from approximately ages 11 to 29. Growth curve models were fitted to the data using mixed effects regression in Stata (version 17).

We first estimated several hypothetical growth functions, namely: a traditional regression model (where time is entered as the predictor), a linear model with a random intercept and fixed slope (where growth is a straight line with a constant rate of change across all ages and the intercept varies by participant, but all participants follow the same trajectory), a linear model with a random intercept and random slope (where growth is a straight line with a constant rate of change across all ages and the intercept varies by participant and participants may follow different trajectories), a curvilinear (squared) model with a random intercept and random slope (which allows for parabola-shaped growth (i.e., one change in direction of the trajectory across time) and the intercept varies by participant and participants may follow different trajectories), and a curvilinear (cubed) model with a random intercept and random slope (which allows for two changes in direction of the trajectory across time and the intercept varies by participant and participants may follow different trajectories). Likelihood ratio tests then compared the overall fit of these models and determined which model best fit the data. Fit indices including the Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC) were computed to provide further indicate the better fitting models (Chakrabarti & Ghosh, 2011), such that lower AIC and BIC indicated better fit.

We also ran analyses after randomly selecting one twin from each pair ($n$ = 381) to check if findings might be attributable to the nonindependence of twin data. As no differences in findings were observed, analyses were conducted with participants treated as singletons. Only the results from the full twin sample are reported herein (see Appendix C for results of analyses using a randomly selected twin from each pair).

### Prediction of disordered eating

Multilevel modeling (MLM) examined the degree to which each aspect of body image predicted disordered eating behaviors and attitudes over time. These MLMs allowed for increased power, and inclusion of all study participants, regardless of missing data at specific time points (Hayes, 2006). MLM accounts for hierarchically structured data, where timepoints (level 1) were nested within participants (twins; level 2) and twins were nested within families (level 3). The third level (family) was dropped from the final models given that nesting within families did not improve model fit. Further, although we tried accounting for the co-twins' relationship in mixed effects models, the overlap in the twins' responses prevented the models from running. Thus, like Slane et al., (2014), we ran the models after randomly selecting one twin from each pair ($n$ = 381), to check if findings might be attributable to the nonindependence of twin data. As no differences in findings were observed, only the results from the full twin sample are reported herein, effectively treating participants as singletons (see Appendix E for results of analyses using a randomly selected twin from each pair).

These models examined the extent to which BMI and components of body image (MEBS Body Dissatisfaction, BRS Actual and Ideal scores, and BRS Actual-Ideal Discrepancy score) predicted disordered eating attitudes (MEBS Weight Preoccupation) and behavior (MEBS Binge Eating and Compensatory Behavior) and Modified Total Disordered Eating Symptom scores across time. In each model, time was included as a fixed effect. The models consistently included either BMI, MEBS Body Dissatisfaction, and BRS Actual and Ideal scores as predictor variables (Model A) or BMI, MEBS Body Dissatisfaction, and the BRS Actual-Ideal Discrepancy score (Model B) as predictor variables. BRS Actual-Ideal Discrepancy scores are calculated using Actual and Ideal scores and thus, there is significant multicollinearity between the former and the latter two scores. Therefore, the effects of these predictors were examined in separate models (Models A and B).

MEBS Binge Eating, Compensatory Behavior, Weight Preoccupation, and Modified Total Disordered Eating Symptom scores were used as outcome variables. An examination of the characteristics of each dependent variable suggested that a traditional multilevel linear model was inappropriate because the assumption of normality was violated (data were heavily skewed left) as was the assumption of linearity (variables did not have linear relationships with time). Therefore, rather than running multilevel linear models (which use a Gaussian continuous probability distribution and identity link function), generalized linear mixed models using a gamma probability distribution and log link function were employed to better fit the data (as the dependent variables followed a gamma rather than linear distribution) and to provide more accurate estimates. These models model continuous, positive dependent variables and are particularly appropriate when data have skewed distributions (see Appendix D for distributions of dependent variables). Given that gamma distributions are appropriate for data with outcomes comprised of values greater than zero, all dependent variables were rescaled by adding one to each score. Marginal effects were also calculated to indicate the relative importance and size of the effect of each predictor variable on each outcome variable (i.e., the marginal change in outcome variable given a one-unit change in each predictor variable; Williams, 2012).

## Results

### *Descriptive statistics*

Descriptive statistics for key variables at each timepoint are presented in Table 1. Participants' BMI and Actual body size ratings increased with age, but their Ideal body size ratings remained largely stable, resulting in growing Actual-Ideal discrepancy and MEBS Body Dissatisfaction scores over time. Although slope coefficients indicated increases in Binge Eating, Weight Preoccupation, and Modified Total Disordered Eating symptoms scores over time, closer inspection of the data suggest these were driven by increases at timepoints 5 and 6. Compensatory Behavior scores also remained relatively consistent (see Slane and colleagues (2014) for growth curve models of these behaviors in our sample from ages 11 to 25).

### *Growth curve analysis*

Estimated means for each growth curve model and model fit statistics for the log of BMI and BRS Actual, Ideal, and Actual-Ideal discrepancy ratings are listed in Table 2. Likelihood ratio test results are presented in Table 3. The trajectories of all tested models for each variable are shown in Appendix F. Importantly, the number of participants who were 31 years of age or older at the last assessment timepoint was small ($n = 12$) and thus, trajectories after age 30 should be interpreted with caution.

