Body Uneasiness, Body Figure Perception, and Body Weight: Factor Structure and Longitudinal Measurement Invariance of a Set of Attitudinal and Perceptual Body Image Assessment Tools in Adolescents

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Abstract

Body image is a multifaceted construct that includes attitudinal and perceptual components, but its attention has mainly been focused on the facet of body dissatisfaction. The present longitudinal study extended the validation of a multifacet attitudinal questionnaire, the Body Uneasiness Test (BUT), against perceptions of body shape and weight. A convenient sample of adolescents took part in a 2-year unbalanced panel study (5 waves). The participants completed the BUT questionnaire and selected their perceived actual, ideal, and reflected body figures along the Contour Drawing Rating Scale; ideal/actual and ideal/normative body mass index discrepancies were also included. After replicating the expected five-factor structure of the BUT items, results from confirmatory factor analysis revealed that the five BUT scales loaded on an attitudinal dimension, whereas the perceived body figures and the discrepancy indices were on a perceptive domain. Such a two-domain structure of body image measures showed gender and seasonal (1-year) measurement invariance, whereas longitudinal 6-month and 18-month invariance partially failed. Overall, the present findings support the validity of the Body Uneasiness Test in adolescence, further demonstrating a preliminary multidimensional structure of body image onto which attitudinal and perceptual body image-related measures were projected.

Keywords

attitudinal body image, perceived body image, longitudinal measurement invariance, gender measurement invariance, adolescence

Adolescence is a critical period for the development of a (un)healthy body image (Neumark-Sztainer et al., 2006; Voelker et al., 2015). Several aspects influence the development of body image during the teenage years, such as biological and physiological changes related to pubertal timing, which affect body shape and size, weight status, and appearance, as well as peer relationships, which contribute to an adolescent's development of beliefs and self-assessments about their perceived actual and ideal (desired) body (Grogan, 2006; Ricciardelli, 2012; Voelker et al., 2015; Wertheim & Paxton, 2011). Moreover, body image deserves attention in adolescence as it plays a key role in the development of weight-related problems, eating disorders, and obesity (Fairburn & Harrison, 2003; Stice, 2001). Despite its relevance, body image has not been systematically investigated as a multifaceted construct. Moreover, studies have often examined samples of young girls and women, while less extensive literature is available on male samples (De Caro & Di Blas, 2022; Voelker et al., 2015). The current study aims to contribute to cover these gaps.

Body image primarily refers to subjective attitudes and perceptions of an individual's body shape, weight, and appearance (Cash & Pruzinsky, 2002; Grogan, 2008). It includes two main dimensions, that is, attitudes and self-perceptions related to one's physical appearance (Cash & Pruzinsky, 2002; Grogan, 2006, 2008).

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Both theoretical and empirical research have shown that the attitudinal domain of body image is a cognitive/affective component that includes facets regarding body image evaluations and feelings about an individual's body weight, body shape, and attractiveness, such as (dis)satisfaction with one's body and the investment or importance a person places on their appearance (Cash, 1994, 2002, 2012; Cash et al., 2002). In empirical studies, however, body image has often been overlapped with a few of its mid-level constructs, among which especially body (dis)satisfaction, although body image and body dissatisfaction have been well distinguished theoretically (Cash, 2002; Thompson, 2004; Thompson & Schaefer, 2019). Indeed, body (dis)satisfaction represents only a single facet of a larger attitudinal domain, under the umbrella of body image. The perceptual domain chiefly includes self-perceptions of body size, shape, and weight, including the self-reported body mass index (BMI), and the accuracy of the subjective assessment compared with objective parameters (Gleghorn et al., 1987; Porras Garcia et al., 2019).

The complexity of the body image construct has favored the development of different assessment instruments (Allen et al., 2008; Cash, 1994; Cash et al., 2002). In the past, research often applied the EDI-2 Body Dissatisfaction scale (Garner, 1995) to assess the overall attitudinal domain of body image, but its items indicate that the scale mainly addresses satisfaction with physical appearance, that is, only a facet of a more complex attitude-related domain, further including some perception-related items, thus favoring misspecification in the underlying constructs assessed, in empirical research (Allen et al., 2008). Conversely, measures such as the Body Esteem Scale (Mendelson et al., 2001) and the Multidimensional Body-Self-Relations Questionnaire (Cash, 2000) mainly capture the attitude-related domain by assessing evaluations of appearance and weight-related appraisals. Similarly, the Body Uneasiness Test (Cuzzolaro et al., 2006) evaluates several facets of the attitudinal domain, such as weight phobia and body image concerns (BICs), further assessing additional attitudinal aspects such as avoidance and compulsive self-monitoring of one's own body and body appearance as well as depersonalization, that is, feelings of detachment and alienation toward one's body, which have been reported to be important during adolescence (Fagioli et al., 2015; Michal et al., 2015).

As to the perceptual component, it has been examined in terms of both objective accuracy (Gardner & Boice, 2004; Sands et al., 2004) and subjective/perceived estimation of body size and shape. For younger participants, the Contour Drawing Rating Scale (Gardner & Brown, 2010) is primarily used as a perceptual measure because it is immediate and quick to administer. In fact, participants are simply asked to select their actual body and their ideal body from nine silhouettes presented on a single sheet and ordered by increasing size, from very thin to obese body shapes, with the central figure representing an average body shape. Kakeshita and Almeida (2006) supported the validity of the Contour Drawing Rating Scale as an appropriate tool for assessing self-perceived body image and also showed that it strongly correlates with the objective BMI (kg/m^2; Gardner et al., 1998; Kakeshita & Almeida, 2006).

The structure of attitudinal-related domain measures has been typically validated against other attitudinal measures of body image, especially in women (Cash, 2002; Cash et al., 2002; Hazzard et al., 2022; Kling et al., 2019). Conversely, to our knowledge, few attitudinal measures have been validated along with perceptual dimensions of body image. This is the case of a study conducted by Banfield and McCabe (2002) who included several attitudinal, behavioral, cognitive, and perceptive self-evaluation tools in their cross-sectional study, on a female sample; the overall results supported a multidimensional body image structure, but the psychometric indices were rather weak and needed to be cross-validated. Furthermore, their pioneering study did not include BMI-related indices as perceptual measures.

Indeed, BMI represents an essential piece of information in a clinical setting (Nicholls et al., 2002; Solmi et al., 2018), and it is calculated both on objective and on self-reported height and weight, that is, kg/m^2 (Lohman et al., 1988). Several empirical studies have found that objective and self-reported BMIs are generally highly correlated. In adolescence, for example, when self-weighing is a very common practice, individuals can accurately report their actual weight and height during the developmental years (Gebremariam et al., 2015). Nevertheless, self-reported and objective actual BMIs are not identical and as such, they can provide complementary information (Brener et al., 2003; Elgar et al., 2005; Goodman et al., 2000; Lipsky et al., 2019). In fact, Cooley and Toray (2001) have shown that objective weight measures may be less informative compared with subjective measures when we want to understand how an adolescent perceives and evaluates their body and the extent to which such subjective views may represent risk factors for eating disordered behaviors and attitudes. Moreover, a discrepancy between self-reported ideal and actual weights ($\Delta_{I/A}$) is often used as an indicator of how satisfied an individual is with their body (Anton et al., 2000; Cooley & Toray, 2001), and such a discrepancy is a stable predictor of subclinical and clinical eating disordered conditions, including unhealthy weight control strategies (Anton et al., 2000; Cafri et al., 2005; Cooley & Toray, 2001; MacNeill & Best, 2015). Remarkably, no attention has generally been paid to the ideal/normative discrepancy, although it provides a complementary index of (un)realistic ideal body weight against ideal/actual discrepancy by comparing a person's desired weight to their healthy, that is, normative, weight (Glauert et al., 2009).

Finally, questionnaires assessing body image often include items that ask how a person feels compared with other people. This is the case with the Body Uneasiness Test (e.g., *I feel I am fatter than others tell me*, and *I feel different to how others see me*). Attention to such a social perspective on body image, for example, is consistent with the social comparison theory, which posits that peers significantly influence body image development during adolescence (Harter, 2012; Morin et al., 2017; Morrison et al., 2004). Accordingly, studies have demonstrated the gendered influence of peers in social comparisons, with same-sex peers influencing body image, self-worth, and the occurrence of eating-disordered behaviors such as excessive exercise or dieting in adolescents (Jones, 2001; McCabe & Ricciardelli, 2003). A possible role of opposite-sex influences has also been investigated. For example, some studies have shown that comments from opposite-sex peers influence adolescents' body dissatisfaction and self-esteem (Krayer et al., 2008; Ricciardelli et al., 2000; Shroff & Thompson, 2006). However, empirical studies of social comparison theories have primarily used direct and explicit peer feedback on body image, and less is known about how reflected self-evaluations, that is, self-evaluations from the perceived perspective of others, influence adolescents' self-perceptions throughout their development (Harter et al., 1997, 1998), and how such evaluations are related to attitudes and perceptions about body image. Thus, an empirical investigation of body image-related constructs that include reflected self-perceptions of body shape is still needed.

