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A Prospective Investigation of Interpersonal Influences on the Pursuit of Muscularity in Late Adolescent Boys and Girls

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Abstract

This project examined whether interpersonal pressure to be muscular predicted late adolescents' pursuit of muscularity. Participants were 199 adolescents (16–19 years), mothers (n=175), and friends (n=159), assessed at two annual times. Pressure to be muscular was assessed with adolescents', mothers', and friends' reports of their relationships. Adolescents reported pressure from fathers and romantic partners, appearance satisfaction, disordered eating, and pursuit of muscularity. Adolescents,' mothers', and friends' reports of pressure related to pursuit of muscularity at both times. Adolescents' perceptions and mothers' reports prospectively predicted pursuit of muscularity. Findings highlight the relevance of relationships to pursuit of muscularity in late adolescents.

Keywords

Adolescence; Exercise; Eating Behaviour; Family; Males

The impact of sociocultural pressure to be thin on girls' and women's body image dissatisfaction and disordered eating is well documented (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). In the last decade, growing attention has been paid to what may be parallel sociocultural pressure to be muscular among adolescent boys (Thompson & Cafri, 2007). The ideal masculine body has been described as an Adonis, V-shape physique characterized by a muscular and lean build (Pope et al. 2000), which has become progressively more muscular over the last several decades (Pope, Olivardia, Gruber, & Borowiecki, 1999). Moreover, although the feminine ideal is primarily centered on thinness, a substantial number of adolescent girls also desire a more muscular, toned, and athletic physique (Lenart, Goldberg, Bailey, Dallal, & Koff, 1995; Olivardia, 2004). Such developments have ushered in a wave of descriptive research on the pursuit of muscularity.

Pursuit of muscularity incorporates a wide range of attitudes and behaviors pertaining to increasing muscle mass and size (Ricciardelli & McCabe, 2004). Pursuit of muscularity has been posited to include weight lifting or strength training in moderation, as well as excessive bodybuilding and steroid use in the extreme. In its excessive forms, pursuit of muscularity is associated with negative health consequences (Cafri, van den Berg, & Thompson, 2006). For instance, compared to other athletic activities (e.g., running or martial arts), competitive body building among adult males is associated with lower self-esteem, poorer body image satisfaction, greater symptoms of disordered eating, and more frequent steroid use (Blouin & Goldfield, 1995). The use of steroids or dietary supplements, in and of itself, is associated with many harmful physical health consequences, especially for adolescents (Cafri et al. 2005). An

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extreme manifestation of the pursuit of muscularity is muscle dysmorphia, which is characterized by a pathological concern with building muscle that interferes with physical health and socio-emotional functioning (Cafri, Olivardia, & Thompson, 2008; Pope, Gruber, Choi, Olivardia, & Phillips, 1997). For the purpose of the current paper, the term pursuit of muscularity is used to encompass the entire range of behaviors driven at pursuing muscularity as well as concerns or preoccupation with muscularity.

An estimated 21–47% percent of boys in adolescence report pursuing greater muscularity (Krowchuck, Kreiter, Woods, Sinal, & DuRant, 1998; Middleman, Vazquez, & DuRant, 1998; Neumark-Sztainer, Story, Falkner, Beuhring, & Resnick, 1999; Ricciardelli & McCabe, 2003). As many as 91% of late adolescent college males reportedly desire a more muscular build, whereas few to none want to be less muscular (Jacobi & Cash, 1994). Adolescent boys report pursuing muscularity more commonly than adolescent girls, whereas girls more frequently desire weight loss and endorse greater symptoms of disordered eating than boys (McCabe, Ricciardelli, & Finemore, 2002; Vartanian, Giant, & Passino, 2001). Nonetheless, adolescent girls perceive sociocultural pressure to increase body muscle tone (McCabe et al. 2002; Vartanian et al. 2001), and at least 6–9% percent of adolescent girls report pursuing greater muscularity (Krowchuck et al. 1998; Middleman et al. 1998; Neumark-Sztainer et al. 1999; Ricciardelli & McCabe, 2003). Further, adolescent girls' and boys' use of behavioral strategies to gain muscle and to lose weight may be modestly interrelated (Ricciardelli & McCabe, 2001, 2002). For instance, adolescent boys may cycle between unhealthy dieting to lose adiposity and behaviors intended to build muscle mass and size (Cafri et al. 2005). Likewise, adolescent girls engaged in disordered eating behaviors may simultaneously pursue weight loss and increased muscle tone (McCabe et al. 2002; Ricciardelli & McCabe, 2001; Vartanian et al. 2001).

From an interpersonal theoretical perspective, messages relayed from mothers, fathers, friends, and romantic partners about appearance are hypothesized to play an important role in body image attitudes and behaviors aimed at changing appearance (Tantleff-Dunn & Gokee, 2004; Thompson & Cafri, 2007). Perceived interpersonal pressure to be thin from parents, friends, and romantic partners has been demonstrated to be a risk factor for early to late adolescent girls' and boys' disordered eating (Field et al. 2001; Shomaker & Furman, 2009; Stice, 1998, 2002; Stice & Agras, 1998; Stice, Mazotti, Krebs, & Martin, 1998; McKnight Investigators, 2003). Interpersonal factors are expected to affect pursuit of muscularity among adolescent boys and girls as well (Ricciardelli & McCabe, 2004; Thompson & Cafri, 2007), but as of yet, such effects have not been extensively documented.

