J Youth Adolescence
DOI 10.1007/s10964-015-0275-3

EMPIRICAL RESEARCH

Peer Group Similarity in Perceptions of Pubertal Timing

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Received: 5 November 2014 / Accepted: 25 March 2015

Abstract Self-report measures of perceived pubertal timing correspond only weakly with clinical measures of "objective" physical development. Peer and school contexts shape adolescents' self-perceptions of pubertal timing. The current study examined associations between perceived pubertal timing and the pubertal timing reported by nominated friends and schoolmates. Participants included 2817 adolescents (M_{age} = 16.6; 49 % female; 16 % Black; 20 % Hispanic) from the National Longitudinal Study of Adolescent Health. Three measures of pubertal timing were included: age-standardized ratings of body changes, comparisons of development relative to peers (relative timing), and, in females, age at menarche. It was hypothesized that relative timing, which explicitly asks adolescents to compare themselves to their peers, would be related to the age-standardized pubertal timing of nominated friends and schoolmates. Surprisingly, there were no associations between relative timing and age-standardized pubertal timing reported by peers, suggesting that pubertal self-perceptions do not fluctuate in response to the average level of development in a friend group. Instead, males were similar to nominated friends and schoolmates in age-standardized ratings of body changes, and females were similar to nominated friends in relative timing, controlling for race, ethnicity, and age. Different self-report measures of pubertal timing index different underlying constructs, and the social processes that influence adolescents' perceptions of pubertal maturation may differ between genders.

Keywords Pubertal timing · Puberty · Peers · Measurement

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Introduction

The timing of puberty is a consistent predictor of a number of health behaviors and associated outcomes. Among girls, early pubertal timing is associated with increased risk for depression, disordered eating, risky sexual activity, sexual victimization, early childbearing, delinquency, and substance abuse (reviewed in Graber et al. 2004). Less research has examined the role of pubertal timing in boys' adjustment and findings are more varied. The association between boys' earlier pubertal timing and externalizing pathology appears robust (reviewed in Mendle and Ferrero 2012). Regarding internalizing problems, however, some longitudinal studies have found higher rates of depression among early maturing boys (e.g., Rudolph and Troop-Gordon 2010), whereas other studies suggest higher rates of depression in later maturing boys, particularly in the context of problematic peer relationships (Conley and Rudolph 2009).

Much of the research on health sequelae of pubertal timing has relied on self-report measures of pubertal timing, which correspond only modestly with clinical measures of development such as physical exam (Dorn and

Published online: 04 April 2015

Biro 2011). Self-report measures of physical development are considered imperfect proxies of actual development, and their use is often noted as a limitation in studies of puberty (e.g., Shirtcliff et al. 2009; Dorn et al. 2006). Age at menarche is considered the most "objective" self-report measure of timing in girls, because it is a discrete event that tends to be reported with reasonable accuracy compared to historical medical records (Casey et al. 1991). However, recall of age at menarche is not perfect, and menarcheal status is a dichotomous measure that captures only one aspect of pubertal development occurring relatively late in the process (Shirtcliff et al. 2009). Nevertheless, these subjective measures of pubertal timing are often stronger predictors of key health outcomes, such as eating disorders, substance abuse, and delinquency than more "objective" indicators (e.g., Deppen et al. 2012). Given the impact of subjective pubertal timing on adolescent behavior, it is important to understand the mechanisms that may lead an adolescent to perceive her or himself as on-time or off-time. This article considers the social comparisons and relationships that may contribute to adolescents' self-perceptions of physical maturation.

Measures of Subjective Pubertal Timing

Although often considered together, there are important conceptual distinctions among different types of self-report measures of pubertal timing (Cance et al. 2012). The widely used Pubertal Development Scale (PDS; Petersen et al. 1988), for example, asks adolescents to rate the progression of specific physical changes (e.g., breast development, voice changes, body hair) using scales with visual or descriptive anchors. Self-report measures can be standardized by age within each sex to create an indicator of pubertal timing (e.g., Natsuaki et al. 2009). In the current article, we refer to these age-standardized ratings of body changes as "*stage-normative timing*." Stage-normative timing predicts substance use (Costello et al. 2007), disordered eating (Baker et al. 2012), delinquency (Harden and Mendle 2012), and depression (Natsuaki et al. 2009). Stage-normative measures are modestly correlated with physician ratings of Tanner stages and with pubertal hormones (Bonat et al. 2002).

In contrast, "peer-normative" or "relative" pubertal timing measures directly ask adolescents to compare themselves to their peers. Some of the strongest effect sizes for the most clinically significant outcomes are found in studies that explicitly ask one to compare their physical development to that of their peers. For example, a study that linked pubertal timing with risk for suicide assessed timing by asking "when you look at yourself now, do you think that you are more or less physically mature compared to others [of the same sex] of your age?" (Wichstrøm 2000). In the current article, we refer to this type of peer comparison measure as "*relative pubertal timing*." Earlier relative pubertal timing is associated with internalizing and externalizing problems in both males and females (Carter et al. 2011; Yuan 2007). These associations persist into mid and late adolescence, even after pubertal development is complete (Kretsch et al. 2014).

Social Comparisons and Subjective Pubertal Timing

Identity development is a key task of adolescence, and the social context—specifically the peer context—plays a role in this process (Erikson 1993; McAdams and Olson 2010). Individuals compare themselves to significant others in order to make sense of who they are and where they fit in the world (Finkenauer et al. 2002; Adams and Marshall 1996). This process is made explicit in survey measures of relative pubertal timing, which introduce "a psychosocial component that is missing from the stage-normative measure" (Cance et al. 2012, p. 766). To our knowledge, however, no previous studies have examined whether the peer context is differentially related to stage-normative versus relative pubertal timing. If the relative pubertal timing measure reflects a peer comparison process that stage-normative measures do not, the pubertal timing of one's peer group is hypothesized to predict relative pubertal timing more strongly than stage-normative timing.

Peers' pubertal timing may relate to individuals' perceived relative pubertal timing in a number of ways. Social comparison theory describes two processes that may occur when individuals compare themselves to others: contrast and assimilation (Festinger 1954; Blanton 2001). When adolescents are asked to compare their development "to other girls or boys your age," their reference group may be limited to the peers who are visible to them, particularly, those peers with whom they frequently interact. If a peer contrast process is unfolding, peers' pubertal timing will influence an individual's ratings such that an early-maturing adolescent may not perceive himself or herself as early maturing if his/her friends are similarly developed, and those who mature on-time or late according to population norms might perceive themselves as early developers if they matured earli*er* than their peer group. Peer contrast would thus result in an inverse association between peer pubertal timing and one's own perceived pubertal timing for early maturing adolescents.

