Give or Take a Few? Comparing Measured and Self-Reported Height and Weight as Correlates of Social Physique Anxiety

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Statistically controlling for physical size is common practice, especially in self-perception studies uncovering the etiology of maladaptive behaviors, such as eating disorders. For example, social physique anxiety (SPA)—apprehension about social evaluations while presenting oneself in front of others (Leary, 1992)—is a prominent correlate of eating disorder indicators (Hausenblas & Mack, 1999; Monsma & Malina, 2004), body image (Ackard, Croll, & Kearney-Cook, 2002; Markey & Markey, 2005), and self-esteem (Caldwell, Brownell, & Willrey 1997; Forbes, Doroszewicz, Card, & Adams-Curtis, 2004). Physical size may potentially mask relationships among the psychological variables between SPA relationships and such constructs.

Psychological analyses frequently control for height, weight, or body mass index (BMI) by examining partial correlations or using physical variables as covariates in mean comparison tests with SPA as well as other psychological disorder symptoms. Among female participants in aesthetic sports, Monsma, Pfeiffer, and Malina (2008) found that physical size characteristics, such as weight, percentage of body fat, and BMI, were the strongest correlates of SPA. Other studies of adolescent and young adult women supported the association of BMI and SPA, with correlations of .14 (Haase & Prapavessis, 1998) and .11 (Russell & Cox, 2003), respectively. Self-reported BMI accounted for 21% of the variance in predicting body satisfaction in 7,200 young adult female dieters (Caldwell et al., 1997), 7.8% of the variance in SPA in 373 college women (Sabiston, Crocker, & Munroe-Chandler, 2005), and measured BMI explained 5% of the variance in eating disorder symptoms among 114 adolescent and young adult figure skaters (Monsma & Malina, 2004).

Physical size is particularly important to consider among adolescents because of the variability associated with growth and maturation. In general, participants with higher BMI tend to report higher scores in SPA, decreased body satisfaction, and increased eating disorder symptoms. Given that social desirability to have a lean figure is prevalent in American society, individuals with symptoms of eating disorders, low to moderate increases in SPA, and body dissatisfaction may be more likely to misreport their height and weight (Klesges et al., 2004).

Both biological and contextual factors are possible reasons for over- or underreporting height and weight among adolescents. Plausible biological explanations include the timing and tempo of growth (Fortenberry, 1992) and time since menarche in girls (Abraham, Luscombe, Boyd, & Oleson, 2004), while contextual factors include those such as the amount of time spent exercising (Abraham et al., 2004) and pressures associated with sports context. Aesthetic activities such as ballet, gymnastics, cheerleading, and figure skating frequently hold weights, involve high-energy expenditure, and, in some cases, recommendations to diet or lose weight.

Aligned with timing and tempo variations of biological events, such as breast development and menarche (Brooks-Gunn, 1988), the ages of ≤ 12.9, 13.0–15.9, 16.0–18.9, ≥ 19 years should be considered because of the associated gains in weight and height. The average age at menarche is 12.8 ± 1.0 years in the North American population and slightly later (13.5–16.8 years) among aesthetic activity participants (Malina, Bouchard, & Bar-Or, 2004). Peak height followed by peak weight velocities typically occur approximately one year prior to menarche.
Growing an average of about 8 cm together with changes in body composition result in average weight gains of about 5 kg (Malina, Bouchard, & Bar-Or, 2004). Young participants might not notice the magnitude of these changes. Fortenberry (1992) conducted a study of adolescents and found results similar to adults by generally underreporting weight and overreporting height, with the exception of underweight males who overreported both measurements. However, Himes and Faricy (2001) found that among younger group participants, ages 12 and 13 years were less reliable than participants ages 14 through 16 years in a national study of 1,635 youth.

