Prospective relations among internalization of beauty ideals, body image concerns, and body change behaviors: Considering thinness and muscularity

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A B S T R A C T

Common models propose that the internalization of societal beauty ideals influences disordered eating behaviors and muscularity-oriented behaviors via body image concerns. However, previous studies addressing these pathways have been mainly cross-sectional and primarily included female samples. We investigated these pathways prospectively in male and female adolescents and young adults, examining two pathways: a ‘weight/shape pathway,’ linking thin-ideal internalization, weight/shape concern, and restrained eating, and a ‘muscularity pathway,’ linking athletic-ideal internalization, muscularity concern, and muscularity-oriented behavior. Across three time points, 973 participants from the German general population were assessed. Although the hypothesized pathways could not be supported in their complete temporal sequence, several hypothesized pathways occurred across two time points. Among others, weight/shape concern predicted restrained eating and the athletic ideal played a prominent role in the prediction of muscularity-oriented behavior in both genders.

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1. Introduction

Adolescence is a critical developmental period characterized by physical changes, identity development, and changes in social relationships, which can encourage body image concerns (Markey, 2010; Voelker, Reel, & Greenleaf, 2015). Body image concerns comprise negative affect and cognitions regarding an individual’s own body; they are already prevalent in adolescent boys and girls and can even increase during the transition to young adulthood (Buchianieri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Ricciardelli, 2012; Wertheim & Paxton, 2012).

Anchored in the eating disorder research, for a long time most studies have examined weight- and shape-related body dissatisfaction by focusing on thinness in female adolescent samples (Thompson, Heinberg, Altbe, & Tantleff-Dunn, 1999). However, male body image issues have begun to attract more attention over the last two decades (Bassett-Gunter, McEwan, & Kamarie, 2017; Murray et al., 2017; Pope, Phillips, & Olivardia, 2000). As the ideal male body is characterized by lean muscularity, concerns generally relate to being too fat or not muscular enough (Ricciardelli & McCabe, 2001). Besides slenderness, muscle tone is currently also a focus for women (Gruber, 2007; Wertheim & Paxton, 2012), resulting in concerns about weight, shape, and muscularity (Girard, Rodgers, & Chabrol, 2018; Kelley, Neufeld, & Musher-Eizenman, 2010). However, it is not the mere existence of socially prescribed body image ideals that promotes body dissatisfaction. It is rather the internalization of societal beauty ideals – taking in these ideals and desiring to approximate one’s own appearance as closely as possible to them – that is considered to be one of the most prominent risk factors for body image problems and disordered eating (Cafri et al., 2005; Stice & Whitenton, 2002; Thompson & Stice, 2001).

In order to explain the emergence of disordered eating behaviors, the tripartite influence model of body image and eating disturbances (Thompson et al., 1999) proposes that internalization of societal values predicts body dissatisfaction, which in turn leads to restrictive eating. So far, the relationship between internalization of the thin ideal, body dissatisfaction and restrained eating has been evaluated mainly among female adolescents and young adults. There is consistent evidence from cross-sectional studies supporting these hypothesized relationships among female adolescents and young adults (Keery, van den Berg, & Thompson, 2004; Lovering, Rodgers, Edwards George, & Franko, 2018; Rodgers, Paxton, & Chabrol, 2009; Rodgers, Chabrol, & Paxton, 2011; Shroff & Thompson, 2006; Yamamiya, Shroff, & Thompson, 2008). Moreover, Rodgers et al. (2009) have reported a comparable pattern among young adult males.
However, cross-sectional studies do not allow researchers to draw conclusions about the hypothesized temporal sequence of these three factors. So far, prospective studies have only focused on individual model components. The temporal association in which body dissatisfaction or weight/shape concern precedes restrained eating is well established in female adolescents and adults (Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004; Stice, 2002; Stice & Shaw, 2002) and is assumed in male adolescents as well (Allen, Byrne, & McLean, 2012). In addition, there is prospective evidence that internalization of the thin ideal predicts body dissatisfaction (Amaral & Ferreira, 2017; Jones, 2004; Rodgers, McLean, & Paxton, 2015; Stice & Shaw, 2002; Stice & Whitenton, 2002) and lower body esteem (Clark & Tiggesmern, 2008), over the course of 8–12 months among female adolescents. Comparably, Jones (2004) reported that an increase in body dissatisfaction was influenced by the internalization of muscular ideals in adolescent boys over the span of one year.