Alternatively, it is possible that friends and schoolmates will be similar in perceptions of pubertal timing, through processes of selection or assimilation. Early or late maturing adolescents may experience rejection by or conflict with their typically-developing peers (e.g., Haynie and Piquero 2006), and, as a result, select friends who are similar in pubertal status. Through assimilation,

adolescents also incorporate features of their peer group into their self-image. Thus, adolescents who have early maturing friends may perceive themselves (or desire to see themselves) as early maturing, regardless of their objective pubertal status. This may play a role in similarity for behaviors such as substance use, delinquency, athletic involvement, academic achievement, and sexual activity, all of which are associated with pubertal timing (reviewed in Mendle et al. 2007; Mendle and Ferrero 2012).

Cross-cultural differences may also play a role in perceived development. Friends and schoolmates are often similar to one another in race and ethnicity (McPherson et al. 2001), and there are racial and ethnic differences in pubertal timing: On average, non-Hispanic White adolescents mature slightly later than Black and Hispanic adolescents (Sun et al. 2002), although they do not necessarily perceive themselves this way (Cance et al. 2012). Friends are also similar in broader aspects of physical appearance, including body mass index (Cohen-Cole and Fletcher 2008; Fowler and Christakis 2008), which is linked with both perceived and actual earlier development and varies across ethnic and socioeconomic groups (Bonat et al. 2002).

Moderation by Individual Characteristics

Studies examining the health effects of pubertal status often limit samples to a narrow age range in early adolescence (i.e., middle school), when there is the greatest variation in objective pubertal status (Lee and Styne 2013; Parent et al. 2003). By mid-adolescence (i.e., high school), when nearly everyone has reached Tanner Stage 5, one might expect less variation in perceived relative timing, with most adolescents rating themselves as average. Previous analyses, however have shown that there are individual differences in perceived relative timing even in high school age samples, and that these individual differences continue to predict important behavioral outcomes (e.g., Kretsch et al. 2014). It is not yet clear whether the social influences for perceived relative timing are the same for younger adolescents, for whom the physical changes of puberty are still ongoing, as they are for older adolescents, whose objective physical development is essentially complete. Several lines of research—on puberty, peer influence, and social cognition—suggest that peer pubertal timing might be more salient for younger adolescents. Perceptions of pubertal timing become more stable (Cance et al. 2012) and more accurate (Dubas et al. 1991) over time, suggesting that, by late adolescence, ratings of relative timing will be less influenced by an individual's peer group. Some research suggests that susceptibility to peer influence decreases between ages 14 and 18 (Steinberg and Monahan 2007). If peer influence on perceptions of relative pubertal timing show the same pattern, one would expect that associations between self-reports of individual and peer timing would decrease over time.

In addition to age, it is important to consider potential gender differences in how peers shape perceptions of pubertal timing. Gender differences in social orientation, peer relationships, peer network structure, and body comparison tendencies suggest that peer comparisons may differ for males and females. Studies of friendship network structure suggest that girls have more intimate friendship networks and are more connected to school peer networks than boys (Urberg et al. 1995). A study on social comparison and body image in 7th and 10th graders found that girls made more appearance-based social comparisons than boys (Jones 2001). Similar gender differences have been observed among first-year college students (O'Brien et al. 2009). Given these findings, and the longstanding view of girls as more peer-oriented than boys (e.g., Rose and Rudolph 2006), one might expect that peer characteristics would be more salient for girls' self image that others. However, research on gender differences in susceptibility to peer influence in general is inconclusive. As Brechwald and Prinstein (2011) summarized, gender moderates peer socialization effects "only within more complex two- and three-way interaction terms that also consider age and the specific behavior being influenced" (p. 172).

Goals and Hypotheses of the Current Study

The goals of the current study were twofold. First, in an exploratory analyses, we examined whether adolescents were similar to their friends and schoolmates in three measures of pubertal timing: (a) "stage-normative" pubertal timing, an age-standardized rating of specific body changes; (b) relative pubertal timing, which directly asked adolescents how developed they were compared to their same-age peers; and (c) girls' age at menarche. Second, we tested peers' pubertal timing (relative, stage-normative, and age at menarche) as a predictor of individuals' relative and stage-normative pubertal timing. We predicted that, controlling for one's own stage-normative timing (and, for girls, age at menarche), the stage-normative timing of one's peers would predict one's own relative pubertal timing. Specifically, adolescents whose peers reported earlier stage-normative timing would report later relative pubertal timing. This prediction was based on the theory that the relative timing measure elicits a social comparison process in which adolescents use their peers as reference groups. We also predicted that, controlling for one's own relative timing, the relative timing of one's peers would *not* predict one's own stage-normative pubertal timing. This prediction was based on the theory that the stage-normative measure does not elicit the same peer comparison process and, as

such, should not be influenced by pubertal timing of one's peers. We examined both the main effects of age on perceptions of pubertal timing and the interactions between age and peers' stage-normative pubertal timing. We predicted that peers' stage-normative timing would be especially relevant for younger adolescents' relative pubertal timing, because younger adolescents are in the midst of pubertal changes and may be more attuned to differences in maturation among their peer group. Finally, we performed separate analyses for boys and girls, to explore how the associations between peer and individual perceived pubertal timing differed between genders. We did not test gender as a moderator in the full sample, given the different measures of pubertal timing for boys and girls (necessitating that all boys would be missing-by-design on the age at menarche variable).

Method

Participants

Data were drawn from the National Longitudinal Study of Adolescent Health (Add Health). Add Health includes four waves of data on health and risk behavior in a nationally representative sample of adolescents who were in grades 7–12 at the initial wave in 1994. Add Health used a school-based sampling procedure that started with identifying all schools in the US that had at least 30 students (N = 26,666). Schools were stratified according to region, urbanicity, racial composition, school size, and school type. A random sample of 80 schools was selected from these strata, and invited to participate. The feeder middle schools for the high schools in this sample were also invited. Of the selected schools, 79 % agreed to participate, yielding a sample of 134 schools.

A confidential survey was administered to all students in participating schools (N = 90,118) during the 1994–1995 academic year. The survey included questions about demographics, academic achievement, school activities, and delinquent behavior. A subsample of 20,745 students was selected to complete a longer, in-home interview between April and December 1995 (Wave I). The home interview included more questions about sensitive topics including sexual activity, drug and alcohol use, and pubertal development. Individuals who completed this interview were interviewed again approximately 1 year later (Wave II). Two additional interviews, Wave III in 2001–2002, and Wave IV in 2007–2009, have been completed. A complete description of the Add Health study is available at http://www.cpc.unc.edu/projects/addhealth. The current study uses data primarily from the Wave I in-home interview.