Based on the likelihood ratio tests, and lower AIC and BIC values, curvilinear (cubed) models with random intercept and random slope (i.e., those which allowed for two changes in direction of the trajectory across time) were the best fit for BMI, BRS Actual, and BRS Ideal Rating trajectories. Specifically, as seen in Figure 1, these models suggest that there is an increase in Actual Body size ratings and BMI until approximately age 20, followed by slowed growth until approximately age 25 and 30, respectively, and a sharper increase until age 33. Mean BMI percentile values at initial assessment fell in the average range ($M = 56.07^{th}$ percentile) whereas BMI values at the final timepoint fell in the "overweight" range ($M = 27.32\ kg/m^2$). By contrast, Ideal body size ratings remained relatively stable across the study period (i.e., from age 10 to 33), although model estimates showed a tendency for participants to begin to select larger ideal body sizes after age 30. Thus, our hypotheses were not supported, as the best-fitting models reflected curvilinear (cubed) trajectories, rather than linear trajectories.

Regarding the trajectory of the BRS Actual-Discrepancy score, the curvilinear (squared) model with a random intercept and random slope (which allows for parabola-shaped growth (i.e., one change in direction of the trajectory across time)) had the best fit, as indicated by the likelihood ratio tests, and lower AIC and BIC values. As seen in Figure 1, this model showed an increase in Actual-Ideal Discrepancy scores from age 10 until approximately age 30, followed by a decrease in these scores until age 33. Thus, contrary to our hypothesis, the best-fitting model reflected a curvilinear (squared) trajectory, rather than a linear increase.

### *Prediction of disordered eating*

#### *Weight preoccupation*

In both Models A and B (Table 4), Body Dissatisfaction, Actual and Ideal body size ratings, and Actual-Ideal discrepancy scores predicted Weight Preoccupation scores, whereas BMI did not. Marginal effects demonstrating the relative importance and effect sizes of changes in each body image variable on Weight Preoccupation scores every three years are also presented in Table 4. In Model A, for each point increase in Body Dissatisfaction and Actual body size ratings, Weight Preoccupation scores increased by .20 and .84 points, respectively. Conversely, for each point increase in individuals' Ideal body size, there was a .99-point *decrease* in their Weight Preoccupation score. In Model B, for each point increase in Body Dissatisfaction and Actual-Ideal discrepancy scores, there were increases of .20 and .92 points in Weight Preoccupation scores, respectively. Thus, results suggest that thinner Ideal body size ratings, greater Body Dissatisfaction scores, larger Actual body size ratings, and larger Actual-Ideal discrepancy scores predicted increases in Weight Preoccupation scores over time. Further, body image perception variables more strongly predicted Weight Preoccupation scores than did Body Dissatisfaction scores: thinner Ideal body size was the strongest predictor, followed by larger Actual-Ideal discrepancy scores and Actual body size ratings.

#### *Compensatory behavior*

Models A and B (Table 5) suggest that BMI, Body Dissatisfaction, Actual and Ideal body size ratings, and Actual-Ideal discrepancy scores predicted Compensatory Behavior scores. Marginal effects demonstrating the relative importance and effect sizes of changes in each body image variable on Compensatory Behavior scores every three years are also presented in Table 5. In Model A, for each point increase in Body Dissatisfaction and Actual body size rating, Compensatory Behavior scores increased by .08 and .11 points, respectively. Conversely, for each point increase in individuals' BMI and Ideal body size, there was a .01- and .15-point *decrease* in their Compensatory Behavior score. In Model B, for each point increase in Body Dissatisfaction and Actual-Ideal discrepancy score, there were increases of .08 and .13 points in Compensatory Behavior scores, respectively. Conversely, for each point increase in individuals' BMI, there was a .02-point *decrease* in their Compensatory Behavior score. Therefore, results suggest that lower BMI, thinner Ideal body size, more Body Dissatisfaction, and larger Actual body size ratings and Actual-Ideal discrepancy scores predicted increases in Compensatory Behavior scores over time. Additionally, body size perception variables more strongly predicted Compensatory Behavior scores than did Body Dissatisfaction; thinner Ideal body size was the strongest predictor, followed by larger Actual-Ideal discrepancy scores and Actual body size ratings.

#### *Binge eating*

Models A and B (Table 6) suggest that BMI, Body Dissatisfaction, Actual and Ideal body size ratings, and Actual-Ideal discrepancy scores predicted Binge Eating scores. Marginal effects demonstrating the relative importance and effect sizes of changes in each body image variable on Binge Eating scores every three years are also presented in Table 6. In Model A, for each point increase in Body Dissatisfaction and Actual body size ratings, Binge Eating scores increased by .12 and .26 points, respectively. Conversely, for each point increase in individuals' BMI and Ideal body size ratings, Binge Eating scores *decreased* by .04 and .19 points, respectively. Similarly, in Model B, for each point increase in Body Dissatisfaction and Actual-Ideal discrepancy scores, there were increases of .12 and.22 points in Binge Eating scores, respectively. For each point increase in individuals' BMI, there was a .03-point *decrease* in their Binge Eating score. Thus, results suggest that lower BMI, thinner Ideal body size ratings, more Body Dissatisfaction, and larger Actual body size ratings and Actual-

https://doi.org/10.1017/S0954579424000907 Published online by Cambridge University Press



