

Gender Composition of Preadolescents' Friendship Groups Moderates Peer Socialization of Body Change Behaviors

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Objective: Peer socialization may be an important contributor to the rising prevalence of diet and muscle gain behaviors (i.e., body change behaviors) in adolescence. The present study longitudinally examined body change behaviors in preadolescents' friendship groups as predictors of preadolescents' own body change behaviors. It was predicted that peer socialization effects would vary according to the gender composition of preadolescents' friendship group. **Method:** Participants ($N = 648$, 48.8% female) were in grades 6 through 8 at Time 1 and reported their dieting and muscle-gaining behavior at three time points approximately 1 year apart. Friendship groups were identified from preadolescents' friendship nominations. Body mass index and pubertal timing were included in analyses as control variables. A multiple group latent growth curve model was used to examine hypotheses. **Results:** Socialization of body change behaviors in preadolescent friendship groups was observed only under certain conditions. For members of all-male friendship groups, preadolescents' dieting trajectories were predicted from friends' average level of dieting. **Conclusion:** Peer socialization effects are associated with trajectories of preadolescents' body change behaviors, particularly among all-male groups. Future research would benefit from incorporating the friendship group context into the study of health risk behaviors in preadolescents.

Keywords: adolescence, dieting, muscle-gain, friendships

Epidemiological data indicate that a large percentage of preadolescents actively are exercising and restricting calories to lose weight (61.5% and 39.5%, respectively; CDC, 2010). Changes in body image and engagement in body change behaviors are normative aspects of development during the preadolescent transition (Harter, 1988); however, early dieting and pursuit of muscularity also are established risk factors for developing later eating and body image-related pathology (e.g., Neumark-Sztainer et al., 2006; Pope, Gruber, Choi, Olivardia, & Phillips, 1997). Given these potentially harmful outcomes, identification of factors that may reinforce these behaviors in youth is vital. This study examines the role of peers as influential agents in the development of body change behaviors.

Shifts in body image and associated body change behaviors may arise from two normative developmental processes. First, pubertal development is associated with a redistribution of muscle and fat tissue among both girls and boys (e.g., Connolly, Paikoff, & Buchanan, 1996). The psychosocial impact of these physiological changes varies across gender. Boys' pubertal development is consistent with cultural ideals of male attractiveness (i.e., "the masculine ideal of lean muscularity"; Leon, Fulkerson, Perry, Kell, & Klump, 1999), whereas girls' physical maturation frequently clashes with dominant conceptions of the female beauty ideal (i.e., "the thinness norm"; e.g., Stice, 1998). Interpersonally, girls' conversations tend to focus on dieting, whereas boys' more frequently discuss muscle-gaining behavior (Jones & Crawford, 2006). Also, appearance-related commentary and body-related teasing among peers become prominent, and can be associated with body dissatisfaction and dietary restraint (e.g., Menzel et al., 2010). Although adolescents of both genders may engage in dieting and muscle-gaining behavior, strategies to increase muscle and weight are more commonly observed among adolescent boys than girls (e.g., McCabe & Ricciardelli, 2001).

Second, these physical changes and interpersonal sequelae occur during the same developmental period associated with changes in the meaning and salience of peer experiences. As time spent with parents decreases, peers become youths' primary sources of esteem support and reflected appraisal (Hartup, 1996) and are increasingly influential (Steinberg & Monahan, 2007). These concurrent body- and peer-related developmental processes may

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create a fertile ground for socialization of body change behaviors (e.g., Eisenberg & Neumark-Sztainer, 2010).

Research in developmental and social psychology has provided a substantial theoretical and empirical basis for understanding peer socialization effects within friendship groups. Theories of socialization and homophily suggest that youths' and their friends' attitudes and behaviors become more similar over time (e.g., Kandel, 1978). This increase in behavioral similarity can be understood in the context of individuals referencing interpersonal social norms to identify acceptable or desirable behaviors, and to reduce the discrepancy between themselves and their reference group, such as a friendship group (e.g., see work on descriptive and injunctive social norms; Prentice & Miller, 1993; Social Influence Theory; Biddle, Bank, & Marlin, 1980). Friendship groups are characterized as small, nonoverlapping groups of preadolescents who spend time and engage in activities with one another, and who form friendships within the group (Brown, 2004). Often, these groups are defined by adolescents' nominations of their closest friends. It is important to note that friendship groups have hierarchies, rules, and their own social norms, which can lead to reinforcement of group-endorsed behaviors and attitudes (e.g., Bagwell, Coie, Terry, & Lochman, 2000). Preadolescents may be particularly influenced by their friendship group to adopt the valued, local norms regarding preferred body shape and body change behaviors, which may include pursuit of the thinness norm (Stice, 1998) and/or the masculine ideal of lean muscularity (Leon et al., 1999).

Empirical work confirms that socialization within friendship groups may be an important determinant of preadolescents' engagement in related health risk behaviors, such as substance use, sexual risk behaviors, and even self-injury (see review; Brechwald & Prinstein, 2011). In contrast, there has been little systematic empirical attention to socialization of preadolescents' dieting and muscle-gaining behaviors, and what research does exist frequently focuses on preadolescent girls.