One last question we took into account regards seasonality and its effects on body image. In fact, seasons are recognized as a relevant environmental factor, which influences changes in physiological, behavioral, and psychological processes (Bronson, 2004). Currently, findings on the effects of seasonality on body image still are sparse. For example, Griffiths and colleagues (2021) found an intraindividual variability in body satisfaction across seasons, with negative peaks in summer. Differences were also observed for perceived body weight, higher in winter but lower in summer, in preadolescent girls, who were used to exercise compared with peers who were not used (Stein & Hedger, 1997). To our knowledge, no measurement invariance of body image tools has been tested across time yet, controlling for seasonality, although such a structural invariance represents a prerequisite for inspecting absolute (mean) continuities across time and seasons to ensure that changes in the observed mean scores reflect genuine changes in the latent factor from time to time rather than transitory and cyclical changes due to seasonal effects.

The Current Longitudinal Study

Our research was guided by several concerns. First, despite its complexity, body image has often been assessed as body (dis)satisfaction in empirical studies (Cooley & Toray, 2001; Gardner et al., 2000), further using body image and body (dis)satisfaction as interchangeable constructs (Allen et al., 2008). Conversely, research should systematically use body image instruments that include multiple mid-level components of its attitudinal and perceptual main domains if the goal is to examine body image as a higher-level construct. Second, attitudinal and especially evaluative components are often favored over perceptual or social components, and they have not been systematically investigated together (Bornioli et al., 2019; Cash et al., 2002, 2004). Finally, discrepancy indices for ideal BMI as well as reflected self-appraisals of body shape are crucial for describing and understanding adolescents' feelings about their own bodies and weight, yet they have not been systematically studied together with attitudinal, perceptual, and social components. Overcoming such limits and developing a systematic, hierarchical structure of body image would also provide a tentative map onto which current measures of body image could be projected, thus helping understand how different tools relate to each other, their commonalities, and uniqueness.

In line with these premises, our longitudinal study aimed at cross-validating the Body Uneasiness Test as an attitudinal instrument also against perceptual body-related self-evaluations (discriminant validity). The Body Uneasiness Test (Cuzzolaro et al., 2006) is a comprehensive attitudinal body image tool, it has been validated in both clinical and nonclinical samples of adolescents and demonstrated as a valid screening as well as a diagnostic instrument of attitudes toward an individual's own body, but, to our knowledge, no study has examined its factor structure along with perceptual or social dimensions of body image yet. Operationally, we examined the factor structure of the Body Uneasiness Test items, further examining its main components along with self-perceived actual, ideal, and reflected silhouettes as well as ideal/actual and ideal/normative BMI discrepancy indices, in cross-sectional data. We expected to validate the Body Uneasiness Test as an instrument capable of capturing distinct attitudinal components of body image, and we further hypothesized that the perceived body figures would load together on an independent perceptual component. Furthermore, we expected the ideal body figure and the ideal/actual and ideal/normative BMI discrepancies to load on the perceptual dimension as well (Cash & Szymanski, 1995; Gardner et al., 1998), although we did not rule out the hypothesis of two independent perceptual domains, one representing actual self-perceptions and the other representing ideal self-perceptions. The empirical factor structure of the study variables was tested against its gender and time invariance. Specifically, longitudinal invariance was tested also against seasonal invariance, that is, we examined longitudinal invariance by testing the hypothesis that the longer the time interval between measurement occasions (6, 12, 18 months) the weaker the invariance, but we also hypothesized that seasonality could affect invariance by strengthening invariance for same-season time pairs (i.e., 12 months) over no matching seasons time pairs (i.e., 6 and 18 months). Such invariances represent a prerequisite for studying developmental changes of body image-related variables in adolescent girls and boys. Beyond testing the validity of the BUT questionnaire, we generally aimed at demonstrating a valid multidimensional structure of our study variables as a preliminary map of the higher order construct of body image.

Method

Participant and Procedures

Data examined for the current study were collected as part of a longitudinal study on vulnerability factors for eating-disordered attitudes and behaviors in a nonclinical sample of adolescents (De Caro, 2020). Our target sample were high school students, generally ranging in age between 14 and 19 years. Specifically, we conducted an unbalanced panel study because new participants were allowed to enter the study after the first measurement occasion (T1), thus renewing the longitudinal sample, whereas some older students left the study after finishing high school, and still others did not provide data at each wave. Therefore, sample size and composition were not identical from one time point to another, but detailed information is provided for each main analysis here presented.

We collected data between Spring 2017 and Spring 2019. Data were regularly collected in Spring (between late April and early May) and in Autumn (early November) and 6 months occurred between any two successive measurement occasions; in Autumn, the overall sample was enlarged and refreshed by including students who just started attending the first year of high school.

After excluding nine students who were older than 19 years, when they entered the research project for the first time, and four students who provided incomplete data (missing responses > 3) along the Body Uneasiness Test, in all 546 students (363 males, 66.5%) took part in the study by providing valid data. Their participation was voluntary. When they entered the study, they were aged between 14 and 19 years ($M = 15.22 \pm 1.36$, no differences between male and female participants, $p > .05$), and their self-reported BMI as kg/m^2 (metric unit) ranged between 13.5 and 34.3 ($M = 21.22 \pm 3.35$, no significant differences between girls and boys, $p > .05$). The flowchart in Figure 1 depicts enrolment and attrition of the participants across the five measurement occasions: 277 students were recruited at T1 (Spring 2017) and 88 among them took part at each of the five waves; 109 new participants entered the study at T2 and 24 among them kept collaborating until the end of the study (T5); and so forth. In all, 16.1% ($n = 88$) of the students provided reports at each wave, 13.0% ($n = 71$, cumulative percentage [c.p.] = 29.1%) at four waves, 19.2% ($n = 105$, c.p. = 48.3%) at three waves, 26.4 ($n = 144$, c.p. = 74.7%) at two measurement occasions, and the remaining 25.3% did only once. Due to the unbalanced sample composition, we partially could inspect attrition across assessment occasions, by comparing, for example, Autumn to successive Spring time points (i.e., T2 to T3 and T4 to T5), and the results showed no differences in age or self-reported BMI between those who remained from Autumn to Spring and those who did not.

Ethical Approval

We submitted our longitudinal research project, including objectives, instruments, and procedures, to the school head teacher and board for review (I.T.E.T. "G. SALVEMINI"-MOLFETTA Unique Protocol ID 0013386, 2017). After their approval, an informed consent was obtained from both parents and students as a mandatory condition to take part in the study.

Measures

Body Mass Index. At each measurement occasion, adolescents self-reported their height and actual and ideal weights. After calculating the self-reported actual and ideal BMI values, we calculated BMI discrepancies. Specifically, the discrepancy between actual and ideal BMI is usually calculated by simply subtracting the actual BMI from the ideal BMI. Although widely applied as such, we considered that it has some limitations. First, it correlates with actual BMI, that is, if actual BMI is not systematically controlled, then the discrepancy between actual and ideal BMI is confounded with actual BMI. Second, it is not possible to estimate