**Table 2.** Results of growth curve models examining the impact of age on BMI and BRS Actual, Ideal, and Actual-Ideal discrepancy ratings

| | Traditional regression | Linear with fixed Slope | Linear with random slope | Curvilinear (squared) | Curvilinear (cubed) |
|---|---|---|---|---|---|
| Model | *Estimate (SE)* | *Estimate (SE)* | *Estimate (SE)* | *Estimate (SE)* | *Estimate (SE)* |
| **Body Mass Index** | 0.02 (0.00)*** | 0.02 (0.00)*** | 0.02 (0.00)*** | 0.00 (0.00)*** | **0.00 (0.00)***** |
| Intercept | 2.76 (0.01)*** | 2.77 (0.01)*** | 2.76 (0.01)*** | 2.25 (0.02)*** | **1.69 (0.08)***** |
| Fit statistics | | | | | |
| AIC | −1441.92 | −3946.13 | −4078.65 | −4619.73 | **−4664.62** |
| BIC | −1423.81 | −3921.99 | −4042.44 | −4577.48 | **−4616.34** |
| Log likelihood | 723.96 | 1977.07 | 2045.33 | 2316.86 | **2340.31** |
| **BRS Actual Rating** | 0.05 (0.00)*** | 0.05 (0.00)*** | 0.05 (0.00)*** | 0.00 (0.00)*** | **0.00 (0.00)***** |
| Intercept | 4.39 (0.07)*** | 4.39 (0.06)*** | 4.39 (0.06)*** | 3.80 (0.16)*** | **−0.62 (0.61)** |
| Fit statistics | | | | | |
| AIC | 13,125.2 | 11,506.67 | 11,282.49 | 11,268.05 | **11,214.22** |
| BIC | 13,144.2 | 11,531.92 | 11,320.37 | 11,312.24 | **11,264.72** |
| Log likelihood | −6559.62 | −5749.33 | −5635.25 | −5627.02 | **−5599.11** |
| **BRS Ideal Rating** | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00)* | **0.00 (0.00)***** |
| Intercept | 4.42 (0.05)*** | 4.42 (0.05)*** | 4.42 (0.05)*** | 4.72 (0.14)*** | **1.01 (0.56)** |
| Fit statistics | | | | | |
| AIC | 10,797.90 | 10,197.96 | 10,067.80 | 10,064.82 | **10,021.09** |
| BIC | 10,816.83 | 10,223.21 | 10,105.67 | 10,109.01 | **10,071.59** |
| Log likelihood | −5395.95 | −5094.98 | −5027.90 | −5025.41 | **−5002.54** |
| **BRS A-I Discrepancy** | 0.05 (0.00)*** | 0.05 (0.00)*** | 0.05 (0.00)*** | **-0.00 (0.00)***** | 0.00 (0.00) |
| Intercept | −0.03 (0.06) | −0.03 (0.05) | −0.03 (0.06) | **-0.93 (0.15)***** | −1.62 (0.58)** |
| Fit statistics | | | | | |
| AIC | 11,841.24 | 10,774.23 | 10,663.42 | **10,623.78** | 10,624.28 |
| BIC | 11,860.18 | 10,799.48 | 10,701.29 | **10,667.96** | 10,674.78 |
| Log likelihood | −5917.62 | −5383.11 | −5325.71 | **−5304.89** | −5304.14 |

*Note.* AIC = Akaike information criterion; BIC = Bayesian information criterion; BMI = body mass index (log of BMI was modelled to ensure normality); BRS = body rating scales (self-report); BRS A-I Discrepancy = Body Rating Scale Actual-Ideal discrepancy score. Curvilinear (squared) = random intercept and random slope (allows for one change in direction of the trajectory across time); Curvilinear (cubed) = random intercept and random slope (allows for two changes in direction of the trajectory across time). Lower AIC and BIC indicate better model fit. The best-fitting models are **bolded**. * $p = .025$, ** $p = .006$, *** $p = < .001$.

**Table 3.** Likelihood ratio test results comparing growth curve model fit for impact of age on body image variables

| Model Comparison | Traditional Regression & Linear with Fixed Slope | Linear with Fixed Slope & Linear with Random Slope | Linear with Random Slope & Curvilinear (squared) | Curvilinear (squared) & Curvilinear (cubed) |
|---|---|---|---|---|
| **Body Mass Index** | 2506.21** | 136.52** | 543.08** | 46.89** |
| **BRS Actual rating** | 1620.56** | 228.17** | 16.44** | 55.83** |
| **BRS Ideal rating** | 601.94** | 134.16** | 4.98* | 45.73** |
| **BRS A-I discrepancy** | 1069.02** | 114.81** | 41.64** | 1.49 |

*Note.* BRS = Body Rating Scales (self-report); BRS A-I Discrepancy = Body Rating Scale Actual-Ideal discrepancy score; Curvilinear (squared) = random intercept and random slope (allows for one change in direction of the trajectory across time); Curvilinear (cubed) = random intercept and random slope (allows for two changes in direction of the trajectory across time). Test results suggest that the curvilinear (cubed) model had the best fit for the impact of time on all body image variables except for BRS A-I Discrepancy, where the curvilinear (squared) model had the best fit. * $p = .026$, ** $p < .001$.