Sociocultural variations in physical characteristics to explain maladaptive perceptions is apparent in gender (Markey & Markey, 2005) and ethnic comparisons of Canadian and Indian women (Gupta, Chaturvedi, Chandarana & Johnson, 2001), Polish and American women (Forbes et al., 2004), and among Norwegian adolescent girls. As controlling for BMI or other physical variables in behavioral studies continues to be common practice (Forbes et al., 2004; Markey & Markey, 2005), especially those involving adolescents (Ackard et al., 2002) and cross-cultural samples (Forbes et al., 2004; Gupta et al., 2001; Kansy, Wichstrom, & Bergman, 2003), it is important to determine the most efficient way to collect these data.

Generally, height and weight data are collected in two ways: objective measurement following stringent anthropometric protocols or via self-report. A fundamental limitation in asking participants to self-report their height and weight is that some participants may simply not know or are potentially subject to socioculturally driven bias. Self-reporting height and weight is used frequently in psychosocial research, because data on large samples can be obtained efficiently and inexpensively. From a psychosocial standpoint, participation in certain contexts may bias the accuracy of self-report data. Aesthetic sport athletes who are evaluated on body shape and size may have a tendency to underreport weight and overreport height due to social desirability. In contrast, these same athletes’ self-reported measures may be accurate because they are weighed and measured more often than nonaesthetic sports athletes or nonathletes.

The second method of physical measurement involves protocols to establish population norms; participants are measured when wearing minimal clothing and no shoes. Data collection involves establishing intra- or interrater reliabilities with two trials of duplicate measures to ensure consistency (National Health and Nutrition Examination Survey, 2002). Technical errors of measurement (TEMs) are used with these protocols because the variation captured by traditional reliability methods used in the social sciences (e.g., Cronbach’s alpha) are typically not sensitive enough to capture measurement error (Malina, 1995).

There are several barriers to collecting objective measures of physical variables. While measuring height and weight are not necessarily challenging tasks, purchasing stadiometers and quality digital scales can be costly. There are also time- and cost-related issues associated with training and retraining data collectors if an acceptable level of error cannot be attained. The equipment can be bulky and heavy, making transportation difficult; especially in cases where multiple sites are involved and data are not available from other sources, such as medical records. In addition to these barriers, physically measuring individuals may be perceived as intrusive in some populations.

These time-consuming and expensive measurement procedures may hinder studies involving athletes. There is some evidence that certain populations provide more accurate self-reports than others. Abraham et al. (2004) found a significant positive correlation between amount of time exercising and accuracy of self-reported height in a study of girls, ages 11–18 years. In Doll and Fairburn’s study (1998), young women with bulimia nervosa accurately reported their height and weight. Even if self-reported measures are accurate, there will be variations due to daily fluctuations in weight and growth, especially among adolescents.

Bosomphan, Carter, and Campbell (2005) examined weight variations in 46 adults over 10 days while controlling food and beverage intake. The authors measured all forms of water output on Days 7 through 10 and found that, during 1 day, weight can vary by as much as 0.25 pounds (0.11 kg) on average. Even more relevant, height can remain static or increase up to 0.20 inches (0.52 cm) per day in adolescent girls (Caino, Kelmsny, Lajarraga, & Adano, 2004; Caino, Kelmsny, Adano, & Lajarraga, 2006). Keeping these issues in mind, further analysis of systematic misreporting of physical data across age groups and within aesthetic sport contexts would help future researchers make decisions about their study designs.

Our study had three goals. First, we examined the accuracy of self-reported height and weight among female aesthetic sport athletes. The majority of participants were expected to underreport their weight and overreport their height. Second, we explored variation in physical variables and in SPA across the age periods Brooks-Gunn (1988) suggested. Participants in the older groups were expected to report higher SPA. Third, we compared the relationship with SPA for measured variables to that of self-reported variables.