For example, using a cross-sectional design, Paxton, Schutz, Wertheim, and Muir (1999) observed substantial homogeneity of body image concerns, extreme weight loss behaviors, and dietary restraint within friendship groups, with youth reporting greater similarity to fellow friendship group members as compared to nongroup peers. Woelders, Larsen, Scholte, Cillessen, and Engels (2010) also examined body change behaviors within friendship groups. Although contemporaneous similarities were revealed between preadolescents' and their friendship groups' body change behaviors, longitudinal analyses revealed no associations between dieting behaviors within a friendship group and girls' own dieting one year later.

One important feature of these previous studies of dieting and body change behaviors within friendship group contexts is that the samples were entirely female. This may be a crucial limitation of these past studies because other-sex friendships (i.e., female-male friendship) also are associated with peer influence of health risk behaviors among youth (e.g., Billari & Mencarini, 2003; Dick et al., 2007). Developmental psychological research demonstrates that not only do friendship groups become more gender-integrated over time (e.g., Connolly, Furman, & Knarski, 2000), but that females, as compared to males, are more likely to be members of mixed-gender groups during the adolescent transition (Poulin & Pedersen, 2007). Considering the gender-specific physiological

changes, divergent female and male beauty ideals, and increased importance of peers, it seems likely that the gender composition of a preadolescent's friendship group may alter the body change strategies that are emphasized among, and potentially adopted by, group members.

This study extends prior research by examining peer influence of dieting and muscle-gaining behavior within preadolescents' same- and mixed-gender friendship groups. It was hypothesized that higher levels of dieting or muscle-gaining behavior within a preadolescent's friendship group would be associated longitudinally with increases in preadolescents' own corresponding behavior. Further, it was hypothesized that the gender composition of the friendship group (i.e., mixed-gender, all-female, or all-male) would moderate this effect such that peer influence would be particularly potent among the same-gender friendship groups. Given the cultural appearance norms, socialization of dieting behavior was expected to be particularly robust among all-female friendship groups, and socialization of muscle-gaining behaviors among all-male friendship groups. To provide a stringent examination of hypotheses, preadolescents' friends' own report of their body change behaviors were used as longitudinal predictors of preadolescents' own behaviors. Using friends' own reports of their behaviors reduces the potential of findings being artificially inflated due to shared reporter variance and eliminates the likelihood that apparent similarities between preadolescents' and their friends were due to preadolescents' erroneous estimations of their friends' behavior (see Prinstein & Wang, 2005). Peer influence effects were examined while controlling for potential "third variables" that might be associated with changes in preadolescents' dieting and muscle-gaining behaviors over time, such as body mass index (BMI), pubertal timing, and grade.

Method

Participants

Participants were 648 preadolescents in grades 6 (36.3%), 7 (30.0%), and 8 (33.8%) at the outset of the study (48.8% female). The ethnic composition of the sample included 84.4% White, 1.4% African American, 4.2% Asian, 1.9% Latino, and 5.9% of participants from mixed ethnic backgrounds (2.2% did not report their ethnic background). Participants were aged 10–14 at Time 1 ($M = 12.60$, $SD = 1.19$) and enrolled in public schools within a city of fairly homogeneous middle-class socioeconomic status in the northeastern United States. According to neighborhood and school records, average adult per capita income was approximately \$30,220, and 11% of children were eligible for free or reduced-price lunch.

Procedure

At Time 1, all sixth through eighth grade students were mailed and hand-distributed consent forms with strong encouragement and incentives for returning a signed form either granting or denying consent to participate. Individual incentives, as well as entry into a drawing for several small prizes (i.e., movie passes) and a grand prize (i.e., Sony Playstation 2), were offered. Teachers also received prorated financial incentives based on the proportion of their students who returned forms. Of the 784 forms returned

(92% of families), 648 youth were granted parental consent to participate at Time 1 (76% of total population). Youth provided assent at the start of the study. Students who were absent or provided incomplete data on primary study constructs ($n = 7$), or refused to participate ($n = 4$) were excluded from analyses, yielding a final Time 1 sample of 637 participants. A total of 565 (88%) of these participants completed testing approximately 1 year later (i.e., Time 2), when students were in grades 7 through 9. Attrition was due to participants' moving away from the area ($n = 36$), absenteeism or invalid data ($n = 33$), and refusal to continue participation ($n = 5$). A total of 471 (83% of Time 2 sample; 74% of Time 1 sample) youth were available at Time 3, 1 year following Time 2. Attrition between Times 2 and 3 was due to participants' moving away from the area ($n = 40$) or being unavailable during testing ($n = 54$). No incentives were provided to participants during the study and all procedures were approved by the university human subjects committee.

Independent sample *t* tests comparing individuals who provided data at all time points with those who had missing data revealed that participants missing BMI data had significantly lower levels of muscle-gaining behavior at Time 1. Participants missing pubertal timing data reported significantly lower Time 2 muscle-gaining behavior. Full information maximum likelihood estimation was used to accommodate missing data; thus, analyses were possible among all 637 participants with data for at least one time point.

Measures

Measures of dieting behaviors and muscle-gaining behaviors were administered at Times 1, 2, and 3. Preadolescents' date of birth, height, and weight statistics were collected at Time 1 to calculate individuals' age and body mass index percentiles (BMI). Preadolescents' responses to pubertal development questions at Time 1 were used to calculate pubertal timing.