More recently, the initial tripartite model was modified to take muscularity-related aspects into account in male samples. Tylka (2011) developed a dual pathway model, postulating that internalization of the mesomorphic (lean and muscular) ideal predicts (a) body fat dissatisfaction, which promotes disordered eating behaviors (referred to as ‘weight/shape pathway’ hereafter), and (b) muscularity dissatisfaction, which promotes muscularity enhancement behaviors (referred to as ‘muscularity pathway’ hereafter). In a cross-sectional examination of undergraduate men, internalization predicted dissatisfaction with muscularity, which in turn predicted muscularity enhancement behaviors (Tylka, 2011). The muscularity pathway was supported in other cross-sectional studies including male students (Rodgers, Ganchou, Franko, & Chabrol, 2012) and adolescents (Karazsia & Crowther, 2009, 2010). Moreover, Tylka (2011) observed a direct path from internalization to muscularity enhancement behavior, which was also supported among another sample of male college students (Girard, Chabrol, & Rodgers, 2018). Furthermore, the weight/shape pathway retained from the tripartite model could also be observed in the male samples (Girard, Chabrol et al., 2018; Tylka, 2011).

As this dual pathway model was developed to explain men’s body image concerns and behaviors, very few studies have examined the muscularity pathway in women. In a cross-sectional study of adult women, internalization of the athletic ideal did not predict dissatisfaction (regarding weight, shape, muscularity, or specific body parts), but was directly associated with dieting, bulimic symptoms, and compulsive exercise (Bell, Donovan, & Ramme, 2016). These authors also found that in a prospective study of female students, internalization of both the athletic ideal and the thin ideal predicted compulsive exercise seven months later, whereas body dissatisfaction and dieting were predicted by internalization of the thin ideal only (Homan, 2010).

In sum, the cross-sectional and prospective evidence reviewed so far suggests that, in line with the tripartite model, internalization of the thin ideal predicts weight/shape concern, which in turn promotes disturbed eating behaviors such as restrained eating in both male and female adolescents and young adults. In addition, there is initial support for the hypothesis that internalization of the athletic ideal predicts muscularity concern, which increases muscularity-oriented behaviors in male adolescents. Moreover, the few available studies in female populations allow the initial conclusion that internalization of the athletic ideal might affect muscularity-oriented behaviors directly, without being mediated by muscularity concern. This direct pathway seems to occur additionally in men.

However, several shortcomings in the previous research should be mentioned. First, prospective data are rare and often focused on female samples. Second, existing prospective studies do not permit an exact temporal examination of internalization, body image concerns, and related behaviors. Third, most prospective studies encompass two time points only, limiting the examination of intermediary pathways. Fourth, research that integrates the muscularity pathway is sparse, focuses on male samples only and is, with one exception (Homan, 2010), cross-sectional. Fifth, although internalization of the thin ideal and the muscular ideal has proven to be two distinct variables (Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004; Uhlmann, Donovan, Zimmer-Gembeck, Bell, & Ramme, 2018), those have often been analyzed as one combined variable in previous research.

The present study aimed to fill these research gaps by simultaneously analyzing the weight/shape pathway and the muscularity pathway in male and female adolescents and young adults. Second, the prospective analysis included three points of measurement and the application of path analysis to address the question of temporal sequences. Third, similar to the differentiation into weight/shape vs. muscularity concern and restrained eating vs. muscularity-oriented behaviors, internalization was analyzed using two distinct variables (thin ideal vs. athletic ideal).

Based on the studies outlined above, it was hypothesized that internalization of the thin ideal would promote weight/shape concern, which in turn would increase restrained eating in both genders. Internalization of the athletic ideal was hypothesized to increase muscularity concern, which in turn would increase muscularity-oriented behaviors in male participants. In female participants, athletic-ideal internalization was thought to influence muscularity-oriented behaviors directly, a pathway that was additionally expected in male participants. To the best of our knowledge, no study has investigated athletic-ideal internalization and muscularity concern as distinct aspects of body dissatisfaction in female adolescents. Therefore, no prediction was made as this relationship was exploratory. The postulated model is displayed in Fig. 1.