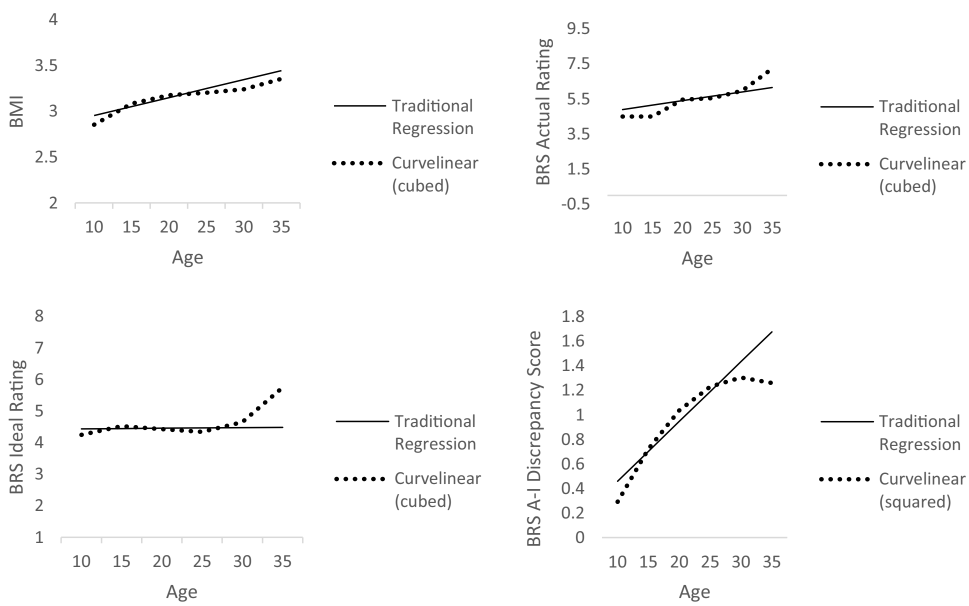


**Figure 1.** Trajectories for the best-fitting models for BMI and BRS actual, ideal, and actual-ideal discrepancy ratings. Traditional regression, curvilinear(cubed). *Note.* BMI = body mass index (log of BMI was modelled to ensure normality); BRS = Body Rating Scales (self-report); *A-I discrepancy score* = Actual-Ideal discrepancy score; Curvilinear (squared) = model with a random intercept and random slope (allows for one change in direction of the trajectory across time); Curvilinear (cubed) = model with a random intercept and random slope (allows for two changes in direction of the trajectory across time). The number of participants who were 31 years of age or older at the last assessment timepoint was small ($n = 12$); thus, trajectories after age 30 should be interpreted with caution.

Ideal discrepancy scores predicted increases in Binge Eating scores over time. Further, body size perception variables more strongly predicted Binge Eating scores than did Body Dissatisfaction; thinner Ideal body size was the strongest predictor, followed by larger Actual-Ideal discrepancy scores and Actual body size ratings.

### *Modified total disordered eating symptoms*

Models A and B (Table 7) suggest that BMI, Body Dissatisfaction, Actual and Ideal body size ratings, and Actual-Ideal discrepancy scores predicted Modified Total Disordered Eating Symptom scores. Table 7 also presents marginal effects demonstrating the relative importance and effect sizes of changes in each body image variable on Modified Total Disordered Eating Symptom scores. In Model A, for each point increase in Body Dissatisfaction and Actual body size rating, Modified Total Disordered Eating Symptom scores increased by .18 and .09 points, respectively. Conversely, for each point increase in individuals' BMI and Ideal body size, there was a .02- and .13-point *decrease* in Modified Total Disordered Eating Symptom scores, respectively. In Model B, for each point increase in Body Dissatisfaction and Actual-Ideal discrepancy scores, there were increases of .17 and 0.11 points, respectively, in Modified Total Disordered Eating Symptom scores. Conversely, for each point increase in individuals' BMI, there was a .02-point *decrease* in their Modified Total Disordered Eating Symptom score. Therefore, results suggest that lower BMI, thinner Ideal body size ratings, greater Body Dissatisfaction, and larger Actual body size ratings and Actual-Ideal discrepancy scores predicted increases in Modified Total Disordered Eating Symptom scores over time. In addition, Body Dissatisfaction was the strongest predictor of Modified Total Disordered Eating Symptom scores, followed by thinner Ideal body size and larger Actual-Ideal discrepancy scores and finally, Actual body size rating.

## Discussion

### *Trajectories of body size perception development*

Consistent with increases in BMI over time, participants selected increasingly large perceived actual body sizes from age 10 until approximately age 20, followed by slowed growth until approximately age 25, and a sharper increase in BMI and perceived body size until age 33. The parallel trajectories observed for BMI and perceived actual body size suggest that our participants generally perceived their bodies accurately, although estimations were not completely consistent (see Magel, 2023 for correlations between

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**Table 4.** Impact of body mass index and body image variables on MEBS Weight Preoccupation scores from ages 11 to 29

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | Model estimates | | Marginal effects | | Model estimates | | Marginal effects | |
| | Estimate (SE) | *p* | dy/dx | SE | Estimate (SE) | *p* | dy/dx | SE |
| **Intercept** | 1.096 (0.07) | < .001 | | | 1.028 (0.07) | < .001 | | |
| **Body Mass Index** | 0.001 (0.00) | .795 | 0.05 | 0.02 | −0.003 (0.00) | .363 | −0.01 | 0.02 |
| **MEBS Body dissatisfaction** | 0.042 (0.00) | < .001 | 0.20 | 0.02 | 0.042 (0.00) | < .001 | 0.20 | 0.02 |
| **BRS Actual rating** | 0.174 (0.01) | < .001 | 0.84 | 0.08 | | | | |
| **BRS Ideal Rating** | −0.206 (0.02) | < .001 | −0.99 | 0.08 | | | | |
| **BRS A-I Discrepancy score** | | | | | 0.191 (0.01) | < .001 | 0.92 | 0.07 |
| **AIC** | 11,639.75 | | | | 11,641.58 | | | |
| **BIC** | 11,687.85 | | | | 11,683.66 | | | |