One of the goals of Add Health was to understand adolescent behavior in the context of social networks. Adolescents were asked to nominate up to five male and five female friends and were asked to list best friends first. They were allowed to nominate romantic partners and asked to indicate which, if any, nominated friends were romantic partners. Based on these nominations, it was possible to link data between individual participants and their nominated friends within the same school. There were 16 schools in which all adolescents in the school (rather than a subsample) were recruited for the in-home interview. This sample ($N = 3702$) is considered the *saturation sample*. Of the students in the saturation sample, 78 % ($N = 2817$) had data on friends' pubertal timing because they nominated at least one identifiable, same sex friend from the school roster, and this friend reported his or her own pubertal timing. The current study includes data from these 2817 individuals ($M_{age} = 16.60$, range 12.5–20.7) and their same-sex friends.

There were several reasons why some adolescents had no data on friends' pubertal timing (i.e., reasons they were removed from the saturation sample of 3702). First, they may not have nominated any same-sex friends ($N = 232$). Second, they may have nominated only out-of-school same-sex friends or friends who were not on the school roster ($N = 484$). Third, they may have nominated an identifiable friend, but this friend did not provide data on pubertal timing ($N = 169$). Adolescents without data on friends' pubertal timing were more likely to be Black ($\chi^2 = 38.18$, $df = 1$, $p < .001$; 26 vs. 16 %) and/or Hispanic ($\chi^2 = 9.46$, $df = 1$, $p < .001$; 21 vs. 16 %) than those with identifiable nominations. There were no differences in age or gender between those with or without data on peer pubertal timing. Demographic differences between the full Add Health sample ($N = 20,745$) and the current study sample ($N = 2817$) are shown in Table 1.

Measures

Individual Characteristics

Relative Pubertal Timing At Wave I, participants were asked, "how advanced is your physical development compared to other boys/girls your age?" Response options fell on a five point scale, including: "I look younger than most" (1); "I look younger than some "(2); "I look about average" (3); "I look older than some" (4); "I look older than most" (5). The mean response was 3.18 ($SD = 1.10$).

Stage-Normative Pubertal Timing At Wave I, females were asked to rate breast development (1 = "My breasts are about the same size as when I was in grade school" to 5 = "My breasts are a whole lot bigger than when I was in grade school; they are as developed as a grown woman's

Table 1 Descriptive statistics for study sample ($N = 2817$) and full add health sample ($N = 20{,}745$)

	Study sample Mean (*SD*)	Full add health sample Mean (*SD*)
Age*	16.61 (1.56)	16.16 (1.72)
Female	48.92 %	50.52 %
Hispanic*	20.37 %	17.04 %
Black*	15.91 %	23.22 %
Relative pubertal timing	3.18 (1.10)	3.19 (1.13)
Stage-normative pubertal timing	−0.02 (.98)	0.00 (1.00)
Age at menarche	12.22 (1.40)	12.17 (1.42)
Friends' mean age	16.60 (1.42)	
% Hispanic friends	16.89 (32.78)	
% Black friends	11.21 (27.91)	
Friends' relative pubertal timing	3.19 (.88)	
Friends' stage-normative pubertal timing	.02 (.78)	
Friends' age at menarche	12.26 (1.10)	
School mean age	16.62 (.96)	
School % hispanic	14.84 (17.41)	
School % black	24.12 (19.40)	
School relative timing	3.18 (.21)	
School stage-normative	−.02 (.25)	
School age at menarche	12.22 (.19)	

School- and friend-level variables are only available for the saturation sample

* Study sample differs from full sample at $p < .05$

breasts") and body curviness (1 = "My body is about as curvy as when I was in grade school" to 5 = "My body is a whole lot more curvy than when I was in grade school"). Males were asked to rate underarm hair growth (1 = "I have no hair at all" to 5 = "I have a whole lot of hair that is very thick, as much hair as a grown man"), facial hair growth (1 = "I have a few scattered hairs, but the growth is not thick," to 5 = "The hair is very thick, like a grown man's facial hair") and voice changes (1 = "it is about the same as when you were in grade school" to 5 = "it is a whole lot lower than when you were in grade school; it is as low as an adult man's voice"). For each item, we calculated each participant's standardized ($M = 0$, $SD = 1$) deviation from the mean response to this item by adolescents of the same age and gender. These standardized scores on each item were summed. Thus, positive higher values reflected more advanced physical development compared to the physical development reported by same-age same-sex adolescents.

Age at Menarche At Waves I and II, female participants were asked "Have you ever had a menstrual period?" If affirmative, they were asked the month and date of their first menstrual period. At Wave III, participants were asked if they had ever had a menstrual period and how old they were when they had their first menstrual period. The current study used the first reported age at menarche for each adolescent (i.e., if an adolescent initially reported that she began menstruating at Wave I and also reported age at menarche at Wave II, the Wave I initial report was used). This was to avoid telescoping bias (Janssen et al. 2006), which occurs when individuals remember events as closer to the date of the interview than they actually occurred. The mean age of menarche in the sample was 12.23 years ($SD = 1.40$, range = 7 –18 years). The Pearson correlation between age at menarche reported at Waves I and II ($r = .76$, $p < .001$) was higher than that between Waves II and III ($r = .53$, $p < .001$) and between Waves I and III ($r = .53$, $p < .001$). This may be attributable to telescoping or the fact that menarche at Wave III was reported in years, whereas menarche at Waves I and II was reported in months and years.

Friend Characteristics Using peer nominations, we identified a group of male friends and female friends for each adolescent. We averaged the pubertal timing measures of each adolescent's same-sex friends to obtain three measures of friends' pubertal timing: friends' relative pubertal timing, friends' stage-normative timing, and female friends' average age at menarche. We also calculated the average age of nominated friends and the proportions of friends who were Black and Hispanic.

School Characteristics We computed the average relative and stage-normative timing reported by males and females at each school, as well as the average age at menarche of

females at each school. Each school had an administrator fill out a questionnaire about school characteristics, including the percentages of Black, White, and Hispanic students at each school. The percentages of Black students ranged from 0 to 99 %. The percentages of Hispanic students ranged from 0 to 43 %. We also calculated the average age of students at each school, which ranged from 13.92 to 17.29 ($M = 16.62$, $SD = .97$).