Dieting behaviors. Two items adapted from the Youth Health Risk Behavior Survey (CDC, 1998) assessed dieting behaviors used to manage weight or shape (i.e., "How many times in the past 30 days did you exercise or work out to lose weight or to keep from gaining weight?", "How many times in the past 30 days did you eat less food, fewer calories, or foods low in fat to lose weight or to keep from gaining weight?"). Frequency of each behavior over the past 30 days was rated on a 5-point scale ranging from 1 = 0 times to 5 = *Every day or almost every day*. A mean score was computed at each time point with acceptable reliability at Time 1: boys: $\alpha = .70$, girls: $\alpha = .81$; Time 2: boys: $\alpha = .69$, girls: $\alpha = .72$; and Time 3: boys: $\alpha = .72$, girls: $\alpha = .81$. This variable has shown acceptable convergent validity with body dissatisfaction and muscle-gaining behavior for both boys and girls in previous research (Rancourt & Prinstein, 2010), which was replicated in this study.

Muscle-gaining behaviors. Three items adapted from the Youth Health Risk Behavior Survey (CDC, 1998) assessed muscle-gain behaviors (i.e., "How many times in the past 30 days did you exercise or work out to gain weight or to get more muscular?", "How many times in the past 30 days did you eat more food, more calories, or foods high in protein, fat, or carbohydrates to gain weight or to get more muscular?", "How many times in the past 30 days did you do exercises to strengthen or tone your muscles [e.g., push-ups, sit-ups, or weight-lifting]?"). Frequency

of the behavior was rated over the past 30 days on a 5-point scale ranging from 1 = 0 times to 5 = *Every day or almost every day*. A mean score was computed across items at each time point with acceptable reliability for boys and moderate reliability for girls, Time 1: boys: $\alpha = .75$, girls: $\alpha = .56$; Time 2: boys: $\alpha = .74$, girls: $\alpha = .60$; Time 3: boys: $\alpha = .75$, girls: $\alpha = .50$. Muscle-gaining behavior was positively correlated with dieting behavior for both boys and girls in previous research (Rancourt & Prinstein, 2010), and this result was replicated in the current study.

Pubertal timing. Participants completed the Pubertal Development Scale (Petersen, Crockett, Richards, & Boxer, 1988), which includes five items assessing pubic hair growth, skin changes, and growth spurt. Additionally, boys rated facial hair and voice deepening, and girls rated breast development and menarche. Items were rated using a 4-point Likert scale ranging from 1 = *not started* to 4 = *seems completed*. As in past research (e.g., McBride, Paikoff, & Holmbeck, 2003), responses for girls' menarche were coded (1 = *no*; 4 = *yes*) to create a scale comparable to other items, and mean scores across all five items were computed separately for boys and girls (boys: $\alpha = .79$, girls: $\alpha = .76$). Scores then were converted to *z*-scores within grade to allow for a measure of pubertal timing, with higher scores indicating more advanced pubertal development compared to other same-grade participants.

Body Mass Index. Preadolescents' birth date and self-reported Time 1 height and weight were used to determine BMI. BMI percentiles (range 0–100) based on age and gender were calculated as recommended by the CDC (Mei et al., 2002). The majority of participants reported having a healthy weight (between the 5th and 85th percentiles; 61.7%). A total of 3.1% of participants were underweight (less than the 5th percentile), and 19.4% of all participants fell into the overweight (between the 85th and 95th percentiles; 12.2%) or obese (greater than the 95th percentile; 7.2%) categories. One hundred participants (15.7%) did not provide enough data to calculate their BMI.

Friendship nominations. Within each school, students were organized into academic teams, each roughly twice the size of a traditional academic classroom, and students attended classes with other students assigned to their academic team. Study participants identified an unlimited number of their "closest friends" from alphabetized rosters of all academic teammates. The order of the alphabetized names on each roster was counterbalanced (e.g., Z through A) to control for possible order effects on nominee selection.

Friendship groups at Time 1 were identified in each grade using a three-step procedure. First, all overlapping groups were identified (the clique routine in UCINET version 6.145, Borgatti, Everett, & Freeman, 2002). These groups consisted of at least three students who were all directly connected with one another via reciprocated or unilateral friendship nominations. These analyses detected a total of 1,306 groups in the sixth grade (ranging from 3 to 10 members; *Mdn*, 4.00, *M* = 4.33, *SD* = 1.39), 1,290 groups in the seventh grade (ranging from 3 to 7 members; *Mdn* = 4.00, *M* = 4.16, *SD* = 1.03), and 1,133 groups in the eighth grade (ranging from 3 to 8 members; *Mdn*, 4.00, *M* = 4.26, *SD* = 1.16). In the second step, hierarchical cluster analyses were performed to classify individuals into nonoverlapping friendship groups by aggregating groups with more than one member in common. Friendship groups derived from the hierarchical clustering method have

been found to produce similar groupings as those found using principal components and social-cognitive mapping methods (Rodkin & Ahn, 2009). The most appropriate cluster solution in each grade was selected based on theoretical considerations (e.g., meaningful size of peer groups), and by employing the E(xternal)-I(nternal) index (Krackhardt & Stern, 1988) to determine which cluster solution maximized the number of nominations within groups and minimized the number of nominations between groups. A total of 89 nonoverlapping friendship groups were yielded using these criteria: 33 in sixth grade ($M = 9.79$ members, $SD = 7.36$), of which there were eight all-female, 18 all-male, and seven mixed-gender friendship groups; 28 groups in seventh grade ($M = 10.25$ members, $SD = 7.66$), of which there were 13 all-female, nine all-male, and six mixed-gender friendship groups; and 28 groups in eighth grade ($M = 9.75$ members, $SD = 5.69$), of which there were three all-female, 15 all-male, and 10 mixed-gender friendship groups.