*Note.* Marginal effects refer to the marginal change in weight preoccupation given a one unit change in each body image variable. AIC = Akaike information criterion (lower AIC indicates better model fit); BIC = Bayesian Information Criterion (lower BIC indicates better model fit); BRS = Body Rating Scales (self-report); BRS A-I Discrepancy Score = Body Rating Scale Actual-Ideal discrepancy score; MEBS = Minnesota Eating Behavior Survey. BRS Actual-Ideal discrepancy scores are calculated using Actual and Ideal scores; because of the significant multicollinearity between them, the effects of these predictors were examined in separate models (Models A and B).

**Table 5.** Impact of body mass index and body image variables on MEBS Compensatory Behavior scores from ages 11 to 29

| | Model A | | | Model B | | |
|---|---|---|---|---|---|---|
| | Model Estimates | Marginal effects | | Model estimates | Marginal effects | |
| | Estimate (SE) | dy/dx | SE | Estimate (SE) | dy/dx | SE |
| **Intercept** | 0.269 (0.04)* | | | 0.225 (0.03)* | | |
| **Body Mass Index** | −0.008 (0.00)* | −0.01 | 0.01 | −0.010 (0.00)* | −0.02 | 0.01 |
| **MEBS Body dissatisfaction** | 0.045 (0.00)* | 0.08 | 0.01 | 0.045 (0.00)* | 0.08 | 0.01 |
| **BRS Actual rating** | 0.064 (0.01)* | 0.11 | 0.01 | | | |
| **BRS Ideal rating** | −0.083 (0.01)* | −0.15 | 0.01 | | | |
| **BRS A-I Discrepancy score** | | | | 0.074 (0.01)* | 0.13 | 0.01 |
| **AIC** | 2224.16 | | | 2227.78 | | |
| **BIC** | 2272.26 | | | 2269.86 | | |

*Note.* Marginal effects refer to the marginal change in compensatory behavior given a one-unit change in each body image variable. AIC = Akaike information criterion (lower AIC indicates better model fit); BIC = Bayesian Information Criterion (lower BIC indicates better model fit); BRS = Body Rating Scales (self-report); BRS A-I Discrepancy Score = Body Rating Scale Actual-Ideal discrepancy score; MEBS = Minnesota Eating Behavior Survey. BRS Actual-Ideal Discrepancy scores are calculated using Actual and Ideal scores; because of the significant multicollinearity between them, the effects of these predictors were examined in separate models (Models A and B). *$p < .001$.

BMI and perceived actual body size). Conversely, participants generally selected relatively stable ideal body sizes across the study period (i.e., age 10 to 33), although model estimates showed a tendency for participants to begin to select larger ideal body sizes after age 30. The diverging trajectories of actual and ideal body sizes produced increasingly large actual-ideal discrepancies from age 10 until approximately age 30, followed by a decrease in discrepancy scores until age 33.

These trajectories are somewhat consistent with the work of Hohenadel et al., (2016), who found steady increases in BMI from age 5 to 19 years (annual rate of change = $1.24 \pm 0.64$ kg/m$^2$) and more subtle increases from age 20 to 45 years (annual rate of change = $0.45 \pm 0.70$ kg/m$^2$) in a sample of 5,906 Native Americans. Nevertheless, other investigations have found that young women (i.e., ages 18–36 years) tend to gain weight more rapidly than women aged 40 and above (Wane et al., 2010). A recent study which examined the assessments completed between 1986 and 2012 also found that mean BMIs seemed to be increasing with each cohort of individuals born and that there were larger increases in BMI with each subsequent cohort (Yang et al., 2021). Although the timespan examined in the investigation by Yang and colleagues roughly matches the years where our assessments were completed (1993-2014; see Appendix E for details), future research should examine whether the trajectories that we observed replicate in samples living in different years than those included in our study.

Ideal body sizes remained relatively constant from age 10 to 33, with participants consistently selecting options in the thinner half of those presented. Therefore, at least until age 33, participants consistently chose bodies that aligned with the thin ideal. The tendency to select objectively thin ideal bodies across time is unsurprising, given that girls begin to show preferences for thin bodies when they are as young as 3 years old relative to larger bodies (Harriger et al., 2010; Ursu & Enea, 2021) and weight stigma (i.e., the stigmatization of individuals in larger bodies) is apparent even in elementary school children (Jendrzyca & Warschburger,