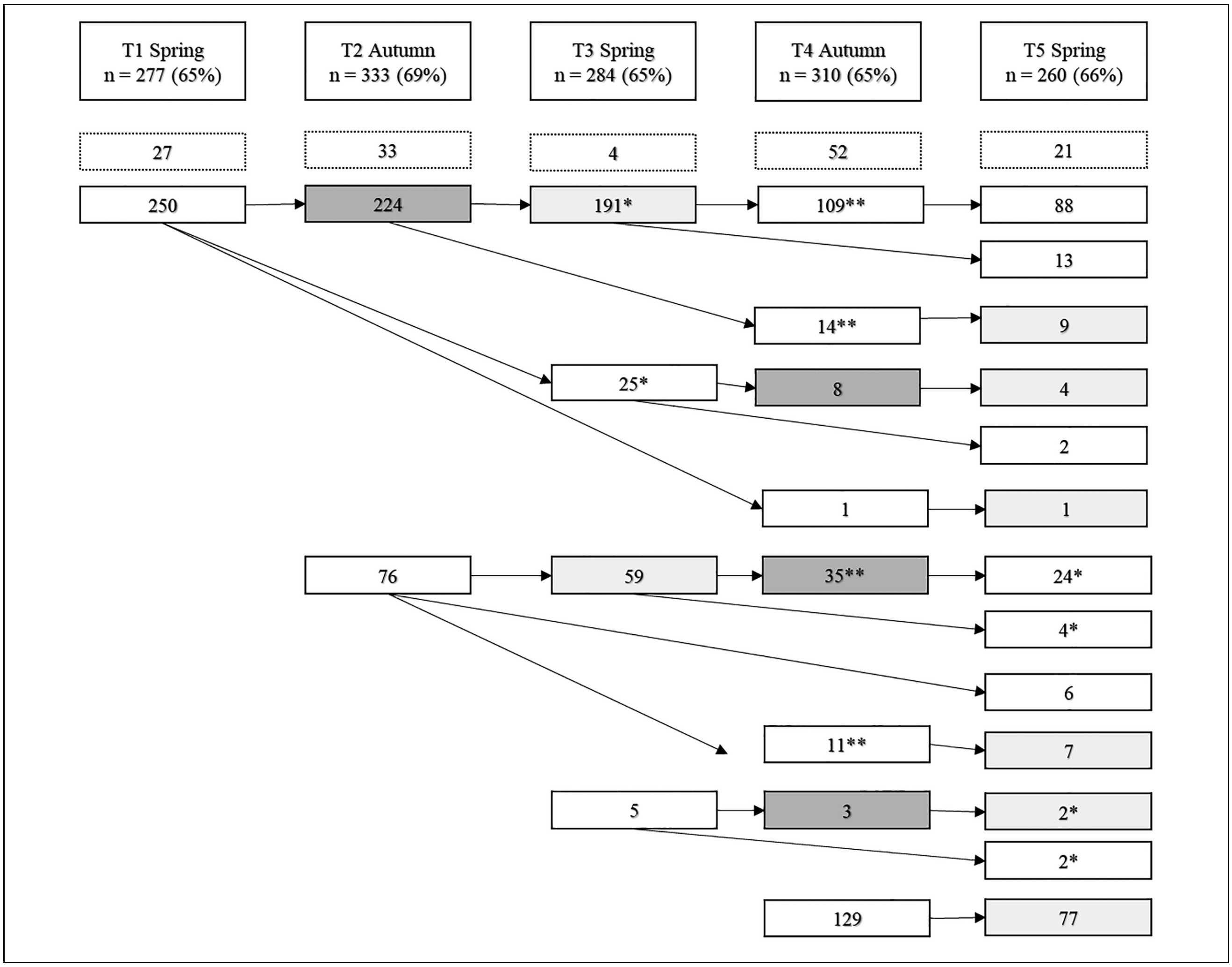

Figure 1. Flowchart of the Longitudinal Study Participants Across 5 Waves.

Note. The first row reports the number of participants at each wave; the second row reports the number of participants who provided self-reports on a single occasion only; the remaining figure displays the flowchart of participants who provided two or more self-reports across time. Longitudinal analyses, that is, factor invariances, were inspected on aggregated subsamples as follows: Gray-filled rectangles highlight the Spring to Autumn (6 months) aggregated subsample of participants (n = 270), while light gray-filled rectangles highlight the Autumn to Spring (6 months) aggregated subsample of participants (n = 350); rectangles with a single asterisk indicate those participants who were aggregated to inspect Spring to Spring (1 year) data (n = 242), while rectangles with a double asterisk indicate those participants who were aggregated to examine Autumn to Autumn (1 year) data (n = 169); finally, invariance across 18 months was examined by combining data from those participants who entered at T1 and provided ratings at T4 with data provided by students who first entered at T2 and self-reported at T5 as well (n = 173).

the proportional discrepancy between ideal BMI and (self-reported) actual BMI. Third, the discrepancy between ideal and actual BMI requires additional information, namely, a discrepancy index between subjective ideal BMI and normative BMI ($\Delta_{I/N}$) as reported in the World Health Organization normative BMI tables.

Hence, the two complementary discrepancy indices of ideal BMI were calculated as follows:

(1) $\Delta_{I/A}$ = (*Ideal BMI—Actual BMI*) / *Actual BMI*

(2) $\Delta_{I/N}$ = (*Ideal BMI—Normative BMI*) / *Normative BMI*

Negative $\Delta_{I/A}$ values proportionally indicate how much a person wishes to be thinner than she or he actually is, while negative $\Delta_{I/N}$ values proportionally express how much a person wishes to be thinner than she or he normatively should be, that is, compared with a healthy standard. The normative body weight for age is derived from the World Health Organization normative BMI tables (from https://www.who.int/growthref/who2007_bmi_for_age/en/, World Health Organization, 2007).

Body Uneasiness Test (BUT). The Body Uneasiness Test (Cuzzolaro et al., 2006) is a questionnaire widely used to assess discomfort and dissatisfaction with one's own body. It has been validated on large samples with different ages and BMIs. BUT presents 34 items divided into five subscales: BIC assessing body (dis)satisfaction, worries, and investments related to physical appearance; Weight Phobia (WP) related to excessive fear of being or becoming fat; Compulsive Self-Monitoring (CSM) related to some body-related behaviors such as body control and monitoring; Avoidance (AV), which assesses behaviors aimed at avoiding and hiding one's own body; and Depersonalization (D), which is related to feelings of detachment and alienation toward one's own body; a Global Severity Index (GSI) score is also calculated from the 34 items. In the current dataset, we used BUT in its self-report form, with a six-point Likert-type response scale, ranging from 0 = *never* to 5 = *always*.

The Contour Drawing Rating Scale. The Contour Drawing Rating Scale (CDRS; Thompson & Gray, 1995) consists of nine drawings of a female figure (for female participants) or a male figure (for male participants), ranging from *a very thin* (1) to *a very obese* (9) silhouette. On four separate sheets, adolescents were asked to select 4 figures that corresponded to their actual (i.e., *How do you think you actually are*?), ideal (i.e., *How would you ideally be*?), and reflected body perceptions by answering the questions *How do you think other girls see you*? (CDRS girls-reflected) and *How do you think other boys see you*? (CDRS boys-reflected).

Analysis

Missing values for the BUT questionnaire and the CDRS body figures were examined using Multiple Imputation; missing BUT responses at the item level were replaced by applying the expectation-maximization (EM) algorithm before calculating scale scores and performing factor analyses. Descriptive statistics and correlation coefficients between measurement occasions were preliminarily inspected for the study variables.

Confirmatory factor analyses were first conducted on the larger cross-sectional data set we collected (T2) to test first the factor structure of the 34 BUT items, with lavaan package (Rosseel, 2012) for the R statistical framework (R Core Team, 2019), by using a robust estimator suitable for modeling ordinal data (i.e., estimator = "WLSMV"). Confirmatory factor analyses were then conducted on the five BUT scales, actual, ideal, and reflected CDRS body figures, and the discrepancy indices of the ideal BMI, to test the structure of attitudinal against perceptual body image components on cross-sectional T2 data collected, further testing cross-gender factorial invariance as well as on longitudinal data, that is, on 6 (Spring to Autumn, Autumn to Spring, 6 months apart), 12 (seasonality: Spring to Spring, Autumn to Autumn), and 18 months, time pairs. Specifically, we implemented a full information maximum likelihood estimation model (FIML) to manage cases with missing values on the perceptual variables, by using the argument missing = "fiml" when calling the fitting function within the lavaan package for the R statistical framework. Furthermore, gender as well as longitudinal factorial invariances were tested by successively comparing four levels of measurement invariance with additional and more progressive equality constraints across gender and time, respectively: configural, weak (or metric), scalar (or strong), and strict (or residual) invariance (Putnick & Bornstein, 2016). First, configural invariance implies equivalence in the number of factors and the pattern of factor–indicator relationships across gender or time. After confirming configural invariance across gender or time, weak (or metric) invariance was tested by examining the equivalence of (indicator) factor loadings on the factor structure; in other words, weak invariance was tested by constraining factor loadings to be equal across boys and girls or across measurement occasions. The weak invariance model with constrained factor loadings was then compared with the configural invariance model or the baseline model using chi-square difference ($\Delta\chi^2$) to determine if constraining the factor loadings did not weaken the tenability of the model. Scalar (or strong) invariance examined the equality of means or intercepts of indicators across gender or time points. Finally, the more restrictive level of measurement invariance, that is, strict (or residual) invariance was performed by examining the equality of the residual variances of the indicators across gender or time points.

At each step, multiple fit indices were used (Hu & Bentler, 1999): Chi-square statistic (χ^2), Comparative Fit Index (CFI; $>.95$), Tucker–Lewis Index (TLI; $>.95$), Root Mean Square Error of Approximation (RMSEA; $<.08$), and Standardized Root Mean Square Residual (SRMR; $<.08$), the difference in χ^2 values, that is, $\Delta\chi^2$ was calculated to compare the four nested models sequentially.

Results

Missing Data

Patterns of missing values for the BUT items revealed that missing responses on single items were in the range of 0.06% (T1) to 1.26% (T4) of the total responses provided at each single wave; the pattern in which no missing values were present was the most prevalent (91.5% to 95.9%), with different patterns being observed for 1.4% at most. Although no pairs of BUT items tended to have missing values in individual cases, the Missing Completely at Random (MCAR; Little, 1988) test indicated that our data were not completely at random ($p <$ .001). Accordingly, we used EM method to estimate replacement values for each missing BUT item to calculate BUT scale scores for each participant. Missing values for the CDRS body figures were completely at random, with the MCAR test being not significant ($p >$ .10), and they were replaced when confirmatory factor analyses were performed by means of FIML estimation method.