Method

Participants

Participants were 244 female aesthetic sport athletes (i.e., sports with revealing or form-fitting uniforms), representing cheerleading (n = 92), ballet (n = 11), auxiliary
dance (n = 13), color guard (n = 34), equestrian (n = 18),
gymnastics (n = 2), volleyball (n = 65), and majorette (n = 9).
Ages ranged from 11 to 22 years (M = 15.07 years,
SD = 2.75). Participants were categorized into one of the
following chronological age groups: ≤ 12 years (n = 58),
13–15 years (n = 96), 16–18 years (n = 59), ≥ 19 years (n = 51) (Brooks-Gunn, 1988).

Instrumentation

Social Phsyique Anxiety Scale (SPAS). We used the 9-item
SPAS (Martin, Rejeski, Leary, McAuley, & Bane, 1997)
to assess the anxiety individuals experience in response
to evaluations of physique. The 9-item SPAS has sound
single factor structure among adolescents (Smith, 2004).
In this version, items 2, 5, and 11 are omitted from the
original 12-item questionnaire because of conceptual and
empirical weaknesses. Items are rated on a 5-point scale
with anchors of 1 = not at all and 5 = extremely. Items 1
and 6 are reverse coded. A higher score indicates a greater
degree of social physique anxiety. The average of the items
was taking providing a possible range of 1 to 5. An alpha
coefficient (Cronbach, 1951) of 0.87 from this study’s
data indicated acceptable internal consistency reliability
of the SPA scale.

Procedure

After acquiring approval from the Institutional Re-
view Board and coaches, participants were recruited via
athletic teams and at annual sports physicals. Athletes 18
years of age and older provided informed consent and
athletes under the age of 18 provided assent and their
parents provided consent. Approximately 50% of the
questionnaire portion of the data was collected via Sur-
veyMonkey.com and the other half in paper and pencil
format. We collected all self-reported data, including
sport, age, height (feet and inches), weight (pounds),
and SPAS prior to measurements.

Participants rotated through various stations where
one researcher was in charge of taking specific measures
in the battery. Height was measured using a portable
stadiometer and weight was measured with a Tanita BWB
800AS digital scale; Tanita Corporation, Tokyo, Japan).
Two measures of each physical variable were taken using
Lohman, Roche, and Martonell’s (1988) protocols. If
the second measurements was inconsistent with the first
measurement by 0.2 pounds (.9 kg) for weight and 0.2
cm for height, a third measurement was taken. We used
the average of the measurements to calculate BMI in
the analyses. In the event of a third measurement, the
two measurements within 0.2 cm of one another were
averaged. Height and weight variables were converted to
metric and BMI calculated using weight/height (kg/m²).
All data were collected during peak activity or competi-
tive seasons.

We used TEMs (Malina, 1995) as indicators of
measurement variability in height and weight. TEM
\(\sqrt{\text{SD}^2/2n}\) is the square root of the sum of squared
differences of replicate measurements (\(\Sigma d^2\)) divided by twice
the number of pairs (2n). Intraobserver TEM based on
replicate measurements of every 15th participant (n = 14)
was 0.15 for height and .22 for weight, which are within
acceptable ranges for young athletes (Malina, 1995).

Analyses

Descriptive statistics were calculated to determine the
proportion of athletes who under- or over-reported height
and weight. Aligned with previous research (Bossingham
et al. 2005; Caino, et al., 2006), weights within .11 kg
and heights within .52 cm of measured values were not
included in the examination of over- and under-reporting
to account for daily variation. We conducted two sets of
analyses to examine the association between measured
and self-reported height, weight, and BMI.

Critical Age Period Variation. To identify potential
critical periods of misreporting, we examined age-group
variation in actual height and weight, self-reported height
and weight, difference scores between measured and
self-reported height and weight, and BMI by a 4 (age
group) x 2 (measured vs. self-report) repeated measures
analysis of variance (ANOVA) with Tukey’s adjustment
for multiple comparisons.