![Fig. 1](https://example.com/fig1.png)

**Fig. 1.** Hypothesized prospective model for male and female adolescents and young adults. Variables at T2 and T3 are controlled for their manifestation at the prior point of measurement, with the exception of muscularity-oriented behavior. Dashed lines are only hypothesized for male participants.

2. Method

2.1. Procedure

Participants were recruited from the PIER study, a large population-based prospective study that was conducted in different districts in the state of Brandenburg, Germany. The survey aimed to include a broad age range as well as comparable numbers of boys and girls. Data from three assessments (T1: 2011–2012, T2: 2013–2014, T3: 2016) were analyzed in the current study. Inclusion criteria were participation at T1 and age between 12 and 16 years at T1.

Participants provided informed assent, and written informed consent was obtained by legal guardians for minors at each wave. At T1 and T2, the assessment took place at school, at home, or on the university campus in a session of approximately 90–120 min for the complete survey; trained research assistants interviewed...
the participants privately. The instructions were read out loud and questions were explained, if necessary, but participants completed the questionnaires by themselves. Questionnaires were presented on the computer screen or as a paper-and-pencil version. At T3, the assessment procedure had to be adapted for organizational reasons. The assessment no longer took place in the presence of research assistants. Participants completed the questionnaires on their own and could choose between a paper-and-pencil or an online version. It took the participants approximately 60 min to complete the questionnaire. They were reimbursed with cinema vouchers or vouchers for different online shops (worth 10 €) after each session. The study was approved by the Ethics Committee of the University of Potsdam, Germany and the Ministry of Education, Youth and Sports of the Federal State of Brandenburg, Germany.

2.2. Participants

At T1, 973 adolescents (50.6% female) aged 12–16 years took part in the study. At T2, 702 participants were reassessed, and at T3, 422 participants were reassessed. Whereas 385 participants provided data at each assessment, 317 took part at T1 and T2, 37 at T1 and T3, and 234 at T1 only. The attrition rate was 27.8% between T1 and T2, and 45.16% between T2 and T3. This relatively high attrition rate might have resulted from the different assessment procedure at T3. Moreover, 3.80% of the initial sample who did not take part in T2 agreed to take part again in T3. T1 and T2 were separated by an interval of approximately 20 months (M = 19.62, SD = 4.00), whereas T3 took place approximately 30 months after T2 (M = 29.56, SD = 3.34).

Systematic comparisons between participants and non-participants revealed the following: Non-participants at T2 were older, t(971) = 6.08, p < .001, d = 0.44, showed more pronounced weight/shape concern, t(426.93) = 2.77, p = .006, d = 0.21, and more pronounced restrained eating, t(381.81) = 3.05, p = .002, d = 0.25, than participants. There were no differences regarding gender, χ²(1) = 0.33, p = .564, BMI standard deviation scores (BMI-SDS), t(939) = 1.04, p = .298, internalization of the thin ideal, t(440.74) = 1.88, p = .061, internalization of the muscular ideal, t(453.96) = 1.72, p = .085, or muscularity concern, t(439.55) = 1.57, p = .118. Those who participated at T2 but not at T3 were older, t(886) = 1.99, p = .047, d = 0.15, showed higher BMI-SDS, t(640) = 3.53, p < .001, d = 0.28, more pronounced weight/shape concern, t(612.44) = 2.06, p = .040, d = 0.16, and muscularity concern, t(621.37) = 0.08, p = .92, d = 0.24, than those who participated in both assessments. There were no differences in terms of gender, χ²(1) = 0.27, p = .601, internalization of the thin ideal, t(625.49) = 1.81, p = .070, internalization of the muscular ideal, t(661.75) = 1.33, p = .183, or restrained eating, t(700) = 1.16, p = .247.

2.3. Materials

2.3.1. Internalization of societal beauty ideals

Internalization of the thin ideal was assessed with six items (e.g., “I would like my body to look like the models who appear in magazines”) from the Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3; Thompson et al., 2004; see also Sehm & Warschburger, 2018), covering the thin ideal represented by TV and movie stars and fashion models. Internalization of the athletic ideal was assessed with four items (e.g., “I wish I looked as athletic as the people in magazines”) from the same questionnaire, covering ideals represented by sports stars and athletic figures. Participants indicated their agreement along a 5-point scale from definitely disagree (1) to definitely agree (5). Internal consistencies were αT1 = .85, αT2 = .89, αT3 = .92, .92 for thin-ideal internalization and αT1 = .87, .84, αT2 = .89, .85, αT3 = .88, .87 for athletic-ideal internalization in male and female participants, respectively.