Perceived pressure to be muscular from mothers, fathers, and friends has been associated cross-sectionally with early and middle adolescent boys' and girls' pursuit of muscularity (McCabe & Ricciardelli, 2003; Smolak, Murnen, & Thompson, 2005). Also, perceptions of both positive and negative comments about appearance are related to late adolescent college males' pursuit of muscularity (Nowell & Ricciardelli, 2008; Vartanian et al. 2001). With regard to associations over time, early and middle adolescent boys' perceptions of pressure to gain muscle from parents and peers predicted increases in strategies to gain muscle over an 8-month period (Ricciardelli & McCabe, 2003). Over a 16-month period, perceived pressure from parents and friends to increase muscle predicted changes in strategies to increase muscle among early to middle adolescent boys as well as among girls (McCabe & Ricciardelli, 2005). Additional prospective investigations of interpersonal influences on adolescents' pursuit of muscularity are warranted. In particular, no longitudinal work to date has examined interpersonal influences on late adolescents, an agespan during which pursuit of muscularity may become increasingly pronounced (McCabe & Ricciardelli, 2001). During the developmental period of late adolescence, relationships with romantic partners and with friends are very salient (Furman &

Burhmester, 1992), although parents remain important relationships as well (Furman & Buhrmester, 1992).

Furthermore, existing findings have almost exclusively been based on assessments of adolescents' perceptions of interpersonal pressures. Yet, it is key that assessments of interpersonal pressures begin to incorporate others' as well as adolescents' reports of these pressures (Ricciardelli & McCabe, 2007). The use of any single reporter's perspective is not as strong psychometrically and presents potential problems of bias and method variance (Schwarz, Barton-Henry, & Pruzinsky, 1985). Adolescents' as well as their mothers' and friends' reports of criticism or pressure to be thin correlate cross-sectionally and prospectively with adolescents' disordered eating symptoms (Baker, Whisman, & Brownell, 2000; Pike & Rodin, 1991; Shomaker & Furman, 2009). To our knowledge, no study has incorporated adolescents' and others' reports of pressure to be muscular.

Although there has been increased attention in recent years to the pursuit of muscularity, there has been limited research on the sociocultural factors that may shape these behaviors and attitudes (Thompson & Cafri, 2007). The current project aimed to expand prior literature on the pursuit of muscularity in a number of important directions. Foremost, our understanding of interpersonal influences on the pursuit of muscularity in adolescence is limited by a paucity of longitudinal data. Thus, the primary objective of the current study was to examine the influence of interpersonal pressure to be muscular on changes over the course of one year. We extended prior longitudinal work by examining such relations in late adolescence (ages 16–19 years). This period has received relatively little attention, yet it is a period during which the pursuit of muscularity may be most pronounced (McCabe & Ricciardelli, 2001; Ricciardelli & McCabe, 2004). We hypothesized that interpersonal pressure to be muscular from mothers, fathers, friends, and romantic partners would predict changes in the pursuit of muscularity over the course of a year. Most of the descriptions of the pursuit of muscularity focus on boys. We included both girls and boys in the present study. We expected that boys would report greater pursuit of muscularity than girls, but we predicted that interpersonal pressure to be muscular would relate to pursuit of muscularity similarly for both genders. We also extended prior research by including mothers' and friends' reports of pressure to be muscular toward the focal adolescent so as to incorporate multiple perspectives on interpersonal pressures. Finally, we tested whether interpersonal pressure to be muscular predicted changes in the pursuit of muscularity after accounting for a number of variables potentially associated with the pursuit of muscularity (i.e., body mass index, pubertal timing, disordered eating symptoms, and physical appearance satisfaction) (Ricciardelli & McCabe, 2004). By controlling for such factors, we were able to rule out a number of possible alternative explanations of the findings we obtained.

Methods

Participants

Participants were drawn from a community sample of 200 adolescents (50% female) involved in an ongoing longitudinal study of interpersonal relationship influences on adolescent psychosocial adjustment and psychopathology. The sample was originally recruited when adolescents were in the 10^{th} grade. The participants were recruited from a diverse range of neighborhoods and schools in a large Western metropolitan area. They were selected such that the sample was representative of the ethnic distribution of the United States; thus, the sample consisted of 11.5% African American, 12.5% Hispanic, 1.5% Native American, 1% Asian American, 4% biracial, and 69.5% White, non-Hispanic youth. The sample was of average intelligence and comparable to national norms on multiple measures of substance use, internalizing and externalizing symptomatology (Furman, Low, & Ho, 2009). With regard to family structure, 57.5% were residing with two biological or adoptive parents, 11.5% were

residing with a biological or adoptive parent and a step-parent or partner, and the remaining 31% were residing with a single parent or relative.

The present paper used two time points of data spaced 12 months apart. At the first time point used in the present study almost all participants were in the 12th grade (*M* = 18 years, 0 months, *SD* = .51). One hundred ninety-nine of the 200 originally recruited adolescents participated (99 boys, 100 girls). At the second time point twelve months later, 196 of the original 200 adolescents participated (98 boys, 98 girls).

Mothers and a close friend nominated by the focal adolescent also were asked to participate in the study. One-hundred seventy-four mothers participated at the first time point of the present study; 168 mothers participated at the second time point. Approximately 55% of participants' mothers reported that they had a college degree, as would be expected from an ethnically representative sample from this particular Metropolitan area.