In the final step, the hierarchical clustering solution was cross-validated by performing additional subgroup analyses (the factions routine in UCINET), which verified that the 89 friendship groups resulted in the fewest number of errors (defined as ties between groups and the absence of ties within groups) compared to alternative numbers of groups. The two partitioning methods produced similar groupings (Cramer's $V = .62, .63,$ and $.66$ in sixth, seventh and eighth grade, respectively). The groups identified by the factions analyses led to a similar pattern of results. Analyses used the groups identified from the hierarchical clustering method.

Average friendship group behaviors. Friendship group scores of dieting and muscle-gaining behavior were calculated at Time 1. These scores describe the average body change behaviors of at least two friends within the friendship group to which a preadolescent belongs. The preadolescents' own scores were not included in these measures.

Data Analysis

Two cross-sequential latent growth curve models were estimated in Mplus 6.0 (Muthén & Muthén, 1998-2010) to examine hypothesized longitudinal associations between the level of dieting or muscle-gaining behavior within a preadolescent's friendship group and individuals' own level of corresponding behavior across grades. Due to the complex sampling design in which participants were sampled within grades and friendship groups were nested within grades, stratification (grade) and clustering (friendship group) information was incorporated into the model. Participants were in grade 6, 7, or 8 at Time 1. Data were collected at three annual time points, allowing the data to be recoded to estimate the trajectory of behavior change across the years (i.e., Grades 6-10). A multiple group analysis was conducted to examine group gender composition (i.e., all-female, all-male, mixed-gender) as a moderator of individuals' trajectories of dieting and muscle-gaining behavior. Maximum likelihood estimation with robust standard errors (MLR) was used, allowing estimation of parameters, non-standard errors, and a chi-squared statistic that are robust to non-normality and nonindependence of observations. Given the sample size and proposed statistical model, to achieve power of .80 to detect significant associations, the minimum parameter values of friendship group levels dieting and muscle-gaining behavior on

individuals' own trajectories needed were 1.73 and .13, respectively.

Unconditional models (i.e., no predictors of the latent intercept and slope) initially were fit to each outcome to estimate the overall pattern of growth within types of friendship groups (i.e., all-female, all-male, and mixed-gender), using chi-squared difference tests to identify error variance and covariance paths that could be constrained to equality across groups for model parsimony. Next, conditional models, which included predictors of the latent intercept and slope, were estimated to examine the impact of the predictor variable (i.e., average friendship group dieting or muscle-gaining behavior) on initial levels and trajectories of body change behavior. Paths also were included to examine BMI percentile and pubertal timing as predictors of the intercept and slope. Covariance paths among the exogenous variables as well as paths between exogenous variables and the model intercept and slope were tested for invariance across friendship group gender compositions to examine the moderation hypotheses. Paths were constrained for parsimony when doing so did not significantly worsen the overall model fit. Significant interactions between exogenous variables and time were probed according to guidelines offered by Aiken and West (1991). All estimates presented are unstandardized.

Results

Table 1 includes the means and standard deviations for the variables of interest for boys and girls, as well as the number of participants by gender in each type of friendship group. Girls reported significantly higher levels of dieting behaviors at Times 2 and 3 than boys. Boys reported significantly higher levels of muscle-gaining behavior than girls across all three time points. Boys had significantly higher BMIs than girls, whereas girls were more pubertally advanced than boys. Boys were significantly more likely than girls to be members of a single-sex friendship group. Table 2 includes the correlations between continuous variables, computed separately for boys and girls.

Friendship Group Descriptive Statistics

Of the 89 friendship groups identified across all grades, 25 were all-female, 42 were all-male, and 22 were mixed-gender friendship groups. Eleven individuals were identified as isolates (i.e., not part of a friendship group) and were not included in the analyses. Stratifying by friendship group gender composition, Table 3 presents average friendship group levels of body change behavior, mean BMI, and mean pubertal timing. Mixed-gender friendship groups had the highest average levels of dieting behavior, whereas all-male friendship groups had the highest level of average group muscle-gaining behavior. Boys in all-male friendship groups had the highest BMIs and girls in all-female groups had the earliest development.

Prediction of Dieting Behaviors

The final unconditional model provided an excellent fit to the data, $\chi^2(35) = 37.55, p = .35; \chi^2/DF = 1.07; CFI = .99; RMSEA = .02$. Results of this overall growth model suggested a significant increase in dieting behaviors over time for all-female friendship groups, $b = .13, SE = .06, p = .04$, and a significant

Table 1
Means (and Standard Deviations) for Primary Variables

	Boys	Girls	<i>t</i>
Time 1			
Dieting behavior	1.93 (1.24)	2.13 (1.31)	<i>t</i> (612) = -1.88
Muscle-gaining behavior ⁺	2.45 (1.18)	1.90 (.86)	<i>t</i> (588) = 6.79**
Body mass index	65.47 (27.78)	49.44 (27.71)	<i>t</i> (535) = 6.69**
Pubertal timing	-.36 (.89)	.37 (.97)	<i>t</i> (627) = -9.74**
Time 2			
Dieting behavior	1.84 (1.21)	2.09 (1.27)	<i>t</i> (551) = -2.35**
Muscle-gaining behavior ⁺	2.39 (1.17)	1.94 (.88)	<i>t</i> (519) = 5.16**
Time 3			
Dieting behavior ⁺	1.71 (1.15)	2.29 (1.39)	<i>t</i> (474) = -5.07**
Muscle-gaining behavior ⁺	2.47 (1.21)	1.96 (.83)	<i>t</i> (419) = 5.40**
Single-gender Group Membership	<i>n</i> = 247	<i>n</i> = 153	
Mixed-gender Group Membership	<i>n</i> = 78	<i>n</i> = 158	$\chi^2(1) = 48.92^{**}$