Descriptive Statistics

Data for all the study variables were normally distributed with skewness and kurtosis values ranging from −0.6 to 0.8. Table 1 presents descriptive statistics for the study variables, at each time point. Self-reported actual BMIs were in the range of normative BMI levels, with differences between actual and normative values ranging from 0.63 (T4) to 0.92 (T5) across the five waves, that is, for the current sample, mean BMI values were in the range of normative 50 < Percentile Rank < 60, for both female and male adolescents. Self-reported mean ideal BMIs were in the range of normative BMI, with girls however reporting generally lower ideal BMI values compared with male participants across the time points ($p < .001$, $.03 \leq \eta^2 \leq .09$). $\Delta_{I/N}$ apparently indicated that ideal weight was generally higher compared with normative weight, but significant differences emerged between female and male participants ($p \leq .001$, $.04 \leq \eta^2 \leq .09$), with positive differences indicating that adolescent males generally reported an ideal weight higher compared with their normative weight whereas girls a lower ideal weight compared to their normative weight. A comparable pattern of differences was observed for $\Delta_{I/A}$, with female participants referring to a substantially lower ideal weight compared with their actual weight, whereas males reported comparable ideal and actual body weights. The same gender differences emerged when the CDRS ideal body figures were compared: Females wanted to be thinner, but boys wanted to be more robust compared to the middle (normative) figure. As to the BUT scales, mean raw scores were statistically comparable ($p > .5$ for t test comparisons) to normative scores reported by Cuzzolaro et al. (2006); moreover, girls generally reported higher scores compared with male participants ($p \leq .001$); for subsequent analyses, we transformed raw BUT scores into normalized and standardized T scores, adjusting for gender. Overall, the present descriptive statistics indicate that our sample is representative of Italian adolescents.

Internal Consistency and Correlations Between Measurement Occasions

Table 2 presents internal consistency values for the BUT measure and correlations between T1 scores (T1) and scores observed 6 to 24 months later, for those participants who provided self-reports 4 times at least, for all the study variables. Overall, they show that BUT scales were reliable in terms of internal consistency, whereas correlations between baseline scores and successive measurements indicated modest levels of rank-order stability across shorter as well as longer time intervals, with change prevailing over stability for BUT Avoidance especially. We explored possible moderation effects of gender, age, and BMI on correlations between T1 and T2 (6 months) to T5 (24 months) matching study variables. Although higher correlations were observed for adolescent girls compared with male adolescents, gender did not significantly moderate the levels of rank-order correlations across time. Conversely, the results revealed a modest moderation effect of age ($.02 \leq R^2_{change} \leq .04$), with higher correlations for older respondents on the BUT GSI scores 6 months later as well as on the BUT Weight Phobia scores 6 to 18 months later. Initial BMI moderated the correlation level of the BUT Body Image Concerns for T1 and T2 time pair, with higher values for students with higher BMIs ($R^2_{change} \leq .05$, $p \leq .01$). Overall, however, no systematic interaction effect or nonlinear associations were observed across time, for the study variables.

Correlations in Table 2 also showed that high rank-order associations across time generally prevailed across both shorter and longer time intervals for the CDRS body figure and for variables reporting actual weight (i.e., BMI), with slightly weaker values for perceptual variables involving an individual's ideal body figure.

Simple Correlations

Table 3 reports simple correlation coefficients among the study variables, separately for boys and girls. They generally show how attitudinal scales were intercorrelated and so did the study of perceptual variables, thus suggesting two distinctive body image–related domains. Nevertheless, significant small to modest correlations emerged between the attitudinal BUT scales and the perceived actual body figure and ideal/actual discrepancy measures, indicating how both female and male

Table 1. Descriptive Statistics for Each Measurement Occasions.

Variables	T1 (Spring 2017)			T2 (Autumn 2017)			T3 (Spring 2018)			T4 (Autumn 2018)			T5 (Spring 2019)		
	n	*M* ± *SD*	ΔMF	*n*	*M* ± *SD*	ΔMF	*n*	*M* ± *SD*	ΔMF	*n*	*M* ± *SD*	ΔMF	*n*	*M* ± *SD*	ΔMF
Age	276	15.9 ± 1.2		333	15.8 ± 1.6		277	16.5 ± 1.4		300	15.7 ± 1.6		258	16.3 ± 1.6	
Actual BMI	272	21.5 ± 3.3	−0.4	330	21.3 ± 3.2	0.0	279	21.7 ± 3.3	0.0	301	21.3 ± 3.3	0.2	253	21.7 ± 3.3	0.2
Ideal BMI	263	20.9 ± 2.6	1.2*	321	20.8 ± 2.5	1.1*	277	21.1 ± 2.5	1.4*	293	20.7 ± 2.7	1.4*	249	21.0 ± 2.4	1.4*
$\Delta_{I/N}$	262	1.3 ± 11.9	6.3*	321	1.1 ± 11.9	5.7*	273	0.0 ± 11.8	6.5*	282	−0.0 ± 12.2	7.9*	245	0.8 ± 11.3	6.5*
$\Delta_{I/A}$	263	−1.5 ± 10.3	6.5*	321	−1.3 ± 9.0	4.3*	275	−2.9 ± 8.9	6.2*	292	−1.9 ± 9.8	5.4*	248	−2.4 ± 9.5	5.6*
BUT scales															
BIC	277	1.4 ± 1.2	−1.0*	333	1.2 ± 1.1	−0.6*	284	1.3 ± 1.1	−0.6*	310	1.3 ± 1.1	−0.7*	260	1.3 ± 1.1	−0.7*
WP	277	1.5 ± 1.2	−1.1*	333	1.3 ± 1.0	−0.7*	284	1.4 ± 1.1	−1.0*	310	1.5 ± 1.1	−0.9*	260	1.5 ± 1.1	−1.0*
AV	277	0.5 ± 0.7	−0.4*	333	0.5 ± 0.8	−0.1	284	0.5 ± 0.8	−0.1	310	0.5 ± 0.7	−0.1	260	0.6 ± 0.9	−0.2
CSM	277	1.1 ± 0.9	−0.6*	333	1.1 ± 0.9	−0.5*	284	1.1 ± 0.9	−0.6*	310	1.1 ± 0.9	−0.5*	260	1.1 ± 0.9	−0.4*
D	277	0.6 ± 0.7	−0.5*	333	0.6 ± 0.8	−0.3	284	0.6 ± 0.7	−0.2	310	0.6 ± 0.7	−0.3*	260	0.7 ± 0.8	−0.3*
GSI	277	1.1 ± 0.9	−0.8*	333	0.9 ± 08	−0.5*	284	1.0 ± 0.8	−0.5*	310	1.0 ± 0.8	−0.5*	260	1.1 ± 0.9	−0.6*
CDRS test															
Actual BF	275	5.6 ± 1.4	−0.1	325	5.5 ± 1.2	0.2	260	5.6 ± 1.2	0.1	287	5.6 ± 1.2	0.1	243	5.6 ± 1.1	−0.1
Ideal BF	275	5.0 ± 1.0	1.0*	324	5.2 ± 1.1	1.0*	260	5.1 ± 0.9	0.9*	288	5.1 ± 0.9	1.0*	242	5.1 ± 0.9	1.0*
g-reflected BF	274	5.4 ± 1.5	0.4	314	5.4 ± 1.3	0.3	223	5.4 ± 1.4	0.2	250	5.4 ± 1.3	0.4	167	5.3 ± 1.4	0.4
b-reflected BF	274	5.4 ± 1.5	0.2	314	5.5 ± 1.3	0.1	222	5.5 ± 1.4	0.2	250	5.4 ± 1.4	0.4	167	5.3 ± 1.4	0.4

Note. ΔMF = Difference between male and female participants; BMI = Body Mass Index; $\Delta_{I/N}$ = (Ideal BMI —Normative BMI)/Normative BMI, with a negative value indicating that a person wishes to be thinner compared to their normative weight; $\Delta_{I/A}$= (Ideal BMI —Actual BMI)/Actual BMI, with negative values indicating that a person wishes to be thinner compared to their actual weight; BUT = Body Uneasiness Test; BIC = Body Image Concern; WP = Weight Phobia; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; GSI = Global Severity Index; CDRS = Contour Drawing Rating Scale; BF = body figure based on the *Contour Drawing Rating Scale*; g-reflected BF = "*How do you think other girls see you*"; b-reflected BF = *"How do you think other boys see you."*.

Table 2. Cronbach's Alpha of Internal Consistency and Correlations for Matching Variables Between Baseline Levels and Successive Measurement Occasions.

T1 study variables	α	T2 (6 months)	T3 (12 months)	T4 (18 months)	T5 (24 months)
Actual BMI		.87	.74	.80	.81
Ideal BMI		.78	.69	.66	.67
$\Delta_{I/N}$		.76	.66	.64	.65
$\Delta_{I/A}$		.70	.62	.72	.54
BUT scales					
BIC	0.90–0.92	.57	.57	.58	.47
WP	0.85–0.88	.52	.62	.47	.41
AV	0.77–0.86	.55	.48	.39	.45
CSM	0.70–0.74	.54	.61	.58	.52
D	0.77–0.85	.53	.52	.56	.50
GSI	0.95–0.95	.57	.61	.55	.50
CDRS test					
Actual BF		.72	.73	.73	.71
Ideal BF		.67	.73	.57	.65
g-reflected BF		.74	.71	.71	.76
b-reflected BF		.70	.71	.72	.75

Note. Cronbach's αs for the BUT scales were calculated at each wave, including all participants, and min and max values are reported. Correlations between matching variables across time (T1 to 6 to 24 months later) were observed on a longitudinal subsample of participants who took part at 4 to 5 measurement occasions (n = 124 to 133 for T1 and T2 pair, n = 121 to 127 for T1 and T3 pair, n = 118 to 123 for T1 and T4 pair, and n = 89 to 112 for T1 to T5 pair). BMI = Body Mass Index; $\Delta_{I/N}$ = (Ideal BMI —Normative BMI)/ Normative BMI; $\Delta_{I/A}$= (Ideal BMI —Actual BMI)/Actual BMI; BUT = Body Uneasiness Test; BIC = Body Image Concern; WP = Weight Phobia; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; GSI = Global Severity Index; CDRS = Contour Drawing Rating Scale; BF = body figure based on the *Contour Drawing Rating Scale*; g-reflected BF = "*How do you think other girls see you*"; b-reflected BF = *"How do you think other boys see you."*
All correlations are significant at $p \leqslant .01$.