Additionally, 159 close friends (*M* age = 17.53, *SD* = 1.18) participated in the study at the first time point; 141 friends participated in the study at the second time point. Most were same-sex friends (65.5%) rather than other-sex friends (34.5%). There were no significant, mean level differences between same- and other-sex friend dyads on key study variables. Close friends' self-identified racial/ethnic backgrounds were similar to those of the focal adolescents. We examined differences between participants who had a mother or friend participate and those who did not on adolescent demographic characteristics (age, sex, race/ethnicity, puberty, and BMI), adolescent physical appearance satisfaction, disordered eating (dieting, bulimia and food preoccupation, oral control), and pursuit of muscularity (drive for muscularity, preoccupation with muscularity). The only significant difference was that White, non-Hispanic participants were more likely to have a mother participate in the study than adolescents from other racial/ethnic backgrounds.

Procedure

Letters and brochures describing the project were sent to families residing in a diverse range of neighborhoods residing in a large Western metropolitan area. We were unable to determine the ascertainment rate because we used brochures and because the letters were sent to many families who did not have a 10th grade adolescent. To ensure maximal response, families were paid $25 to hear staff describe the project to them in their home. Of the families that heard the description, 85.5% expressed interest and carried through with the study. Adolescents who were interested in the project were scheduled for a lab visit. At this assessment, adolescents were administered interviews and participated in videotaped discussions with mothers or peers as part of the larger project. Participants completed multiple questionnaires at home at their convenience. Adolescents and their mothers and friends were financially compensated for participating in the study. Written informed consent or assent was obtained from the participant, mother, friend, and friends' parents. The study was approved by the University of Denver's Institutional Review Board. The confidentiality of participants' data was protected by a Certificate of Confidentiality issued by the U. S. Department of Health and Human Services.

Measures

Demographics—Adolescents reported their height and weight, which were used to compute body mass index (BMI = kg/m^2). Self-reports of these variables have been demonstrated to highly correlate with objective measurements (Elgar & Stewart, 2008; Goodman, Hinden, & Khandelwal, 2000). Mothers' reports of adolescents' pubertal timing were used to assess when participants had gone through puberty. Specifically, mothers were asked what grade her daughter experienced her first menstrual period, or what grade her son went through a growth spurt when he increased rapidly in height. Mothers' reports of their children's pubertal status

have been shown to highly correlate with physician ratings (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987). Because BMI and puberty norms are different for girls and boys, these variables were standardized within gender.

Interpersonal pressure to be muscular—Adolescents completed the pressure to be muscular scales of the Pressure to be Physically Attractive Questionnaire (PPAQ) (Shomaker & Furman, 2008, 2009). This questionnaire assessed interpersonal pressures about physical appearance from a mother, father, close friend, or romantic partner. The pressure to be muscular scales tapped adolescents' perceptions of how often each person compliments and encourages being more muscular. There were three items for each of the four relationship scales (9 items total); each item was rated on a five-point Likert scale from "1" = not at all to "5" = almost always/the most. An example of an item was, "This person compliments me when I look built and toned." Items were averaged for each relationship and internal reliability was very good for all three relationship scales (αs $\geq$ .90). There was good temporal stability over one year for adolescents' reports of mother pressure to be muscular (r = .65, p <.001), father pressure to be muscular (r = .93, p < .001), friend pressure to be muscular (r = .46, p <.001), and romantic partner pressure to be muscular (r = .58, p <.001).

Mothers and close friends completed parallel versions of the PPAQ in which they reported on how often they pressured the focal adolescent to be more muscular. An example of an item was, "I compliment my daughter (or friend) when she or he looks built and toned." In order to make use of both sources, mothers' and adolescents' reports were averaged to create a cross-informant mother pressure to be muscular composite; adolescents' and friends' reports were averaged to create a cross-informant friend pressure to be muscular composite (αs $\geq$ .73). Reports of father pressure to be muscular and romantic partner pressure to be muscular were based on the participants' reports alone.

Physical appearance satisfaction—Adolescents reported how dissatisfied or satisfied they were with their physical appearance on the physical appearance scale of the Adolescent Self-Perception Profile (Harter, 1988). This scale contained five items that assessed participants' feelings of dissatisfaction or satisfaction with their overall physical appearance. Items were averaged to derive a measure of satisfaction, with higher scores reflecting greater satisfaction. Data support this scale's construct and predictive validity (Harter, 1999).

Additionally, mothers and friends completed parallel versions of the physical appearance scale (Harter, 1988) to assess their perceptions of the target adolescent's satisfaction with her or his physical appearance. Mothers' and friends' reports on this scale were internally reliable (αs = .87–.90).

Disordered eating—Adolescents completed the Eating Attitudes Test-26 (EAT-26) to assess their symptoms of disordered eating (Button & Whitehouse, 1981; Garner, Olsted, Bohr, & Garfinkel, 1982; Rosen, Silberg, & Gross, 1988). Using a six-point Likert scale, they reported how often 26 statements about disordered eating attitudes and behaviors were true for themselves. The dieting scale measured dieting behaviors and drive for thinness (13 items; α = .91). The bulimia and food preoccupation scale tapped binge eating and vomiting (6 items; α = .78). The oral control scale assessed perceived social pressure to gain weight (7 items; α = .54). The EAT-26 has demonstrated acceptable reliability and validity in clinical as well as community samples of adolescent girls and boys (Button & Whitehouse, 1981; Garner et al. 1982; Rosen et al. 1988).