⁺ unequal variances across gender. * *p* < .05. ** *p* < .01.

decrease in dieting behavior for all-male friendship groups, *b* = -.08, *SE* = .03, *p* = .01. A nonsignificant slope was observed for mixed-gender friendship groups, *b* = .05, *SE* = .03, *p* = .12.

Next, average level of Time 1 dieting behavior within preadolescents' friendship group, preadolescents' BMI percentile, and preadolescents' pubertal timing were added to the model as predictors of both the intercept and slope parameters describing the trajectory of preadolescents' own dieting behavior. The gender composition of preadolescents' friendship group was considered as a moderator of the association of each of these predictors on both the intercept and slope of participants' individual dieting behavior trajectories; however, for ease of presentation, difference tests of model fit only are presented for the examination of the main hypothesis (full results available from the first author upon request). An omnibus significance test was performed to examine the moderator hypothesis. A chi-squared difference test suggested an interaction between group gender composition and preadolescents' own dieting behavior trajectories, $\Delta\chi^2(2) = 8.68$, *p* = .01. No significant differences between the socialization of dieting trajectories within the all-female and all-male groups, $\Delta\chi^2(1) = 1.71$,

p = .19, or all-female and mixed-gender friendship groups, $\Delta\chi^2(1) = .44$, *p* = .50, were observed. Further probing demonstrated that friend behavior affected members of all-male and mixed-gender friendship groups differently, $\Delta\chi^2(1) = 9.19$, *p* < .01. Allowing the path from average friendship group level of dieting behavior to the slope to vary freely for all-male friendship groups and constraining it to be equal across the all-female and mixed-gender friendship group compositions produced the best model based on overall fit statistics. The final model was a good fit, $\chi^2(74) = 87.01$, *p* = .14; $\chi^2/DF = 1.18$; CFI = .97; RMSEA = .03 (see Table 4).

Consistent with the primary socialization hypothesis, for boys in all-male friendship groups, the average friendship group level of dieting behavior was significantly positively associated with changes in boys' own dieting trajectories, *b* = .18, *SE* = .05, *p* < .01. This was in contrast to the overall significant and negative dieting behavior trajectory for all-male friendship groups, *b* = -.08, *SE* = .03, *p* = .01, suggesting a significant interaction between average friendship group level of dieting behavior and participants' own dieting trajectory over time. Probing this inter-

Table 2
Correlations of Primary Variables at Times 1, 2, and 3 by Gender

	1	2	3	4	5	6	7	8	9	10
Time 1										
1. Dieting behavior	—	.40**	.09	.04	.41**	.05	.42**	.14*	.40**	.08
2. Muscle-gaining behavior	.38**	—	.06	.18**	.04	.11*	.15*	.53**	.11	.30**
3. Grp. dieting behavior	.07	.14*	—	.35**	.08	.10	.06	.07	.12	.14*
4. Grp. muscle-gaining beh.	.10	.10	.52**	—	.10	.10	.10	.22**	.04	.11
5. Body mass index	.40**	-.06	-.04	.08	—	.23**	.35**	-.04	.39**	-.06
6. Pubertal timing	.22**	.08	.05	.07	.22**	—	.16*	.15*	.20**	.17**
Time 2										
7. Dieting behavior	.51**	.21**	.07	.04	.29**	.16**	—	.31**	.39**	.09
8. Muscle-gaining behavior	.23**	.43**	.06	.06	-.15*	.04	.40**	—	.14*	.50**
Time 3										
9. Dieting behavior	.42**	.13*	.10	.05	.26**	.16*	.50**	.19**	—	.27**
10. Muscle-gaining behavior	.12	.35**	.12	.16*	-.11	-.01	.14*	.41**	.36**	—

Note. Correlations of primary variables among boys presented above the diagonal, and correlations of primary variables among girls are presented below the diagonal.

* *p* < .05. ** *p* < .01.

Table 3
Means (and Standard Deviations) of Group-Level Behaviors, BMI, and Pubertal Development Within Types of Friendship Groups

	All-male	All-female	Mixed-gender	F
Time 1				
Group dieting behavior ⁺	1.89 (.64) ^a	2.00 (.60) ^a	2.18 (.37) ^b	F(2, 606) = 17.93**
Group muscle-gaining ⁺	2.48 (.62) ^b	1.79 (.33) ^a	2.13 (.38) ^c	F(2, 623) = 98.91**
Body mass index	67.26 (27.72) ^b	48.78 (28.40) ^a	53.37 (27.59) ^a	F(2, 534) = 21.28**
Pubertal timing ⁺	-.32 (.88) ^b	.39 (.97) ^a	.07 (1.04) ^c	F(2, 626) = 26.74**

⁺ indicates significantly different variances across group compositions. Row means with superscripts are significantly different from each other. * *p* < .05. ** *p* < .01.

action at one standard deviation above and below the mean revealed that lower friendship group levels of dieting behavior were associated with decreases in individuals' dieting trajectories, whereas higher friendship group dieting behavior was associated with increases in individuals' dieting trajectories (see Figure 1). Average friendship group level of dieting behavior was not significantly associated with preadolescents' own dieting trajectories for members of all-female or mixed-gender friendship groups, *b* = -.02, *SE* = .06.