Correlation Analyses. To illustrate the importance of
controlling for age and physical variables in psychosocial
research, separate correlations were conducted between
SPA and self-reported and measured physical variables.
We ran a second set of correlations to control for age and
then tested for significant differences. In addition, measured
and self-reported correlations, as well as those accounting
for age, were tested for significant difference in two ways.
First, we tested the correlations by examining the confi-
dence intervals. If the intervals did not overlap, they were
significantly different. As a second check, correlations
were compared using reference tables based on sample
size (Millsap, Zalkind, & Xenos, 1990). For all analyses,
we included the post hoc comparisons, \(\alpha = .05\).

Results

Table 1 presents the means and standard deviations
for self-reported and measured height, weight, and BMI,
as well as average SPA scores by age group. Descriptive
statistics were calculated to determine the proportion of
athletes who under- or over-reported height and weight.
Sixty-four percent overreported height by an average of
3.85 cm (SD = 5.84) and 39.2% underreported weight
(M = 3.54 kg, SD = 8.60). These initial calculations do
not account for discrepancies between measured and
self-reported variables after accounting for the .11 kg and .52 cm daily variation (Bossingham et al., 2005; Caino et al., 2006). After removing participants who were within these daily fluctuations, approximately 38% of the 244 participants underestimated weight (n = 94), while 51% overestimated height (n = 123). Examination of measured and self-reported means indicated that the three oldest age groups overreported their weight. The descriptive statistics in Table 1 do not account for the potential daily variation in height or weight.

**Critical Age Variation**

A mixed model design was used to examine variation in SPA scores by measured or self-reported physical variables and developmental age group. Means and standard deviations for physical variables and SPA scores by age group are shown in Table 1. Data were analyzed using a 4 (age group) x 2 (measured or self-reported) repeated measures ANOVA for each physical variable. There was a significant interaction for height, $F(3, 240) = 3.85, p < .05$, and a significant main effect for weight, $F(3, 240) = 3.99, p < .05$. There were no other significant main or interaction effects for physical variables.

To further understand age group variation, we examined the post hoc results. The youngest age group’s degree of misreporting was significantly greater than the other three groups ($p < .001$). Both of the youngest two groups underreported height, while the oldest two groups overreported height. The 13–15-year age group was significantly more accurate in reporting height than the 16–18-year age group ($p < .05$) and the oldest age group ($p < .01$). There was no difference between the two oldest age groups in self-reported versus measured height difference.

On further examination of the post hoc results, the only significant difference among age groups for weight was between the oldest and youngest groups, with the youngest group having a significantly lower difference between self-reported and measured weight ($p < .01$). There were no significant differences among age groups in the self-reported and measured BMI. When comparing mean self-reported and measured BMI, self-reported BMI was significantly different from the measured BMI within age groups ($p < .0001$ for each group). Effect sizes were not significant for weight or BMI. For BMI, the difference was small, within .04 and .32 BMI units among age groups.

**Correlational Analyses**

Results from the correlational analyses are presented in Tables 2 and 3. Measured and self-reported height was positively and strongly related ($r = .81, p < .001$), as were measured and self-reported weight ($r = .95, p < .001$). Age, self-reported and measured height, weight, and BMI were positively associated with SPA. After partialing out age, SPA was significantly correlated with self-reported and measured weight and BMI, but not with height. There were no differences in the correlations between measured and self-reported variables. Also, there were no significant differences between the correlations controlling for age and those without controlling for age.

**Discussion**

Our results showed the errors associated with self-reported height and weight among adolescent and young adult aesthetic sports athletes. Although self-reported and

| Table 1. Means and standard deviations for height, weight, body mass index, and social physique anxiety by age group |