Pursuit of muscularity—Pursuit of muscularity was measured with a questionnaire developed by the authors to assess both behavioral and attitudinal components of muscularity. Designed to be consistent with the format of the EAT-26, the measure contained 8 items that

were rated on a 6-point Likert scale from "1" = never to "6" = always. Principal axes factor analysis with oblimin rotation indicated 2 factors: 1) drive for muscularity and 2) preoccupation with muscularity. Questions on the drive for muscularity scale (4 items) assessed behaviors and cognitions pertaining to becoming more muscular: a) "I exercise and lift weights to gain muscle mass;" b) "I take dietary supplements to build muscle;" c) "I think about my weight-lifting and training routine;" and d) "I am concerned about not being muscular enough." Questions on the preoccupation with muscularity scale (3 items) assessed excessive concerns about wanting to become more muscular: a) "I feel that my weight-lifting and training routine controls my life;" b) "I find myself preoccupied with building muscle;" and c) "I read body-building magazines." One item ("I take steroids to help build muscle") did not load onto either scale and was not considered in the present paper. The internal consistencies of the scales were adequate (αs $\geq$ .75), and both scales were related to each other at each time point (r = .62 and .59, time 1 and 2, respectively). Both scales showed adequate temporal stability over one year (rs = .66 and .55, drive for muscularity and preoccupation with muscularity, respectively).

Analytic Plan

All variables were examined to determine if the data were normally distributed (Behrens, 1997). Outliers (< 3% of all data points) were adjusted to fall 1.5 times the interquartile range below the 25th percentile or above the 75th percentile (i.e. to the whiskers in Tukey's (1977) boxplot). All scores had acceptable levels of skew and kurtosis. Descriptive analyses were generated on all key variables. Independent samples t-tests were conducted to determine gender differences on mean levels of measures. Pearson correlations were used to examine the intercorrelations among key variables. Structural equation modeling (SEM) based on full information maximum likelihood estimation was conducted with AMOS 16.0 to evaluate the factor structure and hypothesized relationships among variables. Following recommended guidelines for SEM (Cole & Maxwell, 2003), a confirmatory factor analysis (CFA) was first conducted to ensure that the proposed factor structures fit the data. The unique variances of the same index (e.g., drive for muscularity at Time 1 and drive for muscularity at Time 2) were allowed to correlate (Cole, Ciesla, & Steiger, 2007; Cole & Maxwell, 2003). Approximately 9% of the data was missing, primarily due to instances in which the friend or mother did not participate and instances in which the adolescent did not have a romantic relationship. Because no systematic differences in missingness were observed on study variables, full information maximum likelihood (FIML) estimates were used as this approach yields less biased results than either pairwise or listwise deletion (Schafer & Graham, 2002). Because model χ^2 is highly sensitive to sample size, two additional fit indices were examined to interpret the acceptability of the measurement model for describing the data: a) Steiger-Lind root mean square error of approximation (RMSEA), and b) Bentler comparative fit index (CFI). A cut-off criterion for RMSEA of equal or less than .08 was considered a reasonable error of approximation (Kline, 2005). For CFI, a value equal or greater than .90 was considered indicative of a reasonably good fitting model. We next utilized SEM to examine the hypothesis that Time 1 interpersonal pressure to be muscular would predict Time 2 pursuit of muscularity, after accounting for Time 1 pursuit of muscularity, disordered eating, appearance satisfaction, BMI and pubertal timing.

Results

Descriptive Information and Correlations

Table 1 presents the descriptive information on demographic and key study variables at Time 1 and 2. Significant mean-level gender differences occurred on several variables. Boys perceived more pressure to be muscular from romantic partners than girls. In contrast, boys and girls did not differ on self- or other-reports of pressure to be muscular in relationships with mothers or friends. Compared to boys, girls scored higher on all disordered eating symptoms,

whereas boys had higher scores than girls on drive for muscularity and preoccupation with muscularity at both Time 1 and Time 2.

Correlations among study variables are presented in Table 2. Measures of interpersonal pressure to be muscular from mothers, fathers, friends, and romantic partners were moderately interrelated. Interpersonal pressures were correlated with adolescents' pursuit of muscularity at both time points. These associations were generally consistent across the different reporters. Both drive for muscularity and preoccupation with muscularity were moderately consistent over the course of the year.

Confirmatory Factor Analysis and Structural Equation Modeling

A CFA indicated that the measurement model fit the data adequately, χ^2 (85, N = 199) = 166.28, $p < .001$, RMSEA = .07, CFIs = .91. All manifest variables significantly loaded on their hypothesized latent constructs (ps < .001). Mother pressure to be muscular composite, adolescents' reports of father pressure to be muscular, friend pressure to be muscular composite, and adolescents' reports of romantic partner pressure to be muscular all significantly loaded on an interpersonal pressure latent variable. Cross-informant composites of mother and friend pressure to be muscular were utilized so as to incorporate multiple perspectives on interpersonal pressures into this construct. Adolescent, mother and friend scales assessing focal adolescents' physical appearance satisfaction significantly loaded on a latent variable for physical appearance satisfaction. Likewise, dieting, bulimia and food preoccupation, and oral control scales all loaded on a latent construct of disordered eating. Drive for muscularity and preoccupation with muscularity loaded on a pursuit of muscularity latent construct at each time point.