Analytic Plan

Analyses were performed in SAS v. 9.2. There was no available measure of male pubertal timing that was equivalent to girls' age at menarche; therefore, separate analyses were performed for males and females. Continuous variables were mean-centered. In an initial step, we examined friend- and school-level similarities for each measure of pubertal timing, by calculating partial correlation coefficients for adolescents and their nominated friends and school-level intraclass correlations.

Relative pubertal timing was then analyzed as the focal dependent variable in a series of regression models that first controlled for individual characteristics and then regressed relative pubertal timing on all measures of peer pubertal timing.

Model 1 included individual characteristics only: self-reported stage-normative timing, age, age-squared, age at menarche (for females), race, and ethnicity. Individuals' stage-normative timing and age at menarche were included to examine whether, after controlling for the expected concordance between these self-report measures, the stage-normative pubertal timing of one's peers would influence a participant's perceived relative pubertal timing. Age and age-squared were included because we used an age-heterogenoues sample and the effect of age on the key measures of pubertal development may not be linear (i.e., the relation between age and puberty may be stronger at younger ages). Model 2 added characteristics of the adolescent's nominated friends as predictors of individuals' relative pubertal timing. Of key interest were the associations between individuals' relative timing and their peers' stage-normative timing. Model 3 added school-level characteristics: the mean level of stage-normative and relative timing reported by same-sex students at each school, as well as demographic characteristics of the schools (percent Black, percent Hispanic, and average age). Subsequent models tested for interactions between age and individual, friend, and school characteristics. Model 4 added an age-by-stage-normative timing interaction and, for females, an age-by-age at menarche interaction. Models 5 and 6 added age-by-friends' pubertal timing and age-by-school timing interactions.

Next, stage-normative timing was analyzed as the focal dependent variable in a similar series of regression models. We regressed stage-normative pubertal timing on all measures of peer pubertal timing. The same approach was used in adding individual, friend, and school characteristics followed by a series of age interaction terms.

For both sets of pubertal timing outcome measures, analyses were initially performed using mixed-effects models using PROC MIXED in SAS to account for potential school-level clustering in pubertal timing. However, for models predicting relative timing, after adding the school-level characteristics in Model 3 the school-level random effects were reduced to zero, indicating that all of the school-level clustering for relative timing was due to these characteristics, yielding a general linear (OLS regression) model with the same results. For models predicting stage-normative timing, after adding the school-level characteristics in Model 3, the school-level random effects *were* significant, so analyses for stage- normative timing used mixed-effects models.

Results

To What Extent Are Adolescents Similar to Their Friends and Schoolmates in Self-reported Pubertal Timing?

Results of correlational analyses are shown in Table 2. For each measure of pubertal timing, we examined the partial correlation between self and friends' self-report, controlling for age, race, and ethnicity. Males were similar to their nominated friends in self-reported stage-normative pubertal timing ($r = .16$, $p < .001$). Females were similar to their nominated friends in relative pubertal timing ($r = .07$, $p < .05$).

We also estimated the intraclass correlation coefficient (ICC) within each school, for each measure of pubertal timing. The ICC was computed using linear mixed models that estimated the random effect of school, controlling for fixed effects of school demographics (mean age and percentages of Black and Hispanic students). There were modest between-school differences in male stage-normative pubertal timing (ICC $= .04$, $p < .05$). However, there were no between-school differences in the other measures of pubertal timing that were not explained by school average age and by racial and ethnic demographics. That is, any apparent clustering of pubertal timing within schools was due to clustering of racial/ethnic minorities within schools.

Does the Stage-Normative Timing of the Peer Group Predict Relative Pubertal Timing?

Results of regression analyses using relative pubertal timing as the dependent variable are shown in Table 3 for

Table 2 Correlations between individual and same-sex peers' reports of pubertal timing ($N = 2817$)

	Female relative pubertal timing[c]	Female stage-normative timing[d]	Age at menarche	Male relative pubertal timing[c]	Male stage-normative timing[e]
Partial correlations between adolescents and same-sex friends[a]	0.07*	0.03	0.07	0.06	0.16***
School-level intraclass correlations[b]	0.00	0.00	0.00	0.00	0.04*

[a] Partial correlations control for peers' age (mean age of nominated peers), race (% of peers who report Black race), and ethnicity (% of peers who report Hispanic ethnicity)

[b] School ICCs control for fixed effects of school racial composition and mean student age

[c] Relative pubertal timing was assessed by the question "How developed are you compared to other boys/girls your age?"

[d] Female stage-normative pubertal timing is based on age-standardized ratings of breast growth and body curvature

[e] Male stage-normative pubertal timing is based on age-standardized ratings of voice changes, facial hair, and body hair

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 Predicting male relative pubertal timing from individual, friend, and school variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Individual variables						
Stage-normative timing	.42 (.02)***	.41 (.03)***	.39 (.03)***	.37 (.03)***	.38 (.03)***	.37 (.03)***
Age	.56 (.28)*	.63 (.36)	.80 (.41)*	.79 (.40)	.80 (.41)*	.86 (.42)*
Age-squared	−.02 (.01)*	−.02* (.01)	−.03 (.01)*	−.03 (.01)*	−.03 (.01)*	−.03 (.01)*
Black	.06 (.07)	.04 (.03)	.05 (.17)	.05 (.17)	.04 (.18)	.04 (.18)
Hispanic	−.09 (.06)	−.07 (.11)	0.00 (.12)	−0.01 (.12)	−0.02 (.12)	−0.02 (.12)
Friend variables						
Friends' stage-normative timing		−.03 (.04)	−.06 (.04)	−.06 (.04)	−.08 (.05)	−.09 (.05)
Friends' relative timing		.05 (.04)	.04 (.04)	.04 (.04)	.03 (.04)	.03 (.04)
Friends' mean age		.09 (.04)*	.12 (.05)*	.11 (.05)*	.11 (.05)*	.12 (.05)*
% Black friends		0.04 (.20)	0.16 (.21)	0.16 (.21)	0.16 (.21)	0.16 (.22)
% Hispanic friends		0.00 (.14)	0.09 (.15)	0.09 (.15)	0.07 (.15)	0.08 (.15)
School variables						
School stage-normative timing			−.41 (.35)	−.35 (.35)	−.31 (.35)	−.34 (.36)
School relative timing			.85 (.37)*	.86 (.37)*	.91 (.37)*	.92 (.38)*
School age			−.04 (.06)	−.04 (.06)	−.04 (.06)	−.05 (.06)
% Black students			0.00 (.00)	0.00 (.00)	0.00 (.00)	0.00 (.00)
% Hispanic students			0.00 (.01)	0.00 (.01)	0.00 (.01)	0.00 (.01)
Moderation by age						
Stage × age				.03 (.02)	.03 (.02)	.03 (.02)
Friends' stage × age					.04 (.03)	.04 (.03)
Friends' relative × age					.02 (.02)	.02 (.02)
School stage × age						−.11 (.16)
School relative × age						.06 (.20)
Model R^2	.14	.15	.16	.16	.16	.16