2.3.2. Weight and shape concern

To address concern about weight and shape, we used the child and adult versions of the Eating Disorder Examination (EDE-Q; Fairburn & Beglin, 1994; Hilbert, Hartmann, & Czaja, 2008; Hilbert, Tuschen-Caffier, Krawautz, Niederhofer, & Munsch, 2007; TODAY Study Group, 2007). Whereas only the child version was presented to all participants at T1 and T2, the adult version was presented to participants who were 17 years or older at T3 to consider the higher age of the sample. The equivalence of the content was emphasized, and the items differed in phrasing only. The two subscales of weight concern and shape concern were combined, as recommended by Hilbert et al. (2008). The resulting 12 items were answered on a 7-point scale ranging from no days/not at all (0) to every day/markedly (6) and focused on dissatisfaction about weight and shape during the previous four weeks (e.g., “How dissatisfied have you been with your weight?”). Internal consistencies (α) ranged between .80 and .93 in the German validation studies for the child and adult versions (Hilbert et al., 2007, 2008). Internal consistencies were αT1 = .89, .94, αT2 = .88, .95, αT3 = .90, .94 in the present study for male and female participants, respectively.

2.3.3. Muscularity concern

To assess concern about muscularity, such as the desire for a more muscular body or being dissatisfied with the muscularity of different body parts, six items (e.g., “I wish I were more muscular”) from the attitudes subscale of the Drive for Muscularity Scale (DMS) were used (McCreary & Sasse, 2000; Mohlke & Warschburger, 2011). Because the item regarding muscularity of the chest caused irritation in girls during pilot assessments, it was removed from our survey. Following the study by Mohlke and Warschburger (2011), items were answered on a 6-point scale ranging from never (1) to always (6). The ascending response format was used in accordance with the other questionnaires applied in the survey. Internal consistencies were α = .92 for boys and α = .88 for girls in a previous study involving adolescents (Mohlke & Warschburger, 2011). In the present study, internal consistencies were αT1 = .92, .89, αT2 = .92, .88, αT3 = .91, .90 for male and female participants, respectively.

2.3.4. Restricted eating

The restraint subscale of the ChEDE-Q (Fairburn & Beglin, 1994; Hilbert et al., 2007, 2008; TODAY Study Group, 2007) was used to assess fasting (e.g., “Have you gone for long periods of time without eating anything at all in order to influence your shape or weight?”) and adherence to diet rules during the previous four weeks on a 7-point scale ranging from no days (0) to every day (6). Internal consistency was α = .78 in the German adolescent validation sample and α = .83 in the adult sample (Hilbert et al., 2007, 2008). In the present study, internal consistencies were αT1 = .72, .85, αT2 = .76, .86, αT3 = .70, .83 for male and female participants, respectively.

2.3.5. Muscularity-oriented behavior

Seven items from the behavioral subscale of the DMS (McCreary & Sasse, 2000; Waldorf, Cordes, Vocks, & McCreary, 2014) were applied to assess muscularity-oriented behavior. This subscale was only assessed at the last wave (T3). For example, participants were asked to indicate whether and how often they lifted weights or consumed energy supplements (e.g., “I use protein or energy supplements”) on a 6-point scale ranging from never (1) to always (6). As the sample was drawn from the normal population, one item on anabolic steroids was not included, in line with previous recommendations (McCreary, Sasse, Saucier, & Dorsch, 2004). In previous studies, the full subscale has yielded internal consistencies of around α = .80 in adult men (McCreary et al., 2004; Waldorf et al.,
Table 1
Descriptive statistics at Time 1 (T1), Time 2 (T2), and Time 3 (T3) for male and female participants.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td><strong>T1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>14.09 (1.37)</td>
<td>15.60 (1.39)</td>
</tr>
<tr>
<td>Thin-ideal internalization</td>
<td>1.46 (0.65)</td>
<td>1.42 (0.69)</td>
</tr>
<tr>
<td>Athletic-ideal internalization</td>
<td>2.18 (1.09)</td>
<td>2.07 (1.10)</td>
</tr>
<tr>
<td>Weight/shape concern</td>
<td>0.61 (0.86)</td>
<td>0.55 (0.77)</td>
</tr>
<tr>
<td>Muscularity concern</td>
<td>2.76 (1.25)</td>
<td>2.58 (1.17)</td>
</tr>
<tr>
<td>Restrained eating</td>
<td>1.26 (0.61)</td>
<td>1.28 (0.70)</td>
</tr>
<tr>
<td>Muscularity-oriented behavior</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>T2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight status</td>
<td>12.0%</td>
<td>14.2%</td>
</tr>
<tr>
<td>normal</td>
<td>77.8%</td>
<td>77.0%</td>
</tr>
<tr>
<td>overweight</td>
<td>10.3%</td>
<td>8.9%</td>
</tr>
<tr>
<td><strong>T3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18.05 (1.51)</td>
<td>15.76 (1.35)</td>
</tr>
<tr>
<td>Female</td>
<td>14.20 (1.33)</td>
<td>18.21 (1.37)</td>
</tr>
</tbody>
</table>