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\leq 12$</th>
<th>13–15</th>
<th>16–18</th>
<th>$\geq 19$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (n = 36)</td>
<td>$SD$</td>
<td>$M$ (n = 97)</td>
<td>$SD$</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>158.22</td>
<td>5.26</td>
<td>161.07</td>
<td>6.76</td>
</tr>
<tr>
<td>Measured</td>
<td>156.31</td>
<td>10.09</td>
<td>160.92</td>
<td>6.83</td>
</tr>
<tr>
<td>Self-reported</td>
<td>1.91</td>
<td>7.62</td>
<td>0.15</td>
<td>4.66</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>54.43</td>
<td>13.61</td>
<td>59.12</td>
<td>13.72</td>
</tr>
<tr>
<td>SR</td>
<td>0.65</td>
<td>6.74</td>
<td>-0.53</td>
<td>4.15</td>
</tr>
<tr>
<td>Measured–SR</td>
<td>21.92</td>
<td>5.09</td>
<td>22.48</td>
<td>4.98</td>
</tr>
<tr>
<td>BMI</td>
<td>22.13</td>
<td>4.42</td>
<td>22.80</td>
<td>4.96</td>
</tr>
<tr>
<td>SPA</td>
<td>-0.21</td>
<td>3.50</td>
<td>-0.31</td>
<td>2.13</td>
</tr>
</tbody>
</table>

Note. $M =$ mean; $SD =$ standard deviation; $SR =$ self-reported; $BMI =$ body mass index.
measured correlations for height and weight were strong and significant, the majority of the participants over-reported their heights (51%) as expected, but fewer under-reported their weight (38%) than anticipated. A possible explanation for greater degree of accuracy associated with weight is the potential for frequent weighing through the presence of scales in locker rooms and sport weigh-ins, where fewer opportunities are available for height. This may contribute to more accuracy despite increased fluctuation of weight compared to height measures.

While height tends to be static for longer periods once adult height has been attained, growth and maturity might influence self-reporting by adolescents. This study included a wide range of ages to capture systematic variation of growth that may contribute to related inaccuracies of self-reporting height and weight. Our results indicated younger age groups reported shorter heights, suggesting they may not be aware of recently experienced growth. In contrast, the older groups reported taller heights, which could indicate a social desirability bias as American cultural ideals tend to value height (McGarry, 2005).

Although there were discrepancies between self-reported and measured weight and height, it is important to contextualize these in terms of normal daily fluctuations.

**Table 2. Pearson correlation coefficients among self-reported body mass index, measured body mass index, and social physique anxiety**

<table>
<thead>
<tr>
<th></th>
<th>Age (years)</th>
<th>Height</th>
<th>Weight</th>
<th>BMI</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Measured</td>
<td>Self-reported</td>
<td>Measured</td>
<td>Self-reported</td>
</tr>
<tr>
<td>Height</td>
<td>.30†</td>
<td>.81†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measured</td>
<td>.37†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td>.47†</td>
<td>.47†</td>
<td>.95†</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>.16*</td>
<td>.48‡</td>
<td>.46‡</td>
<td>.89‡</td>
</tr>
<tr>
<td>Measured</td>
<td>.47†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td>.18*</td>
<td>.46‡</td>
<td>.95†</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.06</td>
<td>.12</td>
<td>.19**</td>
<td>.87‡</td>
</tr>
<tr>
<td>Measured</td>
<td>.02</td>
<td>.14*</td>
<td>.03</td>
<td>.89‡</td>
</tr>
<tr>
<td>Self-reported</td>
<td>.35‡</td>
<td>.16*</td>
<td>.29‡</td>
<td>.89‡</td>
</tr>
<tr>
<td>SPA</td>
<td>.35‡</td>
<td>.16*</td>
<td>.18**</td>
<td>.29‡</td>
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<tr>
<td>Measured</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td>.29‡</td>
<td>.29‡</td>
<td>.29‡</td>
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</tr>
</tbody>
</table>

*Note. BMI = body mass index; SPA = social physique anxiety.

*p < .05.

**p < .01.

***p < .001.

†p < .0001.