Table 3. Simple Correlation Matrix Among Body Image-Related Measures by Gender, at T2 Measurement Occasion.

	Girls										
Variables	1	2	3	4	5	6	7	8	9	10	11
1 BUT BIC		.85**	.76**	.60**	.71**	.38**	.08	.22*	.36**	.22*	−.19
2 BUT WP	.77**		.70**	.61**	.65**	.35**	−.02	.17	.27**	.11	−.21*
3 BUT AV	.60**	.54**		.56**	.73**	.32**	.08	.19	.29**	.25*	−.11
4 BUT CSM	.61**	.62**	.51**		.70**	.19	−.14	.13	.12	.18	−.13
5 BUT D	.69**	.67**	.65**	.66**		.21*	.00	.14	.17	.22*	−.04
6 CDRS Actual BF	.23**	.15*	.15*	−.06	.13		.61**	.78**	.82**	.58**	−.65**
7 CDRS Ideal BF	.10	.01	.13	−.04	.12	.37**		.57**	.53**	.50**	−.09
8 CDRS g-reflected BF	.22**	.16*	.18**	−.09	.18**	.84**	.32**		.82**	.51**	−.56**
9 CDRS b-reflected BF	.19*	.14	.15*	−.11	.11	.76**	.27**	.82**		.52**	−.59**
10 $\Delta_{I/N}$	−.10	−.01	−.07	−.09	.02	.29**	.12	.25**	.23**		−.16
11 $\Delta_{I/A}$	−.28**	−.28**	−.20**	−.08	−.16*	−.52**	.07	−.47**	−.45**	.15*	
						Boys					

Note. Boys = 205; Girls = 94; BMI = Body Mass Index; BUT = Body Uneasiness test subscales; BIC= Body Image Concern; WP = Weight Phobia; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; CDRS = Contour Drawing Rating Scale; GSI = Global Severity Index; BF = body figure based on the *Contour Drawing Rating Scale*; g-reflected BF = "*How do you think other girls see you*"; b-reflected BF = *"How do you think other boys see you"*; $\Delta_{I/A}$ = (Ideal BMI—Actual BMI)/Actual BMI; $\Delta_{I/N}$ = (Ideal BMI—Normative BMI)/ Normative BMI, with a negative value indicating that a person wishes to be thinner compared to their normative weight. Girls above the main diagonal.
$^{*}p \leqslant .05$. $^{**}p \leqslant .01$.

adolescents who perceive themselves as heavier, also compared with their ideal body weight, generally feel more uncomfortable with their body.

Correlation patterns were statistically comparable across male and female participants but for the ideal/ normative discrepancy indicator. In fact, gender moderated all the associations observed between $\Delta_{I/N}$ and the four CDRS body figures, being higher for girls compared with boys (the interaction terms gender by $\Delta_{I/N}$ accounted for $.03 \leq R^2_{CHANGE} \leq .06$, $p \leq .01$) as well as the correlations between $\Delta_{I/N}$ and the BUT Body image Concern and BUT Avoidance scales ($.01 \leq R^2_{CHANGE} \leq .02$, $p \leq .05$).

Table 3 also shows that the two discrepancy indices of ideal BMI were poorly correlated, that is, they represent two complementary pieces of information as hypothesized. Mostly, two opposite correlation patterns emerged for these two discrepancy values. Indeed, negative correlations were found for $\Delta_{I/A}$, but positive correlations for $\Delta_{I/N}$ and the study variables, in girls especially. In fact, the more an adolescent wishes to be thinner than they actually are (higher negative $\Delta_{I/A}$ values), the bigger their own perceived body figures and the higher their body discomfort. Conversely, the more an adolescent wishes to be thinner than they normatively should be (higher negative $\Delta_{I/N}$ values), the slimmer their perceived body figures, especially in girls as already reported above. To better understand such patterns, we found that actual BMI was positively associated with $\Delta_{I/N}$ discrepancy ($r = .71$, $p < .001$), indicating that the higher the actual BMI, the higher the ideal BMI compared with the normative one. Moreover, when we statistically compared mean $\Delta_{I/N}$ and $\Delta_{I/A}$ values by also stratifying our sample and distinguishing among underweight (BMI < 18.5), healthy weight ($18.5 \leq$ BMI < 25), and overweight individuals (BMI $\geq$ 25), results from analysis of variance for mixed designs revealed a significant interaction effect between actual BMI and discrepancies, $F(1, 318) = 273{,}53$, $\eta^2 = 0.63$, $p \leq .001$, indicating different patterns for the BMI groups, with heavier participants generally reporting positive $\Delta_{I/N}$ values ($M = 12.66$) but negative $\Delta_{I/A}$ values ($M = -13.01$), thinner participants reporting an opposite pattern, whereas adolescents in the range of healthy BMI values reported discrepancies close to 0; Figure 2 illustrates the interaction effect.

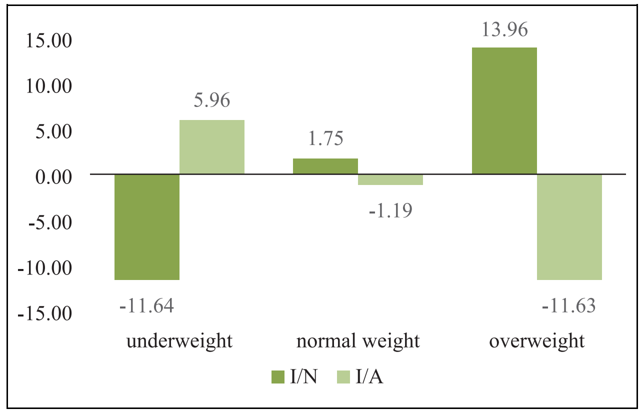

Figure 2. Mean Values for Ideal/Normative and Ideal/Actual Discrepancies for Underweight, Normal Weight, and Overweight Adolescents.

Confirmatory Factor Analysis of the BUT Questionnaire

Analyses were conducted on T2 cross-sectional data, when the sample size was larger compared to the other waves and representative of the overall sample (61% of the overall sample); Figure 1 illustrates how T2 students collaborated at each of the other waves, that is, 224 among them (81% of T1 sample) provided reports at T1, 250 (88% of T3 sample) at T3, 170 (55% of T4 sample) at T4, and 139 (54% of T5 sample) completed reports at T5. When confirmatory factor analysis (CFA) was carried out on the 34 items of the BUT test, the fit indices suggested a good fit for the five-factor, where each item was linked to its expected factor ($\chi^2 = 1{,}015.68$, $df = 517$, $p < .001$; CFI = 0.97, TLI = 0.97, RMSEA = 0.054, SRMR = 0.064). A single-factor model for the 34 items also met the criteria for an acceptable fit (fit indices: $\chi^2 = 1{,}309.43$, $df = 527$, $p < .001$; CFI = 0.95, TLI = 0.95, RMSEA = 0.067, SRMR = 0.078), although Satorra-Bentler scaled $\Delta\chi^2 = 75.04$ ($df = 10$, $p < .001$) indicated that the fit was significantly worse if compared with the five-factor model. A second-order CFA model, with the five first-order latent factors loading on a general second-order factor as illustrated in Figure 3, yielded good fit indices as well ($\chi^2 = 1{,}151.40$, $df = 522$, $p < .001$; CFI = 0.96, TLI = 0.96, RMSEA = 0.060, SRMR = 0.071). Overall, these results indicate that the expected structure of the BUT questionnaire was replicated in our young sample. These results allowed us to test the structure of the BUT attitudinal variables against the perceptual variables here inspected.