*Note. Gender differences in mean values at the different time points are indicated by different superscripts.*

2014). In the present study, the internal consistency was $\alpha_{T3} = .79$, .68 for male and female participants, respectively.

2.3.6. Weight status
At each measurement point, self-reports on weight and height were assessed. BMI-SDS was computed based on German reference data. BMI-SDS controls for age and gender in order to provide a more reliable measure of weight status in children and adolescents (Kromeyer-Hauschild et al., 2001; Kromeyer-Hauschild, Moss, & Wabitsch, 2015). Although height and weight measures were taken objectively as well, we decided to rely on self-report only, because measured weight status could only be assessed in a few cases at T3 and the assessment method should be kept consistent across the measurement points. Self-reported weight status showed high correlations with measured weight status ($r_{T1} = .88, r_{T2} = .86, r_{T3} = .94$) in the sample, supporting the validity of the self-reported values.

2.4. Statistical analysis
Basic analyses (descriptive analyses, drop-out analyses) were performed using SPSS 25. Path analysis was applied to test the theoretical model. Using Mplus 7 (Muthén & Muthén, 1998–2012), internalization of the thin ideal, internalization of the athletic ideal, weight/shape concern, muscularity concern and restrained eating at T1, T2, and T3 were included as exogenous and endogenous variables in the model. Moreover, the mean value for muscularity-oriented behavior, which was assessed only at the last measurement point, was also included. Data were analyzed for each gender separately and all variables were controlled for age and weight status at each measurement point. Model fit was evaluated by the following criteria for fit indices: Comparative Fit Index (CFI) $\geq 0.95$, Tucker Lewis Index (TLI) $\geq 0.95$, Root Mean Square Error of Approximation (RMSEA) $\leq 0.08$, and Standardized Root Mean Square Residual (SRMR) $\leq 0.10$ represented good fit (Schermelleh-Engel, Moosbrugger, & Müller, 2003). To account for missing data on single variables as well as drop-outs across the measurement points, full information maximum likelihood (FIML) estimation was used. FIML is a model-based technique that includes information from the observed data to estimate missing values and thereby overcomes the disadvantages of traditional techniques, such as listwise deletion (Enders & Bandalos, 2001).

3. Results
3.1. Descriptive analyses
Descriptive analyses are presented in Table 1. Results from the multivariate analyses of variance for the three measurement points indicated that female participants reported more pronounced internalization of the thin ideal, weight/shape concern, and restrained eating than male participants across all measurement points. Male participants reported more pronounced muscularity concern (T1, T2, T3), athletic ideal internalization (T1), and muscularity-oriented behavior (T3) than female participants. Correlations among the studied variables are displayed in Table 2.