As a secondary assessment of the strength of socialization processes in this sample, the absolute values of the standardized path coefficients were used as approximates of effect sizes (small: < .10; medium: .30; large: .50; Kline, 2005). A large effect size of $\beta = .79$ was observed for the prediction of individuals' dieting trajectories by friendship group level of dieting behavior among the all-male friendship groups. Small effect sizes of $\beta = .06$ and $\beta = .04$ were observed for the prediction of individuals' dieting trajectories by friendship group level of dieting behavior among the all-female and mixed-gender groups, respectively.

Prediction of Muscle-Gaining Behaviors

The final unconditional model had an excellent fit, $\chi^2(36) = 41.25, p = .25; \chi^2/DF = 1.15; CFI = .98; RMSEA = .03$. Results of this constrained unconditional model suggested a significant increase in muscle-gaining behaviors over time for all-female friendship groups, *b* = .07, *SE* = .03, *p* = .02, and mixed-gender friendship groups, *b* = .09, *SE* = .04, *p* = .02. A nonsignificant

slope was observed for all-male friendship groups, *b* = .01, *SE* = .05, *p* = .79.

Next, average level of Time 1 muscle-gaining behavior within preadolescents' friendship group and preadolescents' pubertal timing were added to the model as predictors of both the intercept and slope parameters describing the trajectory of preadolescents' own muscle-gaining behavior. Research has not found a consistent association between BMI and muscle-gaining behaviors (see Cafri, van den Berg, Thompson, 2006 and Ricciardelli & McCabe, 2004 for reviews). BMI may be confounded with muscle-gaining behaviors because the value does not distinguish between individuals who have high levels of muscle mass and those who have high levels of adipose tissue. Pubertal timing, however, may be associated with the pursuit of muscularity (e.g., Ricciardelli & McCabe, 2003). It was decided that only pubertal timing would be included in the conditional model predicting muscle-gaining behaviors. An omnibus significance test was performed to examine the moderator hypothesis. A chi-squared difference test revealed that this assumption did not significantly affect the model fit, $\Delta\chi^2(2) = 5.75, p = .06$, suggesting that gender composition of friendship group did not moderate the socialization of preadolescents' muscle-gaining behavior. In light of this trend toward significance, a theoretically based decision was made to explore whether model fit would be improved by allowing one of the paths to freely vary. Chi-square difference tests revealed that socialization of muscle-gaining behavior within all-female friendship groups was significantly different from this process within both the

Table 4
Prediction of Body Change Strategy Trajectory From Friendship Group Level of Body Change Strategy; Unstandardized Regression Weights (SE)

Outcome/Predictors	All-male friendship groups		All-female friendship groups		Mixed-gender friendship groups	
	Intercept	Slope	Intercept	Slope	Intercept	Slope
Dieting behavior						
BMI percentile ^a	.17 (.02)**	-.01 (.01)	.17 (.02)**	-.01 (.01)	.17 (.02)**	-.03 (.01)**
Pubertal timing	.16 (.07)*	-.02 (.03)	.12 (.08)	-.02 (.03)	.16 (.07)*	-.02 (.03)
Group-level dieting behavior	-.29 (.15)*	.18 (.05)**	.45 (.12)**	-.02 (.06)	-.29 (.15)*	-.02 (.06)
Muscle-gaining behavior						
Pubertal timing	.09 (.05) ⁺⁺	.04 (.03)	.09 (.05) ⁺⁺	-.05 (.03) ⁺⁺	.09 (.05) ⁺⁺	-.05 (.03) ⁺⁺
Group-level muscle-gain. behavior	.16 (.18)	.08 (.05) ⁺	.16 (.18)	-.12 (.11)	.16 (.18)	.08 (.05) ⁺

^a BMI was rescaled in the final statistical models by dividing it by 10 (range 0–10) to increase interpretability of parameter estimates. ⁺ *p* < .09. ⁺⁺ *p* < .06. * *p* < .05. ** *p* < .01.