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**Table 6.** Impact of body mass index and body image variables on MEBS Binge Eating scores from ages 11 to 29

| | Model A | | | Model B | | |
|---|---|---|---|---|---|---|
| | Model Estimates | Marginal Effects | | Model Estimates | Marginal Effects | |
| | Estimate (SE) | dy/dx | SE | Estimate (SE) | dy/dx | SE |
| **Intercept** | 0.720 (0.07)* | | | 0.773 (0.06)* | | |
| **Body Mass Index** | −0.014 (0.00)* | −0.04 | 0.01 | −0.011 (0.00)* | −0.03 | 0.01 |
| **MEBS Body Dissatisfaction** | 0.042 (0.00)* | 0.12 | 0.01 | 0.042 (0.00)* | 0.12 | 0.01 |
| **BRS Actual Rating** | 0.092 (0.01)* | 0.26 | 0.04 | | | |
| **BRS Ideal Rating** | −0.069 (0.01)* | −0.19 | 0.04 | | | |
| **BRS A-I Discrepancy Score** | | | | 0.080 (0.01)* | 0.22 | 0.03 |
| **AIC** | 8533.97 | | | 8534.29 | | |
| **BIC** | 8582.06 | | | 8576.37 | | |

*Note.* Marginal effects refer to the marginal change in binge eating given a one unit change in each body image variable. AIC = Akaike information criterion (lower AIC indicates better model fit); BIC = Bayesian information criterion (lower BIC indicates better model fit); BRS = Body Rating Scales (self-report); BRS A-I Discrepancy Score = Body Rating Scale Actual-Ideal discrepancy score; MEBS = Minnesota Eating Behavior Survey. BRS Actual-Ideal Discrepancy scores are calculated using Actual and Ideal scores; because of the significant multicollinearity between them, the effects of these predictors were examined in separate models (Models A and B). *$p < .001$.

**Table 7.** Impact of body mass index and body image variables on MEBS modified total disordered eating symptom scores from ages 11 to 29

| | Model A | | | Model B | | |
|---|---|---|---|---|---|---|
| | Model estimates | Marginal effects | | Model estimates | Marginal effects | |
| | Estimate (SE) | dy/dx | SE | Estimate (SE) | dy/dx | SE |
| **Intercept** | 1.585 (0.07)* | | | 1.479 (0.06)* | | |
| **Body Mass Index** | −0.015 (0.00)* | −0.01 | 0.01 | −0.020 (0.00)* | −0.02 | 0.01 |
| **MEBS Body dissatisfaction** | 0.176 (0.01)* | 0.18 | 0.01 | 0.174 (0.01)* | 0.17 | 0.01 |
| **BRS Actual rating** | 0.086 (0.02)* | 0.09 | 0.02 | | | |
| **BRS Ideal rating** | −0.132 (0.02)* | −0.13 | 0.02 | | | |
| **BRS A-I Discrepancy score** | | | | 0.112 (0.01)* | 0.11 | 0.01 |
| **AIC** | 12,922.08 | | | 12,928.28 | | |
| **BIC** | 12,970.11 | | | 12,970.30 | | |

*Note.* Marginal effects refer to the marginal change in disordered eating symptoms (a combination of weight preoccupation, compensatory behaviour, and binge eating scale scores) given a one unit change in each body image variable. AIC = Akaike information criterion (lower AIC indicates better model fit); BIC = Bayesian information criterion (lower BIC indicates better model fit); BRS = body rating scales (self-report); BRS A-I Discrepancy Score = Body Rating Scale Actual-Ideal discrepancy score; MEBS = Minnesota Eating Behavior Survey. BRS Actual-Ideal Discrepancy scores are calculated using Actual and Ideal scores; because of the significant multicollinearity between them, the effects of these predictors were examined in separate models (Models A and B). *$p < .001$.

2016). A preference for thinner bodies may be due to the frequent exposure to such bodies in social and traditional media, and the resulting thin-ideal internalization (Ahern et al., 2008). Indeed, exposure to thin-ideal and muscular/toned-ideal images is prevalent on social media (Alberga et al., 2018), particularly among adolescent girl users (Chang et al., 2013). Social media use has been linked to thin-ideal internalization (Mingoia et al., 2017), as well as weight bias, body dissatisfaction, and disordered eating attitudes and behaviors (Aparicio-Martinez et al., 2019; Marks et al., 2020; Rodgers et al., 2020; Selensky & Carels, 2021). Overall, the tendency for our participants to select thin ideal bodies is consistent with decades of research demonstrating the pervasiveness of the thin ideal in girls and young women (e.g., Brown & Slaughter, 2011).

Model estimates showed a tendency for participants to begin to select larger ideal body sizes after age 30 (and thereby the likelihood of identifying an ideal body size that is closer to their actual body size) should be interpreted with caution considering the small number of participants who were within that age range. Nevertheless, it is possible that this pattern reflects slight improvements in body satisfaction after age 30 (Hockey et al., 2021; Tiggemann & McCourt, 2013). The tendency to select larger ideal body sizes after age 30 may result from the "anchoring effect", a cognitive bias where one's decisions are influenced by reference point or "anchor" about what is appropriate or realistic (Furnham & Boo, 2011). In this case, women's BMIs increased after age 30 and they simultaneously perceived themselves as becoming larger. The tendency to select larger ideal bodies at the final study timepoint may show women contextualizing or anchoring their ideal body to their growing actual bodies. Larger sizes are viewed as more attainable or realistic, a shift toward accepting and embracing one's actual body and increasing size. Future studies should investigate how this may impact body dissatisfaction and disordered eating behaviors after age 30.

https://doi.org/10.1017/S0954579424000907 Published online by Cambridge University Press

### Prediction of disordered eating

Larger actual body size ratings, thinner ideal body size, and greater body dissatisfaction and actual-ideal discrepancies predicted subsequent elevated disordered eating behaviors and attitudes across time. Interestingly, BMI did not meaningfully predict disordered eating behaviors or attitudes, over and above body image variables. Conversely, individuals' perceptions of their actual body size did predict disordered eating behaviors and attitudes, which suggests that one's perception of their own body weight is more important than their actual weight and shape in the prediction of disordered eating symptoms (Kim et al., 2008).