**Table 3. Pearson correlation coefficients among self-reported body mass index, measured body mass index, and social physique anxiety controlling for age**

<table>
<thead>
<tr>
<th></th>
<th>Height</th>
<th>Weight</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Self-reported</td>
<td>Measured</td>
</tr>
<tr>
<td>Height</td>
<td>.79***</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>.41***</td>
<td>.44***</td>
<td>.95***</td>
</tr>
<tr>
<td>Measured</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.11</td>
<td>.19**</td>
<td>.93***</td>
</tr>
<tr>
<td>Measured</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA</td>
<td>.14*</td>
<td>.02</td>
<td>.85***</td>
</tr>
<tr>
<td>Measured</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Self-reported</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPA</td>
<td>.06</td>
<td>.05</td>
<td>.25***</td>
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<tr>
<td>Measured</td>
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<tr>
<td>Self-reported</td>
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</tr>
</tbody>
</table>

*Note. BMI = body mass index; SPA = social physique anxiety.

*p < .05.

**p < .01.

***p < .001.
(Bosingham et al., 2005). Participants may not be aware of recent growth; in a 4-month period, Caino et al. (2006) found the average growth of 10 adolescent girls 10–14 years of age was 3.19 cm. As participants will almost never be completely accurate to the kg or cm, especially given the common weight fluctuations over a day, week, or other short period since last measured, researchers intent on using adolescent females as participants should recognize possible biases associated with the timing of peak height velocity and participants’ hopes of being taller.

Additionally, as girls progress through puberty, they grow less like the cultural ideal, gaining more body fat (Faust, 1983; Rierdan & Koff, 1997). Field et al. (2001) found parental influence were associated with increased weight concerns in young girls, adding to the desire to be thin. Social desirability is higher in younger girls, confounding the relationship between BMI and weight concerns (Klesges et al., 2004). This may explain the greater variation in height reporting in the youngest age group (SD = 10.09). While there was some variation in the degree of over- and underestimating in this sample, once converted into BMI, the magnitude of the difference between self-reported and measured within age groups was between .04 and .32 BMI units, suggesting that the difference is not clinically meaningful.

Examining the degree and direction of over- and underestimating questions the likelihood of the differences statistically canceling each other out. While under- or overestimating was not related to SPA, older groups tended to report more SPA compared to younger groups. Researchers planning to include a range of adolescents in psychosocial research should control for age in addition to physical variables.

The results found in this study are similar to those from other research on adolescent and adult females where there was a pattern of overreporting height and underreporting weight (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Spencer, Appleby, Davey, & Key, 2002; Tsigilis, 2006). Wada et al. (2005) and Brunner Huber (2007) found significant differences between self-reported and measured BMI; however, there were mixed results regarding variation by age in both samples of adult women.

One of our goals was to examine differences in the relationship of SPA when using self-reported versus objectively measured BMI as a control for physical size. To illustrate this, we ran several correlations comparing self-reported and measured BMI. Results indicated no differences in the correlations for measured and self-reported BMI scores. No statistically significant results were found after controlling for age.

Although these findings need replication in other sports and nonathletic contexts, the lack of differences between self-reported BMI and measured BMI when examining over- and underestimating, as well as in associations with SPA, supports the validity and reliability of self-reported BMI in studies with a similar sample. Self-reported height and weight may be sufficient proxies for physical size and can save time, logistics, costs, and personnel required to measure these variables among adolescent aesthetic sport athletes.

Our findings must be taken in the context of two main study limitations. First, participants were not asked when they were last weighed or measured. Therefore, we were unable to analyze accuracy while controlling for recent measurements. While measuring one’s own height is not common, self-reporting is. Participants who had recently weighed themselves may have been more accurate in reporting their weights, thus potentially biasing the results. Second, while self-reports of height and weight in this sample are valid, the findings are cross-sectional and require replication in relation to growth and maturation reflected by peak growth velocities and pubertal timing. Future investigations should consider the differences associated with peak height and weight velocities, distance from those time frames, as well as maturational timing, to more accurately explore the validity and reliability of self-reporting in both aesthetic and nonaesthetic contexts.

References


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