CFA of the Study Attitudinal and Perceptive Body Image–Related Variables

A CFA on T2 data was performed (FIML method to manage missing values along the perceptual variables) to test whether the attitudinal (BUT scales) and the perceptual (i.e., CDRS body figures, and $\Delta_{I/A}$ and $\Delta_{I/N}$ discrepancies) domains of the body image construct represent two distinct latent factors, in the present data sample. After modifying our initial model according to quantitative indices, we tested a model with factor loadings for all the BUT subscales on factor 1, that is, the attitudinal domain, and factor loadings for actual, reflected, and ideal CDRS body figures, $\Delta_{I/N}$ and $\Delta_{I/A}$ discrepancies on factor 2, that is, the perceptual domain,

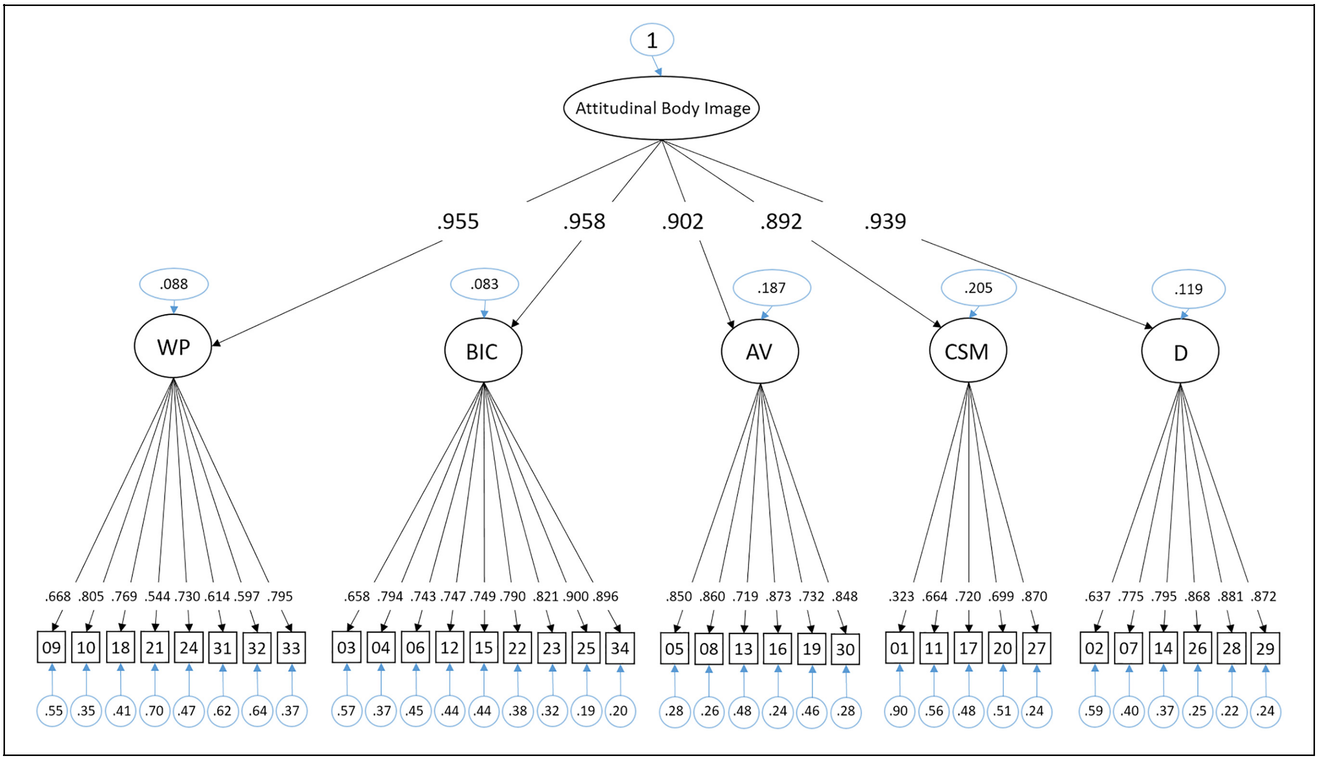

Figure 3. Second-Order Factor Structure of the 34-Items of the BUT Questionnaire: Standardized Model Parameters.
Note. BUT = Body Uneasiness Test; WP = Weight Phobia; BIC = Body Image Concern; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; at the lower level, items are represented.

Table 4. Two-Factor Solution; Standardized Factor Loadings Estimate.

Factor	Indicator	Estimate	*SE*	Z	Stand. Estimate
Attitudinal body image	BUT BIC	8.04	0.45	17.65	0.83
	BUT WP	7.71	0.47	16.39	0.79
	BUT AV	6.33	0.41	15.21	0.74
	BUT CSM	7.56	0.49	15.49	0.79
	BUT D	7.84	0.43	18.50	0.86
Perceptual body image	CDRS Actual BF	1.13	0.05	21.32	0.92
	CDRS Ideal BF	0.59	0.05	9.55	0.51
	CDRS girls-reflected BF	1.14	0.06	20.36	0.89
	CDRS boys-reflected BF	1.13	0.06	19.54	0.87
	BUT CSM	−1.96	0.42	−4.66	−0.21
	$\Delta_{I/N}$	5.30	0.66	8.09	0.45
	$\Delta_{I/A}$	−4.79	0.47	−10.10	−0.54

Note. BUT = Body Uneasiness Test; BIC= Body Image Concern; WP = Weight Phobia; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; CDRS= Contour Drawing Rating Scale; BF = body figure based on *Contour Drawing Rating Scale*; g-reflected BF = "*How do you think other girls see you*"; b-reflected BF= *"How do you think other boys see you"*; $\Delta_{I/N}$ = (Ideal BMI—Normative BMI)/ Normative BMI; $\Delta_{I/A}$ = (Ideal BMI —Actual BMI)/Actual BMI. All coefficients are significant at $p < .001$; Factor correlation: Estimate= 0.27, *SE* = 0.06, *Z* = 4.67, $p < .001$.

with BUT Compulsive Self-Monitoring loading on this factor 2 as well. We took into account the following residual covariances when we modified our initial model: (a) BUT Body Image Concern and Weight Phobia, due to their conceptual overlap, (b) CDRS ideal body figure and $\Delta_{I/A}$ discrepancy, and (c) $\Delta_{I/A}$ and $\Delta_{I/N}$ discrepancy indices due to the underlying ideal BI dimension. The modified two-factor model achieved an acceptable fit to the data (χ^2 = 107.56, df = 39, p <.001; CFI = 0.97, TLI = 0.96,

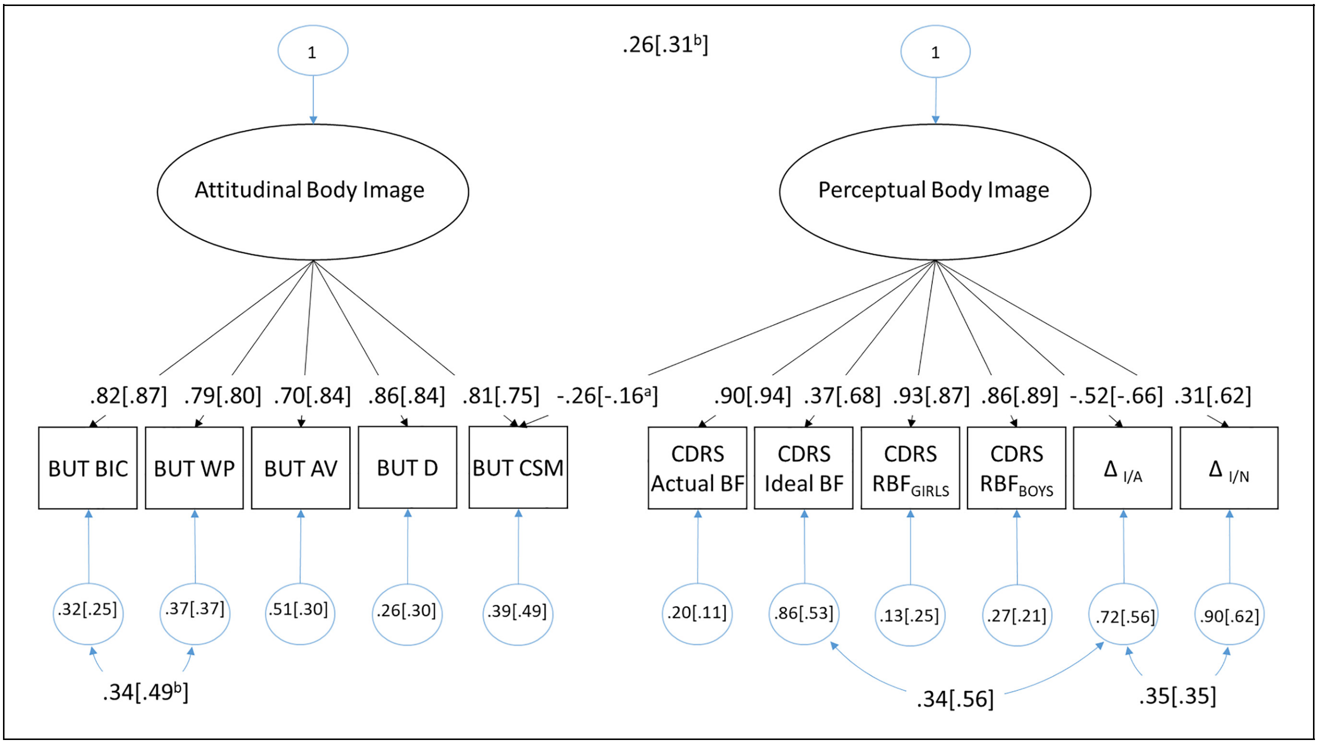

Figure 4. Multiple Group CFA of Two-Dimensional Model of Body Image for Boys and Girls (in Parenthesis).
Note. CFA= Confirmatory Factor Analysis; BUT = Body Uneasiness Test; BIC = Body Image concern; WP = Weight Phobia; AV = Avoidance; CSM = Compulsive Self-Monitoring; D = Depersonalization; CDRS = Contour Drawing Rating Scale; RBF = reflected body figure; RBF_{GIRLS} = "*How do you think other girls see you?*"; RBF_{BOYS} = "*How do you think other boys see you?*"; $\Delta_{I/A}$ = (Ideal BMI—Actual BMI)/Actual BMI; $\Delta_{I/N}$ = (Ideal BMI—Normative BMI)/ Normative BMI.
All coefficients are significant at $p < .001$. [a] $p < .05$. [b] $p < .01$.