Structural equation modeling was used to investigate whether Time 1 interpersonal pressure to be muscular predicted pursuit of muscularity at Time 2 after controlling for Time 1 pursuit of muscularity, physical appearance satisfaction, disordered eating, BMI, and puberty. We first conducted a multiple group SEM analysis to compare a model in which the factor loadings and regression paths were constrained to be equal for the two genders with a corresponding unconstrained model in which there were no constraints. The constrained multiple-group model did not significantly differ from the unconstrained model, $\Delta\chi^2$ (15, N = 199) = 20.63, p = .15, indicating that gender did not significantly moderate the primary effects of interest in the model. Accordingly, we combined the two genders for the primary analysis. The combined gender model was an acceptable fit to the data, χ^2 (85, N = 199) = 166.28, $p < .001$, RMSEA = .07, CFI = .91 (Figure 1). Within Time 1, interpersonal pressure to be muscular was associated with the pursuit of muscularity (b = .47, $p < .001$). Time 1 BMI, appearance satisfaction, pubertal timing, and disordered eating were not significantly related to Time 1 pursuit of muscularity. After accounting for Time 1 pursuit of muscularity and the other variables in the model, Time 1 interpersonal pressure to be muscular predicted significant variations in adolescents' pursuit of muscularity at Time 2 (b = .19, p = .04) (Figure 1). Pursuit of muscularity at Time 1 was also predictive of pursuit of muscularity at Time 2 (b = .68, $p < .001$). No other variable significantly predicted changes in the pursuit of muscularity over time.

Consistent with other studies of multiple reporters' perceptions (Achenbach, McConaughy, & Howell, 1987), adolescents' and their mothers' or friends' reports of pressure to be muscular were only modestly related (M r = .26). Accordingly, we conducted a series of follow-up analyses to determine whether the observed links between the latent constructs of interpersonal pressure to be muscular and pursuit of muscularity reflected adolescents' self-perceptions of pressure, others' perceptions, or both. Retaining all other variables in the model, the latent construct for interpersonal pressure to be muscular was replaced with either adolescent self-report of mother, father, friend, or romantic partner pressure to be muscular, mother-report of pressure to be muscular, or friend-report of pressure to muscular. These six follow-up models

were acceptable fits to data (χ^2s (48, N = 199) = 73.0–80.0, *p*s < .01, RMSEAs ≤ .06, CFIs ≥ .95). Adolescents' own reports of interpersonal pressure to be muscular from mothers (*b* = .30, *p* < .001), fathers (*b* = .30, *p* <.001), friends (*b* = .22, *p* = .03), and romantic partners (*b* = .29, *p* < .001) were associated with pursuit of muscularity within Time 1. Further, adolescents' reports of pressure to be muscular from mothers (*b* = .18, *p* = .01) and romantic partners (*b* = .20, *p* < .001), but not fathers or friends, predicted pursuit of muscularity at Time 2. Mothers' reports of pressure to be muscular toward their children at Time 1 were associated with pursuit of muscularity at both Time 1 (*b* = .28, *p* < .001) and at Time 2 (*b* = .15, *p* = .05). Friends' reports of pressure to be muscular toward focal adolescents were associated with pursuit of muscularity at Time 1 (*b* = .24, *p* = .05), but did not predict pursuit of muscularity at Time 2.

Discussion

Few prospective studies have examined interpersonal risk factors for the pursuit of muscularity. Thus, the current study aimed to investigate whether interpersonal pressure to be muscular predicted changes in late adolescent boys' and girls' pursuit of muscularity over the course of one year. As hypothesized, interpersonal pressure to be muscular was not only associated concurrently with pursuit of muscularity, but predicted changes in the pursuit of muscularity over time. The current findings are consistent with prior cross-sectional (McCabe & Ricciardelli, 2003; Smolak et al. 2005) and longitudinal (McCabe & Ricciardelli, 2005; Ricciardelli & McCabe, 2003) studies of early to middle adolescents. The results suggest that interpersonal influences play an important role in the pursuit of muscularity even as adolescents approach emerging adulthood. In concert with theoretical perspectives on social pressure to be thin and disordered eating (Stice, 2002; Thompson et al. 1999), close relationships such as those with parents, friends, and romantic partners appear to have significant influences on adolescents' attitudes and behaviors related to gaining muscle as well.

Compared to girls, boys reported more pursuit of muscularity and also perceived greater pressure to be muscular from romantic relationships. Yet, it was interesting that late adolescent boys and girls appeared to receive similar pressure to be muscular from relationships with mothers, fathers, and friends. Moreover, gender did not moderate the effect of interpersonal pressure on the pursuit of muscularity, indicating that interpersonal pressure to be muscular affected changes in late adolescent girls' as well as boys' pursuit of muscularity. This pattern of results underscores that adolescent boys and girls both may be affected by interpersonal messages that encourage gaining muscularity. Indeed, a significant number of adolescent girls as well as boys desire a more muscular and toned body, and in contemporary culture, girls as well as boys are encouraged to be athletic and fit (Lenart et al. 1995; Olivardia, 2004). In a large community sample of adolescents, as many as 12% of boys and 8% of girls reported using products to improve appearance, muscle mass, and strength (Field et al. 2005). Hence, as other researchers have proposed (McCabe & Ricciardelli, 2005), although there are important gender differences in the extent of muscularity or leanness desired, both may be components of the sociocultural ideal physiques for both genders. Indeed, according to contemporary perspectives on the female ideal physique, the rise in adolescent girls' involvement in athletics over the last several decades has been accompanied by girls' greater desire to be lean and toned, with visible muscle (Gruber, 2007). In the current sample, disordered eating symptoms and preoccupation with muscularity showed some overlap, supporting the import of considering both behaviors in understanding adolescent girls' and boys' body image and attempts to change their appearance.