* $p < .05$; ** $p < .01$; *** $p < .001$

males and Table 4 for females. Model 1 for males showed the expected positive association between self-reported relative and stage-normative timing ($\beta = .42$, $p < .001$). Males with greater age-standardized ratings of body changes (earlier stage-normative timing) also reported that they were more physically developed than their peers. Age was negatively associated with relative timing ($\beta = -.56$, $p < .05$). There was also a significant, negative quadratic effect of age on relative timing ($\beta = -.02$, $p < .05$): as boys aged, they perceived their pubertal development to be

Table 4 Predicting female relative pubertal timing from individual, friend, and school variables

	Model 1	Model 2	Model 3	Model 4	Model 4a	Model 5	Model 6
Individual variables							
Stage-normative timing	.39 (.02)***	.39 (.02)***	.39 (.03)***	.37 (.03)***	.37 (.03)***	.37 (.03)***	.36 (.03)***
Age at menarche	−.15 (.02)***	−.16 (.02)***	−.15 (.02)***	−.16 (.02)***	−.17 (.02)***	−.17 (.02)***	−.17 (.02)***
Age	1.00 (.27)***	.97 (.34)***	1.04 (.42)*	1.15 (.42)**	.81 (.45)**	1.17 (.51)*	1.21 (.55)*
Age-squared	−.03 (.01)***	−.03 (.01)**	−.03 (.01)**	−.04 (.01)**	−.04 (.01)**	−.03 (.01)**	−.04 (.01)*
Black	−.27 (.06)***	−.27 (.06)**	−.12 (.17)	−.10 (.17)	.08 (.18)	.09 (.18)	.10 (.18)
Hispanic	−.03 (.06)	−.08 (.11)	−.03 (.12)	−.03 (.12)	.03 (.12)	.03 (.12)	.03 (.12)
Friend variables							
Friends' stage-normative timing		.01 (.04)	−.02 (.04)	−.02 (.04)	−.02 (.04)	−.02 (.04)	−.02 (.04)
Friends' relative timing		.03 (.04)	.01 (.04)	−.01 (.04)	−.02 (.04)	−.02 (.04)	−.02 (.03)
Friends' menarche		−.01 (.03)	−.02 (.03)	−.02 (.03)	−.01 (.03)	−.01 (.03)	−.01 (.03)
Friends' mean age		0.00 (.04)	.03 (.04)	.03 (.04)	.02 (.04)	.03 (.04)	.03 (.05)
% Black friends		.09 (.19)	.13 (.21)	.10 (.21)	.05 (.21)	.05 (.21)	.06 (.21)
% Hispanic friends		.07 (.14)	.26 (.14)	.26 (.14)	.27 (.14)	.28 (.14)	.29 (.15)*
School variables							
School stage-normative timing			−.02 (.37)	−.01 (.37)	−.17 (.37)	−.19 (.37)	−.22 (.38)
School relative timing			.66 (.43)	.62 (.44)	.52 (.44)	.52 (.44)	.47 (.45)
School age			−.02 (.07)	−.03 (.07)	0.00 (.07)	0.00 (.07)	0.01 (.07)
School menarche			.13 (.27)	.16 (.27)	.04 (.27)	.00 (.27)	−.04 (.29)
% Black students			0.00 (.00)	0.00 (.00)	−.01 (.00)	−.01 (.00)	−.01 (.00)
% Hispanic students			0.00 (.01)	0.00 (.01)	0.00 (.01)	0.00 (.01)	0.00 (.01)
Moderation by age							
Stage × age				−.01 (.02)	−.01 (.02)	−.01 (.02)	.00 (.02)
Menarche × age				.03 (.01)*	.03 (.01)	.03 (.01)*	.03 (.01)*
Black × age					−.22 (.08)**	−.23 (.08)**	−.24 (.08)**
Hispanic × age					−.07 (.06)	−.08 (.06)	−.09 (.06)
Friends' stage × age						0.00 (.02)	0.00 (.02)
Friends' relative × age						0.00 (.02)	.01 (.02)
Friends' menarche × age						−.03 (.02)	−.03 (.02)
School stage × age							.03 (.17)
School relative × age							−.10 (.16)
School menarche × age							−.06 (.14)
Model R^2	.21	.22	.22	.22	.23	.23	.23

* $p < .05$; ** $p < .01$; *** $p < .001$

earlier until age 15 when this perception shifted to reflect on-time development. There were no significant racial/ethnic differences in relative pubertal timing among boys.

Model 2 added main effects of the adolescent's nominated friends. Contrary to predictions, there were no associations between a boy's relative pubertal timing and either measure of pubertal timing reported by his nominated friends, after controlling for his own individual characteristics. Main effects of individual stage-normative timing remained significant, as did the quadratic age effect, but the linear effect of age became non-significant. There was a positive association between friends' mean age and relative pubertal timing ($\beta = .09$, $p < .05$). Males with older friends perceived themselves as more physically developed than others their age. There were no effects of friends' race or ethnicity.

Model 3 added school-level predictors of relative pubertal timing. At the school level, there was a positive association between relative timing and the average relative timing reported by one's schoolmates ($\beta = .85$, $p < .05$), suggesting school-level similarity for relative timing. This result contrasted with the minimal school-level ICC estimated in our preliminary correlational analyses; the discrepancy may be due to the additional

individual-level and friend-level covariates that were included in the regression models. The racial and ethnic composition of the school was not associated with boys' relative pubertal timing. Effects of age and friends' mean age remained significant in this model. Subsequent models added interactions between age and individual (Model 4), friend (Model 5) and school (Model 6) characteristics. We found no significant interactions between age and any of these characteristics.

Parallel analyses for females are shown in Table 4. Model 1, which included individual characteristics only, showed positive associations between stage-normative and relative pubertal timing ($\beta = .39$, $p < .001$). Age at menarche was also negatively associated with relative pubertal timing ($\beta = -.15$, $p < .001$). Thus, as would be expected, females with earlier age at menarche and with more advanced age-standardized ratings of body changes also rated themselves as more developed than others their age. There were also racial and ethnic differences in relative pubertal timing. Compared to White females, Black ($\beta = -.27$, $p < .001$) and Hispanic ($\beta = -.03$, $p < .001$) females tended to rate themselves as less developed than their same-aged peers.