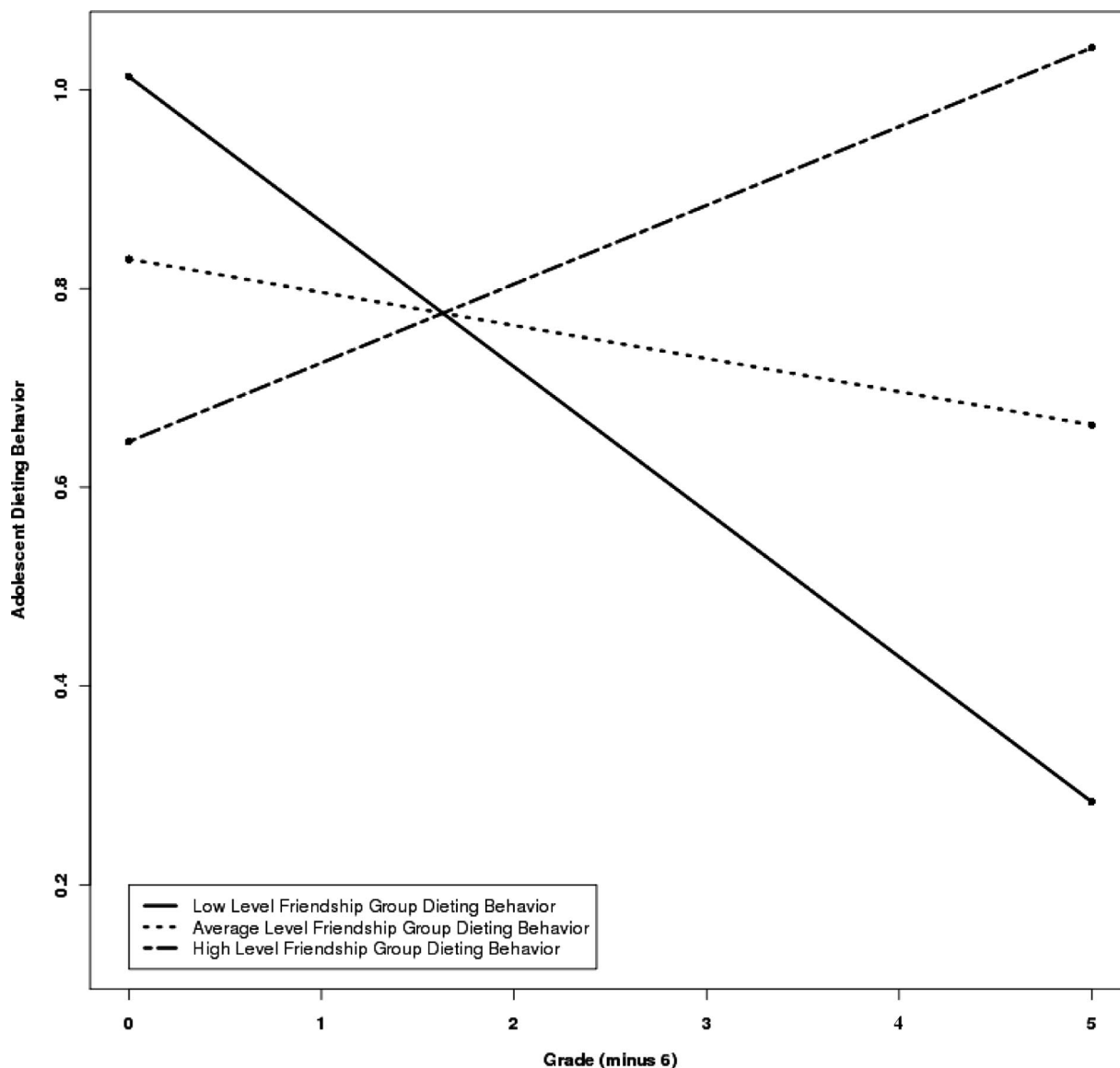


Figure 1. Group dieting behavior by time interaction for all-male friendship groups on individual dieting trajectories. Simple slopes for average and high friendship group level of dieting behavior were not significantly different from zero, $b = -.03$, $SE = .08$, $p = .65$, and $b = .08$, $SE = .09$, $p = .38$, respectively. The simple slope for low levels of friendship group dieting behavior approached significance, $b = -.15$, $SE = .08$, $p = .06$.

all-male, $\Delta\chi^2(1) = 30.96$, $p < .01$, and mixed-gender friendship groups, $\Delta\chi^2(1) = 4.06$, $p = .04$. There was no significant difference between socialization within the all-male and mixed-gender friendship groups, $\Delta\chi^2(1) = .12$, $p = .72$. Thus, the path from average friendship group level of muscle-gaining behavior to the slope was constrained to be equal across the all-male and mixed-gender friendship group compositions and allowed to vary freely for all-male friendship groups. The final model had good fit, $\chi^2(62) = 57.96$, $p = .62$; $\chi^2/DF = .94$; CFI = 1.0; RMSEA = .00 (see Table 4).

Results did not reveal strong support of the socialization hypotheses. Although no results were significant at an alpha level of .05, higher friendship group levels of muscle-gaining behavior

were weakly associated with greater increases in preadolescents' own muscle-gaining behavior in all-male and mixed-gender friendship groups, $b = .16$, $SE = .15$, $p = .089$. No significant association was observed within all-female friendship groups, $b = -.12$, $SE = .11$, $p = .29$. The observed effect sizes suggested small socialization effects in all-male ($\beta = .17$), all-female ($\beta = .12$), and mixed-gender friendship groups ($\beta = .12$).

Discussion

Epidemiologic data, in conjunction with research and theory from developmental and social psychology, indicate that youth are especially likely to initiate dieting and muscle-gaining behaviors

during the transition to adolescence. Peers may be influential to adolescents' adoption of these behaviors, but little research has explored the socialization of body change behavior within preadolescent friendship groups. The present study addresses this gap by examining the average level of body change behavior exhibited in preadolescents' friendship group as a longitudinal predictor of preadolescents' own individual trajectories of the corresponding behavior. These trajectories were considered in the context of the gender composition of preadolescents' friendship group.