A novel finding is that body size perception variables also tended to predict individual disordered eating behaviors and attitudes more strongly than did self-reported body dissatisfaction. Thinner ideal body size most strongly predicted individual disordered eating behaviors and attitudes, and this variable was particularly important in predicting weight preoccupation scores. Conversely, greater body dissatisfaction was the strongest predictor of overall disordered eating symptoms. This finding makes theoretical sense: high body dissatisfaction scores may reflect a wide range of concerns related to one's body and appearance, whereas the discrepancy between perceived actual and ideal body sizes is conceptually close to one's body weight. If a person perceives themselves to have a larger body size than they desire, it naturally follows that they will be more preoccupied with their body weight. The importance of perceived actual and ideal body sizes in predicting individual disordered eating behaviours and attitudes emphasizes the need for considering them in theoretical models of eating disorder development and maintenance.

### Implications for the treatment and prevention of disordered eating

Given their predictive value, should we focus more on perceived actual and ideal body sizes in treating disordered eating behaviors? Interventions to alter individuals' perceptions of their own body sizes are poorly studied. However, a recent study of 182 patients with eating disorders examined the efficacy of interventions aimed at improving their awareness of bodily sensations, promoting a realistic body image, and reducing avoidance of bodily sensations (Artoni et al., 2021). The interventions included guided proprioceptive and interoceptive experiences, guided body scans with instructions to focus on skin and bodily sensations, an exercise where participants drew their own bodies and reflected on their attitudes towards different parts, as well as reflecting on their experience in written form. Incorporating these interventions into existing evidence-based treatments significantly improved disordered eating symptoms and body uneasiness. However, it remains to be seen whether such interventions have an impact on actual and ideal body sizes.

The identification of additional targets is also critical for prevention efforts, as extant eating disorder prevention programs show only small to moderate effects, with benefits decreasing with longer follow-up durations (Le et al., 2017). Thin-ideal internalization is a construct that is conceptually close to the variable of ideal body size measured in the current study and has been effectively targeted through prevention programming. Although few extant prevention programs have been found to decrease thin-ideal internalization (Anixiadis et al., 2019), the Body Project, a manualized prevention intervention which utilized cognitive dissonance to target body dissatisfaction, thin-ideal internalization, and eating disorder symptoms, has been shown to reduce attention to images of thin models in body dissatisfied women (Tobin et al., 2022). Given that social media continues to be an insidious contributor to the internalization of specific body types (Saiphoo et al., 2019), thin-ideal internalization may be effectively prevented through psychoeducation and support in curating diverse social media feeds that promote the acceptance and idealization of diverse bodies (Cohen et al., 2019, 2021; Davies et al., 2020; Tiggemann et al., 2020). Other interventions, including mindfulness, unconditional self-acceptance, and self-compassion may also serve as valuable complements to prevention efforts given the protective role that they play against the idealization of thin bodies (Astani, 2016; Neff & Dahm, 2015; Tylka et al., 2015).

When considering appropriate targets for and timing of prevention efforts, it is important to recall that thin-ideal internalization develops early and persists throughout life (Brown & Slaughter, 2011; Harriger et al., 2010; Ursu & Enea, 2021), and to consider the temporal sequencing of risk factors. Yamamiya et al., (2023) found that youth who developed eating disorders first showed heightened levels of thin-ideal internalization (i.e., preference for thinner bodies), followed by elevated body dissatisfaction, then dieting and/or negative affect, before finally developing an eating disorder (bulimia nervosa, binge-eating disorder, or purging disorder). Thus, targeting reduced idealization of thin bodies and aiming to increase the size of one's ideal body together may aid in disordered eating prevention efforts.

Critics may posit that increasing ideal body weights may "glorify obesity," thereby adversely impacting health outcomes by increasing the incidence of overweight and obesity (e.g., Callahan, 2013). However, many of the adverse physiological and psychological health outcomes often associated with obesity are attributable instead to weight stigma (Wu & Berry, 2018). Furthermore, the body dissatisfaction that results from weight stigma is associated with less healthy eating behavior in adolescents and young adults of diverse backgrounds (Jankauskiene & Baceviciene, 2019; Neumark-Sztainer et al., 2006). Our results also provide support for the notion that individuals' awareness of being in a larger body leads to more binge eating, a behavior that is likely to further increase weight. We also found that higher ideal body weights predicted *less* binge eating. Therefore, we speculate that perpetuating weight stigma through initiatives that shame individuals about their weight or bring attention to it (e.g., BMI report cards) are likely to backfire and worsen the health outcomes of individuals with overweight and obesity (see Thompson & Madsen, 2017 for a review). Furthermore, our findings suggest that BMI did not strongly predict disordered eating attitudes and behaviors. Thus, decreasing BMI via weight loss does not appear to be a worthwhile target for disordered eating behavior prevention efforts, particularly given that weight loss interventions for children and adolescents have limited long-term efficacy and their safety is unclear (Andela et al., 2019). For these reasons, efforts aimed at diversifying the range of idealized bodies are likely to benefit the physical and psychological well-being of individuals of all sizes.