Models 2 and 3 added characteristics of female friends and schoolmates, respectively. There was no evidence for an association between relative timing and friends' or schoolmates' pubertal timing, and there were no friend-level or school-level effects of age, race, or ethnicity (that is, there were no significant effects of friend or schoolmate race, ethnicity, or age on females' self-reported relative pubertal timing). The individual-level effect of Hispanic ethnicity became non-significant when friend-level effects were added.

Model 4 added interactions between age and individuals' stage-normative timing and age at menarche in predicting relative pubertal timing. The negative association between age at menarche and relative pubertal timing was weaker for older girls ($\beta = .03$, $p < .05$). Model 4a added interactions between age and Black race and between age and Hispanic ethnicity to test whether these timing × age interactions remained significant when race/ethnicity × age interactions were added. The age × menarche interaction was no longer significant with these additional interaction terms. There was a significant interaction between age and Black race ($\beta = -.23$, $p < .01$), suggesting that the tendency for Black girls to report later relative pubertal timing increased with age. In Model 5, which added interactions between age and friends' pubertal timing, the age × menarche interaction was significant, as was the age × Black race interaction. Overall, these interaction models suggested that perceptions of relative pubertal timing become less linked to age at menarche and more linked to race among older girls. Model 6 added interactions between age and schoolmates' pubertal timing, none of which was significant. Across all models, R^2 values ranged from .14 to .16, suggesting that friend- and school-level characteristics did not explain more variance than individual level predictors, and that most variation in relative pubertal timing was left unexplained, even by other self-report measures of pubertal timing.

Do Any Measures of Peers' Pubertal Timing Predict Individual Stage-Normative Pubertal Timing?

Results of regression analyses using stage-normative pubertal timing as the dependent variable are shown in Table 5 for males and Table 6 for females. Model 1 for males showed the expected positive association between self-reported relative and stage-normative timing ($\beta = .32$, $p < .001$). Neither age nor age-squared were directly associated with stage-normative timing, which was expected since stage-normative timing was itself age-standardized.

Model 2 added main effects of the adolescent's nominated friends. Consistent with initial correlational analyses, boys' stage-normative timing was positively associated with their male friends' stage-normative timing. There were no associations between boys' stage-normative timing and their friends' relative pubertal timing. There were no significant effects of friends' age, race, or ethnicity on males' stage-normative timing. Model 3 added school-level predictors of stage-normative pubertal timing. At the school level, there was a positive association between stage-normative timing and the average stage-normative timing reported by one's male schoolmates ($\beta = 1.07$, $p < .001$), suggesting school-level similarity for stage-normative timing. This result aligned with the school-level ICC estimated in our preliminary correlational analyses. The racial and ethnic composition of the school was not associated with boys' stage-normative pubertal timing. Subsequent models added interactions between age and individual (Model 4), friend (Model 5) and school (Model 6) characteristics. We found no significant interactions between age and any of these characteristics in predicting boys' stage-normative pubertal timing.

Parallel analyses for females are shown in Table 6. Model 1, which included individual characteristics only, showed positive associations between stage-normative and relative pubertal timing ($\beta = .33$, $p < .001$). Age at menarche was surprisingly not significantly predictive of stage-normative timing. Black females had earlier stage-normative timing than their same-aged, White female peers ($\beta = .15$, $p < .05$).

Models 2 and 3 added characteristics of female friends and schoolmates, respectively. There was no evidence for an association between stage-normative timing and any measure of friends' pubertal timing. However, consistent with findings for boys, at the school level, there was a significant association between school and individual stage-normative timing ($\beta = .98$, $p < .01$). There were no

Table 5 Predicting male stage-normative pubertal timing from individual, friend, and school variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Individual variables						
Relative timing	.32 (.02)***	.32 (.02)***	.29 (.02)***	.29 (.03)***	.29 (.03)***	.29 (.03)***
Age	.08 (.24)	−.06 (.31)	.21 (.35)	.22 (.35)	.22 (.35)	.27 (.36)
Age-squared	.00 (.01)	0.00 (.01)	−.01 (.01)	−.01 (.01)	−.01 (.01)	−.01 (.01)
Black	.32 (.06)***	.29 (.14)*	−.09 (.15)	−.09 (.15)	−.09 (.15)	−.08 (.15)
Hispanic	.12 (.05)*	.13 (.10)	−.08 (.10)	−.08 (.10)	−.08 (.10)	−.08 (.10)
Friend variables						
Friends' stage-normative timing		.17 (.03)***	.10 (.04)**	.10 (.04)**	.09 (.04)*	.09 (.04)*
Friends' relative timing		0.00 (.03)	−.01 (.03)	−.01 (.03)	−.01 (.03)	−.01 (.03)
Friends' mean age		.02 (.04)	.06 (.04)	.06 (.04)	.06 (.04)	.06 (.04)
% Black friends		−.01 (.17)	.06 (.18)	.06 (.18)	.06 (.19)	.06 (.19)
% Hispanic friends		−.02 (.12)	.28 (.13)*	.28 (.13)*	.28 (.13)*	.28 (.13)*
School variables						
School stage-normative timing			1.07 (.30)***	1.07 (.30)***	1.08 (.30)***	1.08 (.31)***
School relative timing			−.48 (.32)	−.48 (.32)	−.47 (.32)	−.51 (.33)
School age			−.09 (.05)	−.09 (.05)	−.09 (.05)	−.09 (.05)
% Black students			0.00 (.00)	0.00 (.00)	0.00 (.00)	0.00 (.00)
% Hispanic students			0.00 (.00)	0.00 (.00)	0.00 (.00)	0.00 (.00)
Moderation by age						
Relative × age				0.00 (.02)	0.00 (.02)	0.00 (.02)
Friends' stage × age					.01 (.02)	.01 (.02)
Friends' relative × age					0.00 (.02)	0.00 (.02)
School stage × age						−.01 (.14)
School relative × age						−.05 (.18)

* $p < .05$; ** $p < .01$; *** $p < .001$

friend-level or school-level effects of age, race, or ethnicity on females' self-reported stage-normative pubertal timing. The individual-level effect of Black race became non-significant when friend-level effects were added.