3.2. Prospective relationships in male adolescents and young adults
The hypothesized model showed an acceptable fit to the data (RMSEA = .050, CFI = .955, TLI = .931, SRMR = .088). Modification indices indicated that additional pathways would further improve model fit. Therefore, the pathway from internalization of the athletic ideal (T1) to internalization of the thin ideal (T2) and the pathway from restrained eating (T2) to internalization of the thin ideal (T3) were added. Adding these pathways, the model fit improved significantly, $\Delta \chi^2(2) = 26.40$, $p < .001$. The modified model showed a good fit to the data (RMSEA = .047, CFI = .962, TLI = .940, SRMR = .078). Results are displayed in Fig. 2. All autoregressive pathways reached statistical significance (all $ps < .001$, except restrained eating T2-T3, $p < .01$). Contrary to our hypotheses,
internalization of the thin ideal did not predict weight/shape concern (β_{T1T2} = 0.0, p = .968; β_{T2T3} = −.1, p = .859), and muscularity concern did not predict muscularity-oriented behavior (β_{T2T3} = .01, p = .765). According to our hypotheses, internalization of the athletic ideal predicted muscularity concern between T1 and T2 (β_{T1T2} = .17, p = .001) and there was a trend between T2 and T3 (β_{T2T3} = .14, p = .055). Weight/shape concern predicted restrained eating, but only between T1 and T2 (β_{T1T2} = .20, p < .001) and not between T2 and T3 (β_{T2T3} = .12, p = .112). Moreover, internalization of the athletic ideal at T2 predicted muscularity-oriented behavior at T3 (β_{T2T3} = .24, p < .001). In addition, internalization of the athletic ideal at T1 predicted internalization of the thin ideal at T2 (β_{T1T2} = .14, p < .001), and restrained eating at T2 predicted internalization of the thin ideal at T3 (β_{T2T3} = .22, p < .001). Neither the trajectory from internalization of the thin ideal to weight/shape concern to restrained eating nor the trajectory from internalization of the athletic ideal to muscularity concern to muscularity-oriented behavior was supported in our model. Variability in all endogenous variables could be significantly explained (p < .05), with explained variances ranging between 10% and 39%.

### 3.3. Prospective relationships in female adolescents and young adults

The hypothesized model showed a good fit to the data (RMSEA = .041, CFI = .975, TLI = .962, SRMR = .067), and modification indices did not suggest additional pathways. Results are displayed in Fig. 3. All autoregressive pathways reached statistical significance (all ps < .001). In line with our hypotheses, internalization of the thin ideal predicted weight/shape concern, but only between T2 and T3 (β_{T2T3} = .23, p = .006) and not between T1 and T2 (β_{T1T2} = .05, p = .161). Weight/shape concern predicted restrained eating (β_{T1T2} = .37, p < .001; β_{T2T3} = .23, p = .006). Additionally, internalization of the athletic ideal predicted muscularity concern (β_{T1T2} = .20, p < .001; β_{T2T3} = .13, p = .032), and internalization of the athletic ideal at T2 predicted muscularity-oriented behavior at T3 (β_{T2T3} = .18, p = .005). Overall, the hypothesized trajectory from internalization of the thin ideal to weight/shape concern to restrained eating was not supported by the data. With the exception of muscularity-oriented behavior, variability in the endogenous variables could be significantly explained (p < .001), with explained variances ranging between 18% and 45%.

### 4. Discussion

The emergence of potentially health-damaging behaviors triggered by the internalization of beauty ideals and body image concerns is frequently discussed in body image research, but rarely addressed prospectively. Therefore, the aim of the present study was to examine their prospective associations across three time points in male and female adolescents and young adults. The final
models showed a good fit to the data in both genders and explained significant proportions of variance in the outcome variables.

4.1. Associations among male adolescents and young adults

In male participants, all autoregressive pathways reached significance between T1 and T2 and between T2 and T3. Expanding on existing evidence from cross-sectional studies (Karazsia & Crowther, 2009, 2010; Rodgers et al., 2012; Tylka, 2011), we revealed that internalization of the athletic ideal preceded muscularity concern. Whereas this influence reached statistical significance between T1 and T2, there was only a trend between T2 and T3. This might be due to the fact that the time lag between T2 and T3 was greater (30 months) than that between T1 and T2 (20 months).

In contrast to several cross-sectional studies (Girard, Chabrol et al., 2018; Rodgers et al., 2009; Tylka, 2011) and one prospective study (Jones, 2004), internalization of the thin ideal did not predict weight/shape concern in male participants in our study. There are several possible explanations for this difference. With one exception (Girard, Chabrol et al., 2018), previous studies did not explicitly address the specific influences of both thin-ideal internalization and athletic-ideal internalization. These constructs were instead analyzed as a combined thin/athletic-ideal internalization (e.g., Tylka, 2011) or integrated along with appearance comparison into one variable (e.g., Rodgers et al., 2009). Moreover, the previous cross-sectional studies only addressed university students and therefore encompassed a higher age range (18 years and older) compared to our study (12–21 years). It is possible that the prospective relationships between internalization of the thin ideal and weight/shape concern are different across the age range. In addition, pathway coefficients should be interpreted in light of the temporal stability of the outcome variable, as well as the correlation between outcome variables and additional predictors (Adachi & Willoughby, 2015). Taking these correlations and autoregressive pathways into account, the variance of the outcome variable is adjusted for the variance shared with the previous manifestation and with the other predictor. As weight/shape concern was highly stable and showed a moderate correlation with thin-ideal internalization, the effects of thin-ideal internalization were considerably reduced in our model.