## Strengths and limitations

This study has important methodological strengths, particularly related to its design and lengthy follow-up period. Whereas most studies examining the development of body size perception have done so cross-sectionally, our 18-year follow-up period allowed us to investigate the relationship between body image and disordered

https://doi.org/10.1017/S0954579424000907 Published online by Cambridge University Press

eating symptoms across important developmental periods wherein girls and women experience dramatic changes to body shape and increases in body weight (Smolak, 2012). High retention rates over such a lengthy period are also a considerable strength. Additionally, most studies examining the impact of each aspect of body image on disordered eating symptoms have evaluated these relationships separately. Our examination of perceived actual and ideal body sizes, and body dissatisfaction allowed for a more comprehensive, prospective investigation of the relative contributions of different body image facets to disordered eating behaviors and attitudes. Further, given that the rates of disordered eating behaviors are much higher than rates of clinical eating disorders (Galmiche et al., 2019; Neumark-Sztainer et al., 2011) and the fact that most individuals with eating disorders do not receive formal treatment (Noordenbos et al., 2002), the utilization of an epidemiological community sample suggests that our results are likely to be more widely generalizable than those from studies examining individuals receiving treatment for eating disorders.

The characteristics of the study sample also give rise to its main limitations. First, given that only girls and women completed body image and disordered eating measures over time as part of the MTFS, we were not able to include individuals of other genders in our study. Future research should examine how relationships among body size perception, body dissatisfaction, and disordered eating symptoms may differ in boys and men, as well as in nonbinary and transgender individuals, given that body size perceptions and body dissatisfaction may present differently across gender identities (Nagata et al., 2020; Uniacke et al., 2021). Second, as we did not have data regarding the pregnancy status of participants, we could not examine any pregnancy-related changes in body shape or image . This limitation is particularly important given that our study period intersected with the average age of first-time childbearing in the USA (27.3 years; National Center for Health Statistics, 2023) and perinatal body dissatisfaction is common (Hodgkinson et al., 2014). Third, because body image ideals and dissatisfaction may differ among individuals of various ethnicities (Chapa et al., 2020), our findings regarding their association to disordered eating symptoms in White girls and women may not generalize to other ethnic groups. For example, in an examination of White, Latina, and Black college women, Gordon and colleagues (2010) found that the perceived ideal body for each woman's cultural group was more strongly associated with their disordered eating behaviors than their perceived ideal body for the US. Further, acculturative stress (i.e., the stress associated with adapting to a new culture; Berry, 2005) has been positively associated with thin-ideal internalization and eating pathology in BIPOC individuals in the US (Gordon et al., 2010; Warren & Akoury, 2020). Thus, future studies should attempt to replicate our findings in individuals of various genders, ethnicities, cultures, and countries of residence and with diverse body sizes. They should also consider including additional predictor variables, such as acculturative stress, to better understand the relationship between body size perception and disordered eating behaviours and attitudes.

## Conclusion

Although body dissatisfaction has been shown to be a risk factor for disordered eating behavior, body size perception has often been excluded from theoretical models of disordered eating behavior. This work filled important gaps in the literature by examining body size perception, body dissatisfaction, and disordered eating behaviors and attitudes across an 18-year time span. Our participants were followed through developmental periods often associated with marked changes in body shape and weight (i.e., puberty and early adulthood), elucidating how body size perception changes across development, and its relative contribution to disordered eating, compared to BMI and body dissatisfaction. Participants accurately perceived increases in body size over time, with a relative slowing of these increases from age 20-25, while simultaneously selecting consistently small ideal body sizes. These results heighten the importance of early intervention aimed at decreasing idealization of the thin ideal to prevent a widening of the discrepancy between perceived actual and ideal body sizes across development. The importance of targeting the idealization of thin bodies is further supported by our findings that body size perception variables (particularly ideal body ratings) more strongly predicted individual disordered eating behaviors and attitudes than did body dissatisfaction. BMI did not meaningfully predict disordered eating symptoms, over and above body image variables. Overall, the patterns of development of body size perception variables and their substantial impact on disordered eating behaviors and attitudes shed new light on the critical role played by body size perceptions, ideal body sizes, and their potential value as targets of prevention programming.

**Supplementary material.** The supplementary material for this article can be found at https://doi.org/10.1017/S0954579424000907.

**Acknowledgements.** This research was supported by the U.S. National Institutes of Health's National Institute on Drug Abuse (R37DA005147) and National Institute on Alcohol Abuse and Alcoholism (R37AA009367). C.A.M. was supported by graduate scholarship funding from the Social Sciences and Humanities Research Council, the University of Calgary (ii'taa'poh'to'p Graduate Scholarship), and the Alberta Graduate Excellence Scholarship – Indigenous. This article describes a portion of C.A.M.'s doctoral dissertation research, completed under the supervision of K.M.v.R. K.M.v.R. is a member of the University of Calgary's Alberta Children's Hospital Research Institute, Hotchkiss Brain Institute, Mathison Centre for Mental Health Research and Education, and O'Brien Institute for Public Health.

We thank Dr Irene Elkins for providing critical information on the administration of the Body Rating Scales in the Minnesota Twin Family Study. We also thank Dr Amelia Andrews for providing invaluable statistical consultation.

The funders had no role in the study design, data collection and analysis, decision to publish, or manuscript preparation. E.L. and K.M.v.R. are independent consultants to the Power Within, a partnership of PLAN International Canada, the Dove Self-Esteem Project, and Women and Gender Equality Canada. The authors declare no other conflicts of interest in relation to this work.

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