A unique contribution of the current study was the assessment of interpersonal pressure to be muscular with mothers' and friends' reports as well as adolescents' reports of their respective relationships. Adolescents' and others' reports of pressure to be muscular showed low but significant correspondence, which is consistent with typical cross-informant reports among

youth and their parents or peers (Achenbach, McConaughy, & Howell, 1987; Frank, Van Egeren, Fortier, & Chase, 2000; Youngstrom, Loeber, & Stouthamer-Loeber, 2000). Yet, in spite of the relatively weak correspondence, both adolescents' and mothers' reports of pressure to be muscular predicted changes in late adolescents' pursuit of muscularity over time. Thus, the links between interpersonal pressure from mothers and the pursuit of muscularity do not merely reflect adolescents' perceptions of relationships, but may indeed reflect actual behaviors occurring in these relationships. Interpersonal pressures from parents are recognized as important contributors to adolescents' body image and disordered eating (Thompson et al. 1999). The present study extends this work to the domain of pressures to pursue muscularity, and lends further support to the role that mothers play in shaping attitudes and behaviors about their appearance. It is notable that such pressures continue to impact changes in pursuit of muscularity even in late adolescence. Adolescents' perceptions of pressure to be muscular from fathers were associated with adolescents' pursuit of muscularity within time, but did not predict changes in pursuit of muscularity over one year. Existing research on father influences on the pursuit of muscularity is scarce, but some data suggest that mothers may possibly be more influential than fathers in promoting dieting in daughters and sons (Wertheim, Martin, Prior, Sanson, & Smart, 2002). Further investigation into the actual messages about muscularity that fathers convey to their adolescents is needed.

Late adolescents' reports of friends as well as friends' own reports of pressure to be muscular toward focal adolescents were concurrently associated with the pursuit of muscularity at Time 1, but neither adolescents' perceptions of friends nor friends' reports predicted changes in pursuit of muscularity over time. This pattern contrasts with previous research finding that perceived pressure to be muscular from friends was associated with changes in early and middle adolescent boys' and girls' pursuit of muscularity (McCabe & Ricciardelli, 2005). On the other hand, perceptions of romantic partners' pressure to be muscular in the current study did predict changes in the pursuit of muscularity, even after controlling for the other variables in the model. The influence of romantic partners on body image and eating or muscle-building behaviors and attitudes has not been routinely examined. Yet, romantic partners become increasingly salient especially in late adolescence (Hazan & Zeifman, 1994). Romantic relationships are also distinguished from other close relationships by their passionate aspects, including fascination with the other, sexual desire, and exclusiveness of the relationship (Davis & Todd, 1982). Thus, perceptions of how much romantic partners comment on appearance may hold particular importance for the pursuit of muscularity particularly in late adolescence. In future work, it would be important to assess romantic partners' own reports of pressures. Although the findings regarding the roles of friends, mothers, and romantic partners were somewhat different, interpersonal pressures to be muscular from mothers, friends, and romantic partners were substantially related. An important direction for future research is to determine whether those adolescents who perceive an emphasis on muscularity from their parents are selectively attracted to romantic partners who also encourage muscularity.

Satisfaction with physical appearance showed some positive associations with drive for muscularity, but was not related to preoccupation with muscularity and did not predict changes in the pursuit of muscularity prospectively. Other studies also have failed to find a significant association between body image satisfaction and the pursuit of muscularity (McCabe, Ricciardelli, & Banfield, 2001). In contrast, in samples of adolescent boys or adult male athletes, pursuit of muscularity – particularly steroid use – has been associated with poorer body image satisfaction (Blouin & Goldfield, 1995; McCreary & Sasse, 2000; Smolak et al. 2005). The differences in findings could have occurred because we used a community sample rather than a group such as athletes who are heightened risk for more extreme pursuit of muscularity. Alternatively, we measured satisfaction with overall physical appearance, which may not be as relevant to the pursuit of muscularity as body image concerns specific to desiring

more muscle in various body parts (Cafri & Thompson, 2004; Jones & Crawford, 2005; Tiggemann, Martins, & Churchett, 2008).