In line with previous cross-sectional (Tylka, 2011) and prospective results (Allen et al., 2012), weight/shape concern at T1 predicted restrained eating in male adolescents 20 months later. However, weight/shape concern at T2 did not predict restrained eating another 30 months later. This might be due to the longer time lag or indicate differential age effects. As the age groups largely overlapped across the time points in our study, we can only speculate that weight/shape concern had a stronger influence in the younger participants compared to the older ones without defining a critical age range. Future studies are warranted in order to analyze the relationship between weight/shape concern and restrained eating in different age groups prospectively.

Contrary to previous research (Karazsia & Crowther, 2010; Tylka, 2011), muscularity-oriented behavior was not predicted by muscularity concern, a finding that was also reported in adult males in a cross-sectional study (Stratton, Donovan, Bramwell, & Loxton, 2015). However, we observed a prospective pathway from internalization of the athletic ideal (T2) to muscularity-oriented behavior (T3). This finding is in line with previous research (Girard, Chabrol et al., 2018; Tylka, 2011), reporting a direct influence between internalization of the muscular/athletic ideal and muscularity enhancement behaviors.

In sum, our prospective data did not support the progression from thin-ideal internalization to restrained eating via weight/shape concern as proposed by Thompson et al. (1999) and Tylka (2011) in male adolescents and young adults across three measurement points. However, weight/shape concern influenced restrained eating, even when controlling for its stability over 20 months. This underlines the relevance of weight/shape concern in the development of eating disturbances in male adolescents. Interestingly, thin-ideal internalization (T3) was influenced by restrained eating 30 months earlier. Contrary to the hypothesized pathways, we observed that more pronounced weight/shape concern was associated with more pronounced restrained eating, which in turn promoted more pronounced thin-ideal internalization. Further studies are necessary to examine this potentially vicious cycle regarding weight/shape concern, restrained eating, and thin-ideal internalization in male adolescents and young adults. With respect to the muscularity pathway, we observed that internalization of the athletic ideal predicted muscularity concern even when controlling for its previous levels. The relevance of the internalization of the athletic ideal was further underlined by its direct effect on muscularity-oriented behavior. These results suggest that high levels of athletic-ideal internalization are sufficient to promote muscularity-oriented behavior without a progression via muscularity concern. The orientation towards socially desirable athletic bodies might become a guiding principle (Thompson et al., 2004) and therefore foster concordant behaviors. Moreover, internalization of the athletic ideal also predicted internalization of the thin ideal and therefore might even link the muscularity and weight/shape pathways.

4.2. Associations among female adolescents and young adults

In female participants, all autoregressive pathways reached significance between T1 and T2, as well as between T2 and T3. In line with evidence from cross-sectional (e.g., Keery et al., 2004) and prospective studies (Clark & Tiggesmann, 2008; Jones, 2004; Rodgers et al., 2015), internalization of the thin ideal predicted weight/shape concern. It is worth mentioning that this was only the case between T2 and T3 and with a comparably low regression coefficient ($\beta = .10, p < .05$). Similar to the male sample, weight/shape concern showed the highest stabilities in the model for female participants. Therefore, the effects of thin-ideal internalization were considerably reduced by this high stability and the high correlation between thin-ideal internalization and weight/shape concern. Of note, because girls and boys develop body dissatisfaction at a young age, perhaps internalization predicts weight/shape dissatisfaction earlier in development rather than in adolescence. Boys as young as six report muscularity- and thinness-oriented body dissatisfaction (McLean, Wertheim, & Paxton, 2018). Among girls and boys, internalization at age 6 was found to predict greater body dissatisfaction at age 7 (Nichols, Damiano, Gregg, Wertheim, & Paxton, 2018).