RMSEA = 0.073, SRMR = 0.044), and factor loadings are shown in Table 4.

We also tested an alternative model, with ideal body-related indicators loading on an independent factor, but it did not fit the data well enough (χ^2 = 274.42, *df* = 41, p <.001; CFI = 0.89, TLI = 0.86, RMSEA = 0.131, SRMR = 0.075).

Two-Factor Model Invariance Across Gender

The invariance of the 2-factor model (Table 4) was tested across gender. Results showed that only configural invariance was supported, that is, the factorial loadings of the indicators on the higher-order perceptual domain varied by gender (χ^2 = 173.99, *df* = 78, p <.001; CFI = 0.96, TLI = 0.94, RMSEA = 0.086, SRMR = 0.052). Figure 4 shows that CDRS actual, ideal, and reflected body figures, BUT Compulsive Self-Monitoring and discrepancy indices of ideal BMI yielded comparable patterns in boys and girls, but associations between CDRS ideal body figure and discrepancy indices of ideal BMI were stronger in girls compared with boys. Specifically, a Lagrange multiplier test (score test) for the release of constrained parameters in the weak invariance model confirmed a statistically significant difference in the factorial loadings of the CDRS ideal body figure (χ^2 = 7.81, *df* = 1, p <.005) and the CDRS girls-reflected body figure (χ^2 = 10.11, *df* = 1, p = .001).

Longitudinal Invariance

Finally, we tested the invariance of the two-factor model across time pairs, with 6 to 18 months intervals. Participants were aggregated across time points (for details, see Figure 1 and Table 5 Note) so as to increase the sample size at each time pairs we compared. Table 5 presents the results. Fit indices indicate that longitudinal configural, weak, and strong invariances reached acceptable levels at 6 months for Autumn to Spring data, whereas invariance failed for Spring to Autumn data. The results in Table 5 supported 1-year longitudinal configural and weak invariances as well, both for Spring to Spring and for Autumn to Autumn data, with RMSEA and SRMR indices close to 0.08; strong and strict invariance led to significantly worse models. Overall, the results in Table 5 are mixed for a 6-month interval but suggest that seasonality affected the

Table 5. Confirmatory Factor Analysis on Longitudinal Data: Multiple Fit Indices of Longitudinal Invariance (Configural, Weak, Strong, and Strict) for Time Intervals With 6 Months, 1-Year, and 18 Months Apart.

Time	Model	N	χ^2 (*df*)	CFI	TLI	RMSEA (90% CI)	SRMR	$\Delta\chi^2(\Delta df)$
6 months (Spring to Autumn)	Config. I	270	567.213 (184)	0.91	0.89	0.088 [0.080 0.096]	0.07	
	Weak I		584.157 (194)	0.91	0.90	0.086 [0.078, 0.094]	0.08	16.945 (10)
	Strong I		616.045 (205)	0.91	0.90	0.086 [0.078, 0.094]	0.08	31.888 (11)***
	Strict I		648.352 (216)	0.90	0.90	0.086 [0.079, 0.094]	0.08	32.307 (11)***
6 months (Autumn to Spring)	**Config. I**	**350**	**511.967 (184)**	**0.94**	**0.93**	**0.072 [0.065, 0.080]**	**0.07**	
	Weak I		**517.192 (194)**	**0.94**	**0.93**	**0.070 [0.062, 0.077]**	**0.07**	**5.225 (10)**
	Strong I		**534.315 (205)**	**0.94**	**0.93**	**0.068 [0.061, 0.076]**	**0.07**	**17.122 (11)**
	Strict I		555.591 (216)	0.94	0.94	0.068 [0.061, 0.075]	0.07	21.276 (11)*
1-year Seasonality (Spring to Spring)	**Config. I**	**242**	**485.109 (184)**	**0.93**	**0.91**	**0.082 [0.073, 0.091]**	**0.08**	
	Weak I		**498.083 (194)**	**0.93**	**0.91**	**0.080 [0.072, 0.089]**	**0.08**	**12.974 (10)**
	Strong I		520.145 (205)	0.92	0.91	0.080 [0.071, 0.088]	0.08	22.062 (11)*
	Strict I		542.826 (216)	0.92	0.91	0.079 [0.071, 0.087]	0.09	22.681 (11)*
1-year Seasonality (Autumn to Autumn)	**Config. I**	**169**	**385.439 (184)**	**0.93**	**0.91**	**0.080 [0.069, 0.092]**	**0.08**	
	Weak I		**392.970 (194)**	**0.93**	**0.91**	**0.078 [0.067, 0.089]**	**0.08**	**7.531 (10)**
	Strong I		417.441 (205)	0.92	0.91	0.078 [0.068, 0.089]	0.09	24.471 (11)*
	Strict I		428.862 (216)	0.92	0.92	0.076 [0.066, 0.087]	0.08	11.421 (11)
18 months	Config. I	173	415.121 (184)	0.91	0.89	0.085 [0.074, 0.096]	0.09	
	Weak I		443.174 (194)	0.90	0.88	0.086 [0.076, 0.097]	0.10	28.053 (10)**
	Strong I		464.091 (205)	0.90	0.89	0.085 [0.075, 0.096]	0.10	20.916 (11)*
	Strict I		501.846 (216)	0.89	0.88	0.087 [0.077, 0.097]	0.10	37.755 (11)***

Note. Config I = Configural Invariance. The achieved level of longitudinal invariance is highlighted in bold. Data sample: Figure 1 illustrated sample composition for each tested longitudinal invariance. Spring-to-Autumn sample share n = 241 participants with Autumn-to-Spring sample, n = 225 participants with Spring-to-Spring sample, n = 158 participants with Autumn-to-Autumn sample, and n = 155 participants with 18-months sample. Autumn-to-Spring sample shares n = 221 participants with Spring-to-Spring sample, n = 160 participants with Autumn-to-Autumn sample, and n = 158 participants with 18-months sample. Spring-to-Spring sample shares n = 133 participants with Autumn-to-Autumn sample, and n = 141 participants with 18-months sample. Autumn-to-Autumn sample has n = 154 participants in common with the 18-months sample. CFI = Comparative Fit Index; TLI = Tucker–Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

longitudinal invariance of body-image attitudinal and perceptive latent factors.

Discussion

Body image is a crucial factor in preventing and understanding various clinical conditions, such as eating disorders, in adolescents (Grogan, 2006, 2008; Voelker et al., 2015). Therefore, body image as a psychological construct represents an important target to address in empirical studies. In the current longitudinal study, we extensively tested the factor structure of the Body Uneasiness Test as a multicomponent attitudinal instrument of body image, further testing its discriminant validity alongside perceptual measures of body silhouettes and ideal/actual discrepancies and some additional relevant but less systematically investigated body image–related constructs, namely, the ideal/normative body weight discrepancies and reflected body silhouettes. Finally, we tested the structural invariance of body image domains across gender and time.

Preliminarily, the descriptive statistics of BMI and BUT variables were consistent with previous studies (Cuzzolaro et al., 2006; Elgar et al., 2005; Gardner & Brown, 2010; Goodman et al., 2000; Lipsky et al., 2019) and indicated that our nonclinical sample of adolescents is representative of Italian adolescents. Differences in mean values in the study variables between female and male participants were also consistent with the literature, systematically showing that both younger and older women wish to be thinner than they are and are generally less satisfied with their bodies compared with male individuals (Voelker et al., 2015).

Correlations between matching perceptive measures across time suggested that some stability prevailed over change; moreover, they were higher compared with those observed for the attitudinal BUT scales. These results are consistent with several studies showing high stability of self-ratings along body figure scales and BMI among adolescents (Gardner & Brown, 2010; Wertheim et al., 2004), whereas they are expected to experience developmental changes in their negative body evaluation as they gradually acquire self-reflective, body self-care and resilience skills that enable them to accept their maturing bodies (Halliwell, 2015). However, we cannot empirically compare our results with other previous studies as they did not provide correlations across time for the BUT scales (Cuzzolaro et al., 2006; Marano et al., 2007). Generally, results on rank-order continuity on body image-related constructs are sparse in the literature and they suggest some 1-year stability for body dissatisfaction in young females (Jones, 2004; Stice & Whitenton, 2002), whereas modest levels of correlations across time, even a few weeks, are reported for young males when body image-related variables are assessed (Forbush et al., 2019; Ricciardelli & McCabe, 2003). In brief, studies on rank-order continuity and change of body image in adolescent years need to be replicated and extended by systematically considering different components of the body image construct as well as shorter and longer time intervals between measurement occasions. Our findings for the BUT questionnaire represent a contribution in this direction (Cuzzolaro et al., 2006; Marano et al., 2007).