It is important to note a number of limitations. The sample size was relatively small for structural equation modeling (Kline, 2005). Although theoretically-derived hypotheses about interpersonal influences on the pursuit of muscularity were tested with prospective data, the findings are correlational and the direction of any causal relations cannot be conclusively established. Further, the results of the present study provide only preliminary evidence for the validity of a new measure for assessing behavioral and attitudinal dimensions of the pursuit of muscularity construct. Yet, additional validation (e.g., test-retest reliability and construct validity) is essential, particularly as existing measures of the pursuit of muscularity show limited convergence (Cafri & Thompson, 2004). As BMI and puberty were not the focus of the present study, we relied on self-reports of BMI and maternal reports of pubertal timing. Such measures correlate highly with objective assessments (Elgar & Stewart, 2008; Goodman et al. 2000), but are still subject to bias. The present study examined interpersonal influences from parents, friends, and romantic partners, but not from siblings. The limited research on siblings and muscularity in late adolescents (e.g., Karazsia & Crowther, 2009) suggests that they warrant further examination in subsequent work. Finally, although the current investigation focused upon interpersonal influences, it would be important to also consider the contribution of perceived media pressure to be muscular.

The current study contributes to a recognized need for prospective research on the pursuit of muscularity by showing that social relationships affect the pursuit of muscularity in late adolescents. The challenge now is to better understand the psychosocial consequences of pursuing muscularity. Pursuit of muscularity has been associated cross-sectionally with both negative affect as well as positive affect in adolescents (Heywood & McCabe, 2006; McCabe et al. 2001). Even normative behaviors aimed at building muscle (e.g., weightlifting or strength training) or concerns about wanting more defined muscle are associated with middle and late adolescents' positive beliefs about and use of performance enhancing substances (Dodge, Little, Seitchik, & Bennett, 2008; Field et al. 2005; Litt & Dodge, 2008), the use of which holds an array of negative health consequences (Cafri et al. 2005). In the current era of an obesity epidemic (Ogden, Carroll, & Flegal, 2008), it will be critical for future research to determine how we can differentiate healthy from unhealthy adolescent outcomes associated with pursuing greater muscularity.

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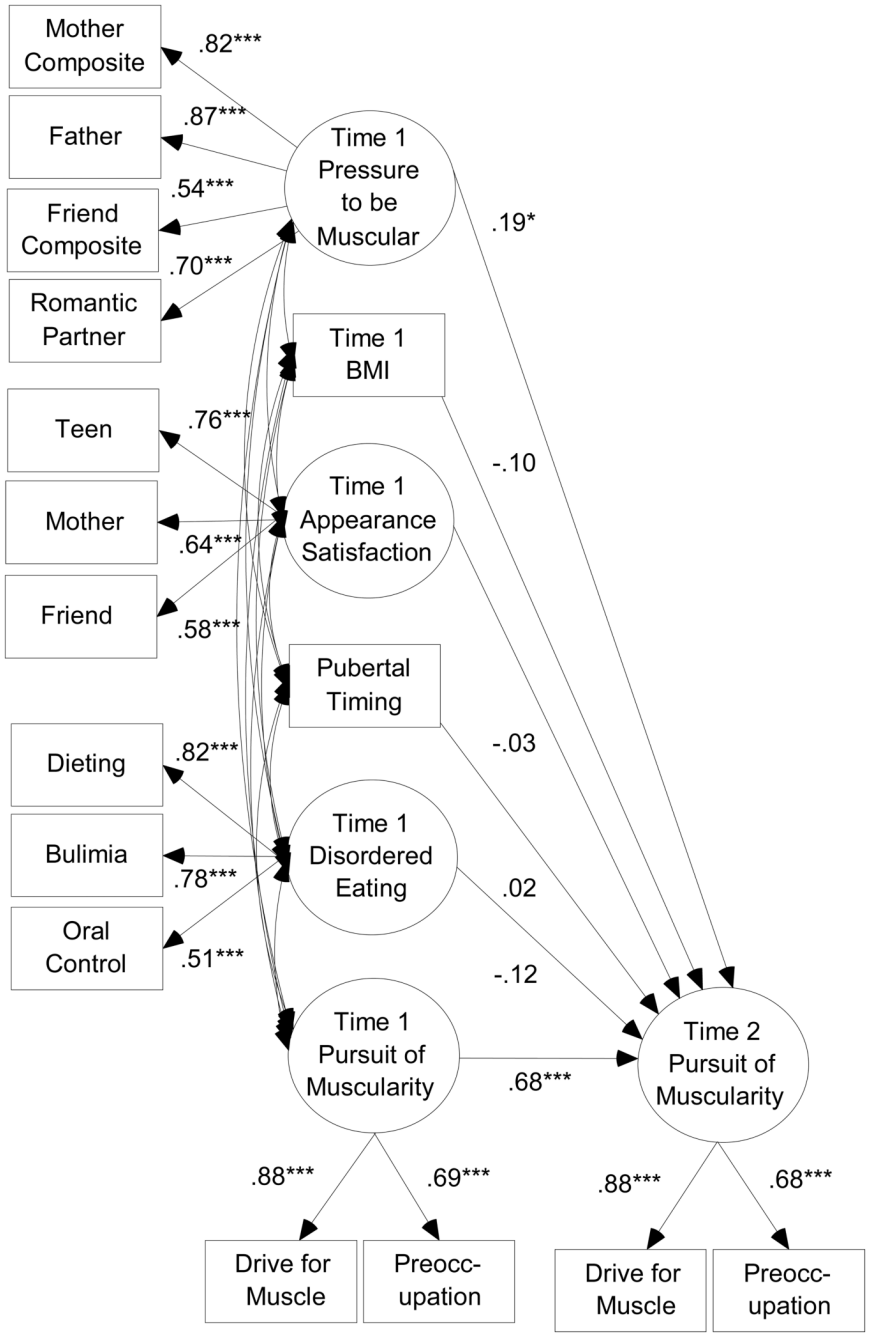

Figure 1.
Interpersonal influences on adolescents' pursuit of muscularity over time. BMI and puberty were standardized within gender. Covariances among Time 1 variables in the model are described in the text. Standardized path coefficients are presented. ***$p < .001$. *$p < .05$.