Weight/shape concern predicted restrained eating across all points of measurement, supporting previous cross-sectional (e.g., Rogers et al., 2011) and prospective findings (Blodgett & Salafia & Gondoli, 2011; Dakanalis & al., 2014). Although most of the hypothesized relationships within the weight/shape pathway were found in female adolescents and young adults, its complex temporal sequence could not be supported across the three measurement points.

With respect to the muscularity pathway, our study was the first to report prospective influences from the internalization of the athletic ideal on muscularity concern in female adolescents and young adults. The important role of the internalization of the athletic ideal was underlined by its direct impact on muscularity-oriented behaviors. Based on previous findings addressing compulsive exercise (Bell et al., 2016; Homan, 2010), the influence via muscularity concern on muscularity-oriented behavior was not included in our model and not proposed by the modification indices.
Our results suggest that, comparable to male adolescents and young adults, athletic-ideal internalization precedes muscularity-oriented behavior. However, this finding has to be interpreted with caution, as the variance explained was low (3%) and muscularity-oriented behavior was not controlled for its stability.

4.3. Strengths, limitations and future research directions

One major strength of our study is the prospective design involving three points of measurement. Moreover, incorporating autoregressive pathways within the path analysis allowed us to control for the stability of the variables. This procedure is referred to as the ‘gold standard’ in longitudinal research (Adachi & Willoughby, 2015). In addition, thin-ideal internalization and athletic-ideal internalization were analyzed as distinct variables, allowing us to determine their individual impact on both weight/shape concern and muscularity concern. Furthermore, our study is one of the few that addresses body image in both male and female adolescents and young adults.

Nevertheless, our results should be discussed in the context of this study’s limitations. First, the attrition rates between the different points of measurement were high, and analyses revealed systematic drop-out. Although FiML was used to account for missing data which allowed us to refer to the whole original sample, and although effect sizes for the differences between participants and non-participants were mostly low, future studies should put special effort into motivating older and strained participants to complete further surveys. Second, the measures applied might not depict all the relevant aspects in the context of body image. For example, the SATAQ-3 refers to the athletic ideal, which is similar, but not equivalent to, the muscular ideal. Among others, athleticism might be understood as sports competence, an aspect that does not necessarily have to be related to muscularity. With the revised SATAQ-4R, there is a reliable and valid instrument to assess internalization of the muscular ideal (Schaefler, Harrirger, Heinberg, Soderberg, & Thompson, 2017). Moreover, future studies should include gender-sensitive measures to take the qualitative differences in body image concerns into account (e.g., Female Muscularity Scale; Rodgers et al., 2018). Third, although the sample size was sufficient for the conducted analyses, a larger sample would have been necessary for latent modeling, accounting for measurement errors. Moreover, the sample size was too small for analyses of the differential effects of age, weight status, or further confounding variables. Fourth, as the questionnaire on muscularity-oriented behaviors was included only at the third measurement point, we could not control for the temporal stability of this variable. Therefore, the prospective effect of internalization of the athletic ideal (T2) on muscularity-oriented behavior (T3) might be overestimated in our study. Additionally, the internal consistency of the behavioral subscale was comparably low in the female sample.

4.4. Conclusion

In sum, our study expands upon previous research examining the dynamic relationships between internalization, body image concerns, and related behaviors in male and female adolescents and young adults considering both weight/shape and muscularity in both genders. Overall, there were only slight differences in the models between genders, suggesting comparable prospective relationships in the context of body image concerns. In particular, with regard to the muscularity pathway, male and female adolescents and young adults exhibited similar patterns. Regarding the weight/shape pathway, there were clearer connections in female compared to male participants. Genders largely differed in the mean levels of the studied variables, indicating a greater relevance of weight and shape for female and muscularity for male adolescents and young adults, according to the literature. As pathways might be influenced by these manifestations, investigating the relationships in male and female adolescents with comparable levels would be promising for future research. Although the complete weight/shape pathway and muscularity pathway proposed by Thompson et al. (1999) and Tykkylä (2011) could not be observed in the temporal sequence across the three time points, several relationships were supported prospectively. In particular, weight/shape concern proved to be a predictor of restrained eating in both male and female adolescents and young adults, underscoring its relevance as a predictor for disturbed eating behaviors and a central starting point for prevention programs. Furthermore, internalization of the athletic ideal was found to directly predict muscularity-oriented behavior in both genders and should therefore be targeted in prevention programs to reduce the development of potentially health-damaging behaviors.

Declarations of interest

None.

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