Model 4 examined interactions between age and age at menarche and between age and relative pubertal timing in predicting stage-normative timing. No age interactions were significant. Models 5 and 6 added interactions between age and friends' pubertal timing and schoolmates' pubertal timing, none of which were significant. The main effect of Black race was significant in these models, with Black girls reporting earlier stage-normative timing ($\beta = .03, p < .05$). In addition, a significant main effect of friends' age at menarche was found, such that girls whose friends had earlier ages at menarche reported earlier stage-normative pubertal timing.

Do Race and Ethnicity Moderate Associations Between Peer Stage-Normative Timing and Individual Relative Timing?

We conducted exploratory analyses to test whether race and ethnicity moderated the hypothesized effects (i.e., an effect of peer stage-normative timing on individual relative pubertal timing). A series of models, analogous to the age moderation models, were estimated to test for interactions between Black race and peer pubertal timing (relative, stage-normative, and age at menarche) and between Hispanic ethnicity and peer pubertal timing. These models revealed no significant moderating effects of race ethnicity. Full results from race/ethnicity moderation models are available from the first author upon request.

Discussion

Self-report measures of pubertal timing correlate modestly with each other and with clinically assessed methods and are therefore often considered imperfect proxies for underlying biological changes (reviewed in Shirtcliff et al. 2009; see also Dorn et al. 2006). Nevertheless, these measures predict an array of important health risks and behaviors in adolescents, indicating that perceptions of timing are meaningful psychological constructs. Moreover, different self-report measures often predict different outcomes (see Baams et al. 2015). While it has been theorized that accuracy of self-report measures may hinge on social

Table 6 Predicting female stage-normative pubertal timing from individual, friend, and school variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Individual variables						
Relative timing	.33 (.02)***	.33 (.02)***	.32 (.03)***	.33 (.03)***	.32 (.03)***	.32 (.03)***
Age at menarche	−.03 (.02)	−.01 (.02)	−.01 (.02)	−.03 (.02)	−.03 (.02)	−.03 (.02)
Age	.14 (.25)	−.02 (.32)	−.49 (.39)	−.38 (.39)	−.40 (.39)	−.39 (.45)
Age-squared	0.00 (.01)	0.00 (.00)	.01 (.01)	.01 (.01)	.01 (.01)	.01 (.01)
Black	.15 (.06)*	.25 (.14)	.28 (.16)	.29 (.16)	.29 (.16)*	.31 (.16)*
hispanic	−.08 (.06)	.04 (.10)	.08 (.11)	.07 (.11)	.08 (.11)	.07 (.11)
Friend variables						
Friends' stage-normative timing		.01 (.04)	−.02 (.04)	−.02 (.04)	−.04 (.04)	−.03 (.04)
Friends' relative timing		.04 (.03)	.01 (.03)	.02 (.03)	.01 (.03)	.02 (.04)
Friends' menarche		−.03 (.03)	−.05 (.03)	−.05 (.03)	−.06 (.03)*	−.07 (.03)*
Friends' mean age		.07 (.04)	.05 (.04)	.04 (.04)	.04 (.04)	.05 (.04)
% Black friends		0.00 (.00)	.08 (.19)	.06 (.19)	.05 (.19)	.02 (.19)
% Hispanic friends		−.15 (.13)	−.03 (.13)	−.03 (.13)	−.04 (.13)	−.04 (.13)
School variables						
School stage-normative timing			.98 (.34)**	.99 (.34)**	1.03 (.34)**	1.13 (.35)**
School relative timing			−.16 (.40)	−.19 (.40)	−.16 (.40)	−.01 (.42)
School age			.05 (.06)	.04 (.06)	.04 (.06)	.09 (.07)
School menarche			.01 (.25)	.02 (.25)	.08 (.25)	−.01 (.26)
% Black students			0.00 (.00)	0.00 (.00)	0.00 (.00)	0.00 (.00)
% Hispanic students			0.00 (.00)	0.00 (.00)	0.00 (.01)	0.00 (.01)
Moderation by age						
Relative × age				−.02 (.02)	−.02 (.02)	−.02 (.02)
Menarche × age				.02 (.01)	.02 (.01)	.02 (.01)
Friends' stage × age					.03 (.02)	.01 (.02)
Friends' relative × age					.04 (.02)	.04 (.02)
Friends' menarche × age					.03 (.02)	.03 (.02)
School stage × age						.34 (.16)*
School relative × age						−.17 (.14)
School menarche × age						−.17 (.13)

* $p < .05$; ** $p < .01$; *** $p < .001$

comparisons (Moore et al. 2014), the relation between social contexts and self-perceptions of puberty has not yet been empirically tested. The current study addressed this gap in the literature by examining associations between self-reports of pubertal timing among adolescents, their friends, and their schoolmates. Our findings provide further support for a high degree of variability across self-report pubertal timing measures and suggest that these differences could be due, in part, to the peer context.

Three self-report measures of pubertal timing were examined in a high school sample of male and female adolescents: "stage-normative timing" (age-standardized ratings of body changes), "relative pubertal timing" (perceived development compared to one's same aged peers), and, in females, self-reported age at menarche. Initial analyses assessed how similar adolescents were to their nominated friends and to their schoolmates in these three measures, controlling for age, race, and ethnicity. Males appeared similar to their nominated friends and schoolmates in stage-normative pubertal timing, whereas females were similar to their friends in relative pubertal timing. It may also be due to racial or ethnic differences in the social desirability of early versus late pubertal timing.

Homophily by pubertal timing may reflect a selection process, with adolescents selecting friends who are similar to them in pubertal timing or in the behaviors that are correlated with pubertal timing. Such behaviors include athletic involvement (Malina and Bielicki 1996), academic achievement, and various forms of risky behavior, including substance use and delinquency (reviewed in Mendle and Ferrero 2012; Mendle et al. 2007). It is well established that these behaviors cluster within adolescent peer groups

(e.g., Matsueda and Anderson 1998; Curran et al. 1997; Tolson and Urberg 1993), and peer group selection is a commonly proposed mechanism for associations between pubertal timing and risky behavior (Caspi et al. 1993). Peer similarity for perceptions of development may also reflect an assimilation process, whereby adolescents perceive themselves as early maturing partly because their friends also appear older. For example, a typically developing girl (i.e., one with average objective pubertal timing) begins to affiliate with a risky, precocious peer group (e.g., girls who use drugs, have sex, wear makeup, and dress to look older). Regardless of her own age at menarche and her actual physical maturity, she may perceive herself to be more advanced in her pubertal development—because she may in fact look and act older—than her same-aged peers.