Table 1

Descriptive Information on Study Variables at Time 1 and 2

	Boys		Girls		
	M	***SD***	***M***	***SD***	***t***
T1 BMI (kg/m^2)	22.34	3.16	21.85	2.92	1.11
Pubertal Timing (grade)	8.24	1.26	7.15	1.10	6.25***
T1 Mother Pressure to be Muscular (C)	2.29	.94	2.18	.93	.81
T1 Mother Pressure to be Muscular (A)	2.55	1.16	2.29	1.09	1.54
T1 Mother Pressure to be Muscular (M)	2.05	.98	2.04	1.03	.03
T1 Father Pressure to be Muscular (A)	2.38	1.22	2.04	1.14	1.84
T1 Friend Pressure to be Muscular (C)	2.14	.94	2.18	.77	−.32
T1 Friend Pressure to be Muscular (A)	2.18	1.01	2.07	1.05	.68
T1 Friend Pressure to be Muscular (F)	2.11	.94	2.33	1.13	−1.26
T1 Partner Pressure to be Muscular (A)	3.25	1.10	2.18	1.12	5.79***
T1 Physical Appearance Satisfaction (A)	2.93	.62	2.87	.71	.64
T1 Physical Appearance Satisfaction (M)	3.04	.62	2.97	.67	.77
T1 Physical Appearance Satisfaction (F)	3.01	.61	2.90	.67	1.02
T1 Dieting	1.50	.48	2.16	.79	−7.04***
T1 Bulimia and Food Preoccupation	1.23	.35	1.42	.45	−3.14**
T1 Oral Control	1.65	.52	1.89	.57	−3.12**
T1 Drive for Muscularity	2.39	1.02	1.71	.78	5.14***
T1 Preoccupation with Muscle	1.38	.54	1.22	.46	2.21*
T2 Drive for Muscularity	2.47	1.01	1.65	.69	6.40***
T2 Preoccupation with Muscle	1.27	.35	1.18	.31	2.04*

Note: T1 = Time 1. T2 = Time 2. C = Composite of Adolescent- and Other-Report. A = Adolescent-Report. M = Mother-Report. F = Friend-Report.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

Table 2

Correlations among Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. T1 BMI	--																		
2. Puberty	−.19*	--																	
3. T1 Mother Pressure(C)	.22*	−.02	--																
4. T1 Mother Pressure (A)	.12	.03	.87*	--															
5. T1 Mother Pressure(M)	.25*	−.02	.82*	.35*	--														
6. T1 Father Pressure (A)	.12	.04	.73*	.81*	.30*	--													
7. T1 Friend Pressure(C)	.00	.20*	.44*	.47*	.31*	.39*	--												
8. T1 Friend Pressure (A)	.07	.21*	.52*	.58*	.31*	.57*	.84*	--											
9. T1 Friend Pressure (F)	−.07	−.06	.03	−.04	.15	−.16	.70*	.17	--										
10. T1 Partner Pressure (A)	.04	.13	.45*	.55*	.12	.63*	.42*	.57*	−.02	--									
11. T1 Satisfaction (A)	−.18*	−.02	.23*	.26*	.13	.24*	.13	.11	.01	.23*	--								
12. T1 Satisfaction (M)	−.13	−.19*	.12	.13	.09	.13	.18*	.15	.13	.17	.47*	--							
13. T1 Satisfaction(F)	−.13	.08	.15	.16	.05	.05	.06	.07	−.07	.12	.42*	.45*	--						
14. T1 Dieting	.27*	−.05	.06	−.05	.14	−.11	.06	−.04	.15	−.27*	−.30*	−.18*	−.21*	--					
15. T1 Bulimia	.21*	−.02	−.01	−.08	.07	−.16*	.03	−.02	.11	−.10	−.28*	−.20*	−.13	.63*	--				
16. T1 Oral Control	−.07	−.02	−.07	−.04	−.05	−.02	.09	.11	.04	−.10	−.11	−.16*	−.12	.41*	.42*	--			
17. T1 Drive for Musc	−.02	.02	.36*	.33*	.26*	.27*	.26*	.25*	.11	.36*	.11	.02	.20*	.00	.05	.14*	--		
18. T1 Preoccupation	.07	.07	.34*	.27*	.22*	.21*	.36*	.28*	.25*	.30*	.02	.00	.08	.16*	.18*	.17*	62*	--	
19. T2 Drive for Musc	−.10	.10	.37*	.36*	.26*	.29*	.27*	.26*	.01	.43*	.08	.15*	.19*	−.18*	−.06	−.04	66*	.41*	--
20. T2 Preoccupation	.01	.05	.30*	.27*	.25*	.19*	.23*	.17*	.22*	.28*	.08	.09	.11	.06	.05	.02	50*	.55*	.59*

Note: BMI and puberty were standardized within gender. T1 = Time 1. T2 = Time 2. C = Composite of Adolescent- and Other-Report. A = Adolescent-Report. M = Mother-Report. F = Friend-Report.

*$p < .05$.