Contrary to hypotheses, socialization of dieting behavior was not observed within the all-female friendship groups. This finding is consistent with the one other longitudinal study examining associations between levels of dieting in preadolescent girls' friendship groups and girls' own individual dieting trajectories (Woelder et al., 2010). The replication of this finding suggests that all-female friendship groups may not be a risk factor for girls' normative dieting behavior escalating into higher-risk dieting behavior (i.e., increasing dieting trajectory over time). The average level of dieting behavior within all-female friendship groups was associated with girls' own initial level of dieting behavior, suggesting that the absence of socialization could be due in part to multiple selection processes (i.e., assortative pairing). As girls' dieting behavior changed over time, their friendship group membership also may have changed such that they affiliated with other youth who had similar levels of dieting behavior. Examination of selection processes will be important to reconcile the differences observed between findings from cross-sectional (Paxton et al., 1999) and longitudinal (Woelders et al., 2010) studies.

Consistent with socialization hypotheses, peer influence of dieting behavior was observed in all-male friendship groups. Preadolescent boys who were members of all-male friendship groups with low levels of dieting behavior decreased their dieting behavior over time, whereas members of groups with high levels of dieting had increases in their own dieting trajectories. There are three ways this interaction can be understood. First, it may be that the low levels of dieting observed are normative behaviors that decline as boys advance in pubertal development. Second, it may be that being in a friendship group with low levels of dieting behavior is protective against, whereas membership in a friendship group with high levels of dieting behavior is a risk factor for, development of unhealthy levels of dieting behavior. Third, there may be other characteristics of all-male friendship groups, or the individuals who are members of those groups, that might account for this finding. For example, members of all-male friendship groups may be more likely to be athletes and identify other teammates as their closest friends. Sports participation could be protective against the development of maladaptive dieting behavior because of a particular sport's culture (e.g., football emphasis on bulk and strength). Research is needed to replicate and understand the broader implications of this finding.

The modest influence of all-male friendship groups on boys' muscle-gaining behavior may be related to participants' pubertal development. Research suggests that pubertal timing may be associated with the pursuit of muscularity (e.g., Ricciardelli & McCabe, 2003). Indeed, in this study, boys' pubertal development at Time 1 was significantly positively correlated with muscle-gaining behavior over time. Muscle-gaining behaviors may be more frequent later in adolescence once boys are biologically able to gain muscle mass in a way that is consistent with the muscular ideal. It

is possible that using an older adolescent sample of males would reveal a stronger socialization effect.

It is important to note that it is difficult to evaluate the power associated with specific path coefficients in latent curve models because of the large number of assumptions about population parameters that must be made. Based on the data collected and the model proposed, it was estimated that for power of .80, the population parameter values would need to be approximately twice as large as those observed. Despite less than ideal power, significant results were observed in conjunction with promising small effects sizes. Results may be attenuated and findings might be stronger with a sample large enough to achieve power of .80.

Limitations

There were a number of limitations to this study that should be considered. First, the sample was ethnically/racially homogenous, limiting the generalization of results. The impact of ethnic/racial body-related norms and friendship group composition needs further exploration. Second, self-reported height and weight were used in the calculation of BMI. Although there are studies supporting the accuracy of preadolescents' body estimations (e.g., Elgar & Stewart, 2008), other research suggests underestimations by up to 27% of participants, especially among males, ethnic minorities, and preadolescents from lower income households (Park, 2011). Future research should use objective measures to calculate participants' BMI to better understand associations between BMI and body change behaviors. Third, the measures used were not diagnostic and do not have specified cut-offs to identify at what point behaviors are considered problematic. There was no way to ascertain the extent to which the participants' engagement in dieting and muscle-gaining behaviors was pathological or led to physical or psychosocial impairment. Fourth, qualitative research is needed to investigate the ecological validity of the current procedure used for identifying friendship groups. The extent that adolescents grouped together by UCINET report reciprocal support and emotional closeness, in addition to spending time together, would provide further support of the methodological approach used. Fifth, internalization of appearance norms was not assessed. It is possible that the extent to which preadolescents endorse the thinness or muscular norms moderates their susceptibility to socialization. Sixth, the model did not account for participation on sports teams. There may be a correlation between sports team membership and dieting and/or muscle-gaining behavior. For example, boys who are wrestlers may report higher levels of both dieting and muscle-gaining behaviors compared to males who participate in football and likely are more focused on gaining muscle. Lastly, the structure of friendship groups was assessed only at one time point, prohibiting examination of friendship selection effects (i.e., assortative pairing). Past research suggests that friendship groups remain relatively stable over time (i.e., approximately 60% of preadolescent friendship group members will remain together over a 1-year interval; Degirmencioglu, Urb-erg, Tolson, & Richard, 1998). However, member fluidity within a friendship group could attenuate socialization processes of body change behaviors because it may be more difficult to establish a single appearance norm.

Conclusion

This study extends prior research by examining the influence of a specific group of peers on preadolescents' body change trajectories over time, as well as whether the gender of fellow group members may moderate that effect. In the present study, socialization via friendship groups was detected for dieting behavior and, at a trend level, for muscle-gaining behavior for members of all-male friendship groups. Understanding how friendship groups may facilitate socialization differently for preadolescents in all-male, all-female, or mixed-gender friendship groups is helpful to identify which preadolescents may be a higher risk of developing unhealthy behavior trajectories. Future research should continue to incorporate the friendship group context into the examination of peer influence and socialization processes of body change behaviors, as well as other health risk behaviors, among preadolescents.

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