Differences in peer homophily across gender lend clues to how adolescents arrive at their self-conceptions. Females appeared similar to their friends on relative pubertal timing, rated on a scale ranging from "I look younger than most [girls my age]" to "I look older than most [girls my age]." Males appeared similar to their friends in stage-normative timing, rated on a scale ranging from "how [you looked] in grade school" to how they imagine a "grown man" looks. Thus, males seemed alike in whether they view themselves as boys versus men, whereas females seemed alike in whether they see themselves as typical versus atypical. In addition, among males, the age of nominated friends predicted self-reported relative pubertal timing: having older friends was correlated with earlier relative pubertal timing. This finding is consistent with previous studies that suggest early maturing males tend to affiliate with older peers (Ge et al. 2002), and, as a result, engage in risky behavior at an earlier age than their typically developing peers (Mendle and Ferrero 2012).

Our study further examined associations between relative pubertal timing and peers' stage-normative timing. Controlling for an individual's self-reported physical changes (breast growth, voice changes, menarche, body hair—all factors that should theoretically predict a global, single item rating of pubertal timing), we tested whether the pubertal timing of one's nominated friends and schoolmates influenced self-reported relative pubertal timing. However, we found no evidence for peer contrast effects, and most of the variance in relative pubertal timing (in both males and females) remained unexplained in the models tested.

There are several possible explanations for this null finding. We operationalized "stage-normative peer pubertal timing" as friends' and schoolmates' ratings of their own body changes. A peer contrast effect is basically a negative bias—a distorted perception of one's actual pubertal timing due to the actual, observable reference point being skewed. For the purposes of these analyses we assume that the peers' reports of stage-normative and peer normative timing indexed something that is stable and accurate enough for an individual to use as a reference group. We cannot, however, confirm this. In addition, the adolescents in this sample were, for the most part, post-pubertal or mid-pubertal. It is possible that adolescents are more attentive to—and thus influenced by—perceptions of their friends when they are in the midst of pubertal changes and when there is more variability in pubertal status. Moreover, although adolescents spend a great deal of time in school and with friends, there are numerous other targets of comparison to which adolescents are regularly exposed, such as family members or figures in the media, who may shape their perceptions of maturation. Finally, the current study used a school-wide nonclinical sample. It is possible that peer effects on perceived pubertal timing would emerge in more specialized contexts that attract adolescents with off-time development, such as athletic environments. In sum, the current study does not support the hypothesis that peers' stage-normative pubertal timing influences perceptions of one's relative pubertal timing, but a more objective rating of peer pubertal timing and a different study sample might yield different findings.

Comparing across the different models of stage-normative and relative pubertal timing, an interesting pattern of racial difference emerges. Although Black girls and boys reported earlier (more advanced) pubertal timing than White adolescents on the stage-normative measure, this racial difference was not reflected in self-perceptions of relative pubertal timing. There was no significant racial difference in relative pubertal timing for boys, and Black girls actually perceived themselves as later developing, on average, than White girls perceived themselves to be. One possible interpretation for these findings is that, although Black and Hispanic females develop earlier than their White counterparts, they do not view themselves as early maturing. This could indeed be due to a social comparison process, with adolescents using their same-race peers as the target of comparison; this is why the racial composition of the peer group is included as a variable in our regression models.

Results from the current study must be interpreted in light of several limitations. First the data are cross-sectional, and do not explain within-person changes in perceived development over time. There are also limitations to the measures of pubertal timing used. The reliability of reports of age at menarche decreased as Add Health participants aged. Relative pubertal timing was also assessed using a single question; although consistent with previous research practices (Dubas et al. 1991; Graber et al. 1997), a more extensive assessment of perceived development might permit a better understanding of how individuals leverage peer comparisons to interpret their development.

Other limitations pertain to the study sample. The sample is from 1994 to 1995 and therefore not representative of

today's youth, potentially limiting the generalizability of the findings. The sample was moreover limited to adolescents with identifiable (same school) peer nominations, and this sample differs slightly from the full sample, as shown in Table 1. Previous studies of the Wave I Add Health social network data have revealed some differences between adolescents with and without identifiable friends. Female adolescents without identifiable friends were more likely to be Hispanic (Kretsch et al. 2014) and there appeared to be slightly lower rates of alcohol use among adolescents without identifiable peer nominations (Cruz et al. 2012). However, since the focus of this study was how characteristics of the friendship reference group might shape perceptions of one's own pubertal timing, it was reasonable to limit our sample to individuals who have such a reference group.

The measure of friends' timing was also restricted to same-sex friends. We focused on same-sex friends because the measure of relative timing asked adolescents to compare themselves to other same-sex peers. Given the increased frequency of opposite-sex friendships in adolescence, future studies might explore the associations between gender composition of the peer group and the pubertal timing of one's opposite-sex peers as correlates of perceived pubertal timing. Regarding gender differences, we did not test statistically test gender as a moderator of the effect of peers' pubertal timing on individual timing. Rather, we analyzed boys and girls data separately and examined if results of our main research questions seemed consistent across male and female populations. The gender differences we did identify, particularly regarding school-level clustering of relative and stage-normative pubertal timing, warrant further investigation.

Conclusion

Identity development is a key task of adolescence, and part of identity development is negotiating one's place in the social world. Peer comparisons are ubiquitous in adolescence and measures of pubertal timing implicitly or explicitly invoke a peer comparison. Therefore, the pubertal timing of one's peer group may explain variation in adolescents' subjective reports of pubertal timing. The current study found evidence for peer group similarity in perceived pubertal timing. Peer selection and socialization shape development, so this homophily may result from adolescents selecting peers who look similar to them in terms of physical development or because adolescents come to see themselves and present themselves as early maturing if they are in an early maturing group. Males were more likely to rate themselves as similar to their peer group on stage-normative timing, whereas females were more likely to rate themselves as similar to peers in relative development. These results provide further evidence that relative pubertal timing, stage-normative timing, and age at menarche are unique indicators of the enduring impressions of adolescents' experience of puberty.

Acknowledgments This research uses data from Add Health, a Program Project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by Grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from Grant P01-HD31921 for this analysis.

Author contributions NK conceived of the study, participated in its design and coordination, performed statistical analyses, and drafted the manuscript; JM participated in the study design and interpretation of the data and helped draft the manuscript; KH participated in the design and coordination of the study, assisted with statistical analysis, and helped draft the manuscript; JC participated in the study design, assisted with statistical analysis and interpretation of the data, and helped draft the manuscript. All authors read and approved the final manuscript.

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