The present results from the CFA of the BUT questionnaire also provided additional information to current available studies. In fact, our study demonstrated the validity of both the five-factor structure and the second-order factor structure, both structures being consistent with the theoretically expected organization of the BUT items. Specifically, Cuzzolaro and colleagues (2006) reported on the validity of the five-factor structure, but they did not test the second-order factor structure of the BUT questionnaire. Mostly, the results from CFA supported the discriminant validity of the BUT questionnaire against perceptual measures, with a two-factor solution, following post hoc theoretically consistent changes (Gardner et al., 1998; Kakeshita & Almeida, 2006), showing that the BUT scales load on an attitudinal factor, that is, the cognitive, affective, and investment dimensions of body image, whereas the CDRS body figures, BUT Compulsive Self-Monitoring (secondary loading), and ideal BMI discrepancy indices load on a perceptual factor. The present results thus support the validity of the Body Uneasiness Test as an attitudinal measure of body image in adolescence. Only the BUT Compulsive Self-Monitoring scale also captured the perceptual component along with the CDRS body figures and discrepancy indices of ideal BMI (Sullivan & Harnish, 1990). This result is consistent with findings by Sullivan and Harnish (1990) and Reas et al. (2002) who revealed that self-monitoring is associated with self-perceptions of physical appearance.

Our results provided new insights into the perceptual domain as well. First, our results showed that perceived actual, ideal, and reflected body figures are correlated but not interchangeable (Voelker et al., 2015) and suggest thereby that reflected self-appraisals in the perceptual domains of body image should be systematically investigated in adolescence. Reflected self-assessments also showed gender differences as will be discussed later. Second, ideal/actual and ideal/normative BMI discrepancies also contribute to defining the perceptual domain. Gardner and colleagues (1998) also found a relationship between how individuals estimate their own body weight, shape, and size and the distance they perceive between actual and ideal body weight (Gardner et al., 1998). Thus, the present finding contributes to extend the self-discrepancy theory of body perception by suggesting its location on a conceptual map of body image (Higgins, 1989; Vartanian, 2012). Moreover, our study revealed the relevance of the ideal/normative BMI discrepancy as a complement to the ideal/actual BMI discrepancy, in the perceptual domain. Indeed, the two discrepancy indices showed two opposite correlation patterns with both perceived silhouettes and body image-related attitudes, with self-reported fatter body figures being associated with a lower ideal BMI compared with actual BMI, but fatter figures being associated with a higher ideal BMI compared with normative BMI, especially in girls. More in detail, we found that overweight adolescents tend to report a higher ideal body weight compared with their normative weight while also feeling uncomfortable with their own body shape.

Regarding the discrepancy between ideal and normative weight, our findings are consistent with studies drawing attention to individuals, whether they clinically are obese or excessively underweight, who concurrently report a subjective ideal weight in the range of respectively unhealthy over- or under-weight, with potentially significant health consequences (Albert et al., 2022; Buscemi et al., 2018; Caterson et al., 2019; MacNeill & Best, 2015; Naghshizadian et al., 2014; Yaemsiri et al., 2011). Clinically, these studies suggest that individuals who tend to misperceive the ideal/health discrepancy of body weight are vulnerable to dysfunctional eating habits, to poor or excessive concern for their body weight (Caterson et al., 2019; MacNeill & Best, 2015; Yaemsiri et al., 2011) as well as to procrastinate in asking for professional help (Caterson et al., 2019; Yaemsiri et al., 2011). On the other side, decreasing the gap between actual and healthy weight is challenging for both overweight and underweight individuals. Therefore, a perceived achievable target weight can play a positive motivational role during a treatment program (Caterson et al., 2019), along with the perception of individual body changes beyond actual changes, with the perceived weight loss encouraging to continue the program and reach the final healthy weight step by step (Ginis et al., 2012). Overall, longitudinal research on the ideal/actual and ideal/normative discrepancies in relation to body image and eating-related behaviors deserves more attention.

The present results support the two-factor model of attitudinal and perceptual body image assessment tools, further demonstrating the configural invariance in boys and girls, that is, the measurement model of the latent body image construct, that is the attitudinal and perceptual domains, is valid in both boys and girls. Such a finding is a prerequisite for a systematic study of similarities and differences between female and male adolescents (Putnick & Bornstein, 2016). Indeed, some differences have already emerged in our study: Perceptual indicators showed stronger factor loadings for girls than for boys. This finding is consistent with established empirical findings which show that ideal body silhouettes and body-related discrepancies are stronger indicators of perceived body image and risk factors for eating-disordered conditions in girls than in boys (Anton et al., 2000; Gardner et al., 2000; MacNeill & Best, 2015). However, we highlight that such findings, including the present one, may depend on the perceptual indicators investigated. Indeed, they often address adiposity but omit important aspects of the male body such as muscularity and leanness (Bozsik et al., 2018; Cunningham et al., 2019; Ralph-Nearman & Filik, 2018). Another difference between boys and girls that emerged in our study revealed that opposite gender-reflected body image, that is, girls-reflected CDRS body silhouette, is more intensely related to the perceptual body image domain in boys than in girls. Such a finding is exploratory, but points to the need for expanding body image research so as to include reflected body figures, to better represent adolescents' self-evaluations and understand how same- and opposite-sex reflected self-representations contribute to the development of a (dys)functional body image (Krayer et al., 2008; Shroff & Thompson, 2006).

Finally, the present longitudinal study demonstrated longitudinal invariance of the two-factor model across seasonal time intervals, Spring to Spring and Autumn to Autumn, that is, the measurement model was equivalent across seasons, whereas mixed results emerged when shorter (6 months) time intervals were inspected. Developmentally, longitudinal invariance helps ensure that scores observed over time on attitudinal and perceptual body image-related domains express true changes in latent factors rather than changes in assessment instruments and scale composition. Hence, the introduction of time-invariant measures of body image helps identify if and when changes occur during adolescence beyond those associated with puberty, the transition period between school years, and/or seasonal variations in weight and body shape (Voelker et al., 2015). Furthermore, such seasonally time-invariant body image draws attention on the effects of environmental factors, which deserve more attention, as they might influence the temporal stability of attitudinal and perceptual domains of body image constructs (Bronson, 2004; Griffiths et al., 2021; Kasper et al., 1989). The mixed findings from 6 months invariance also call attention to seasonal effects. In fact, our findings are consistent with results from Griffiths and colleagues (2021) who evidenced that summer represents a critical period, susceptible to changes, when bodies are more on public display and body comparisons are favored, thus resulting in negative peaks in body satisfaction. The failed structural invariance might reflect such a higher instability in body perceptions occurring from spring to autumn. However, the literature is still sparse and our results need to be cross-validated.

Strengths and Limits

Overall, the current study contributes to cross-validate the Body Uneasiness Test as an attitudinal tool for assessing body image, provides new insights into perceptual measures in adolescents, including the relevance of both ideal/normative weight discrepancy and reflected body perceptions, and a preliminary map onto which projecting tools aimed at assessing the multifaced construct of body-image and offers psychometric evidence that seasonality affects body image assessment. However, it has several limitations. First, we only used the scales from BUT as attitude-related indicators in our study. In the future, other body image-related measures should be included to develop a clearer map of attitudinal facets of the body image construct; similarly, additional perceptual body measures should be included. Second, our results promisingly support measurement invariance of a two-dimensional model of body image across gender and time, but the study results need to be cross-validated in larger samples and across longer time intervals, although our sample was representative. Third, we conducted an unbalanced panel study, which involved an overall large number of participants, most of which however did not respond at each measurement occasion, after they entered the research project. This implies an unstable sample size and composition across time points, with results on longitudinal invariance, for example, partially depending on a varying number of observations across comparisons. A large and balanced panel study is needed in order to test the overall tenability of our findings. A fourth limitation concerns the perceptual indicators, that is, the Contour Drawing Rating Scale, which were stable across time, but suffer from reliability as any single-item tool does. We have used this scale for drawing figures because it has proven useful in the school context, but we acknowledge that future research should use other methods and instruments to assess the perceptual body image in boys and girls. Furthermore, the Contour Drawing Rating Scale excludes two specific male body-related aspects, leanness and muscularity (Ralph-Nearman & Filik, 2018; Smolak & Murnen, 2008), two characteristics that are also increasingly relevant for girls and women (Bozsik et al., 2018; Cunningham et al., 2019). Thus, it is important for future research directions to assess perceived leanness and muscularity to better understand the construct of body image in both boys and girls. A further limit deals with the use of self-reported instead of objective weight and height. Although objective and self-reported body measures are generally valid, they nevertheless are complementary. Thus, including objective parameters would allow examining how discrepancies between subjective and objective BMIs affect an individual's feelings and attitudes toward their body but allowed also to detect possible invalid self-reported data. One last limit regards gender. On one hand, our sample included mostly boys and we could contribute to fill a gap in the current literature on body image that still is mainly focused on younger as well as older women (Voelker et al., 2015). However, we could not contribute to an emerging field of research on body image that more and more focuses on persons, especially among young people, who identify themselves with a non-binary gender. In future research, a stereotypical view of gender needs to be overcome in order not to exacerbate BICs, for example, among transgender young people. Indeed, a binary gender may favor personal expectations of meeting stereotypical gender norms thus exacerbating both negative body images as well as eating disturbances in transgender people (Ålgars et al., 2010; McGuire et al., 2016).

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The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author Contributions

Elide Francesca De Caro: investigation, data curation, writing-original draft, writing-review and editing, formal analysis.
Michele Grassi: formal analysis, writing-review and editing.
Lisa Di Blas: supervision, conceptualization, methodology, writing-original draft, writing-review and editing.

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Data Availability

Materials and analysis code for this study are available by emailing the corresponding author.

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