

Peer Influences on Academic Motivation: Exploring Multiple Methods of Assessing Youths' Most "Influential" Peer Relationships

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Abstract:

The present study examines the relative role of three distinct types of peer relationships (reciprocated friendships, frequent interactions, and shared group membership) in within-year changes in academic self-concept and engagement before and after the transition to middle school (fifth and seventh grade). In a series of linear regression analyses, main effects of each peer type's academic self-concept and engagement on changes in youths' academic characteristics were used to test socialization processes. Interactions of youths' academic skills with those of each peer type were used to test social comparison processes influencing changes in academic self-concept. Results suggest unique roles of each peer relationship differentially influencing changes in youths' academic adjustment as well as stronger influence effects during seventh than fifth grade. Implications are discussed in terms of distinct influence processes associated with each peer relationship type as well as potential developmental differences in the role that certain peer relationships play.

Keywords: peer relationships | academic achievement | academic/school transitions | self-concept | friendships | peer groups

Article:

Peers play a prominent role in children's lives during elementary and middle school, both in terms of time spent together and potential to impact development (e.g., Hartup, 1996; Newcomb & Bagwell, 1995; Rubin, Bukowski, & Parker, 2006). Peers influence youth in a variety of domains, including academic adjustment (e.g., Altermatt & Pomerantz, 2005; Berndt & Keefe, 1995; Guay, Boivin, & Hodges, 1999; Kindermann, 2007; Ryan, 2001), but the magnitude of peer influence effects is typically small and evidence regarding age-related differences in influence is mixed (e.g., Berndt & Murphy, 2002). One possible reason for the mixed evidence

may be that peer influence is a more heterogeneous set of phenomena than is currently appreciated. In the present study, we explore this possibility by considering multiple types of social ties connecting peers and multiple influence processes in a longitudinal study of youths' academic self-concept and effort before and after their transition to middle school.

Achievement motivation is an interaction of cognitive, affective, behavioral, and environmental components (Bandura, 1997; Deci & Ryan, 2008; Dweck, 2002; Wigfield & Eccles, 2002), but here we focus on one cognitive component (academic self-concept) and one behavioral component (academic engagement). Academic self-concept refers to perceptions of one's own academic competence, and develops out of past experiences, evaluative feedback from important others, and social comparisons (Dweck, 2002; Harter, 1998). *Academic engagement* refers to enthusiastic and focused involvement in academic activities and manifests in behaviors, such as effort and active class participation (Kindermann, 2007; Ryan, 2001). Youths' academic self-concepts and engagement are interrelated: academic self-concept predicts expectations for success and the value placed on academic achievement, which in turn affect levels of academic engagement (e.g., Wigfield & Eccles, 2002). Youths' motivational patterns are important to understand both as proximal processes that ultimately shape youths' achievement and as uniquely important predictors of youths' general well-being and likelihood of engaging in deviant behaviors (e.g., Deci & Ryan, 2008; Ludden & Eccles, 2007).

Three Types of Social Ties

Peers have potential to shape these motivational components in the context of multiple types of social ties. Friendship researchers focus on dyadic, mutual liking relationships. Compared with non-friend dyads, mutual friends engage in higher levels of prosocial behavior, closeness, warmth, equality, and more equitable resolution of conflict (Berndt & Murphy, 2002; Hartup, 1996; Newcomb & Bagwell, 1995). Friends adhere to norms of reciprocal exchange (Laursen & Hartup, 2002), with an increasing emphasis on sharing, disclosure, trust, loyalty, and emotional support in early adolescence (Berndt & Murphy, 2002; Newcomb & Bagwell, 1995). Dyadic interaction researchers focus on the frequency of interactions among peers. This approach builds on developmental-ecological frameworks emphasizing the importance of direct, regularly occurring interactions as the proximal settings in which individuals acquire competencies, learn social skills, and develop sets of beliefs and behaviors (Bronfenbrenner & Morris, 1998; Dishion, Andrews, & Crosby, 1995; Kindermann, 2007). There is also a long tradition of studying informal social groups composed of three or more individuals. Shared group membership is distinct from dyadic relationships because some dyads within a group are only indirectly tied; yet the group itself becomes rewarding as a source of identity, resources, and positive feelings of belonging and being liked (Brown, 1990; Thibaut & Kelley, 1959). Friendships, interaction dyads, and groups overlap but are partly distinct (Cairns, Leung, Buchanan, & Cairns, 1995; Kindermann, 2007; Urberg, Degirmencioglu, Tolson, & Halliday-Scher, 1995). For instance, Kindermann (1996) found that only 30% of sixth-grade interaction dyads were mutual friends,

and just over half of friends were interaction dyads; similarly, Urberg and colleagues (1995) found that 30% to 50% of youths' mutual friends were in different groups.

Developmental Differences

Early adolescence is a particularly important developmental period for examining the role of friends, interaction dyads, and groups in academic motivation. Most generally, peer influence may peak during early adolescence, as youth spend more time with peers, place increased importance on peer approval and advice, and look to peers as a source of identity (e.g., Brown, 1990; Bukowski, Sippola, & Newcomb, 2000). Moreover, early adolescent cognitive development produces greater sensitivity to peer feedback and greater skill at using social comparisons to assess one's own competence level (Dweck, 2002), and the transition to middle school brings more competition for grades, ability-grouped classrooms, and a larger peer reference group. These changes may prompt youth to reevaluate their academic beliefs and behaviors, and may increase the salience of peers in these processes (e.g., Eccles & Midgley, 1989; Schunk & Pajares, 2002). For instance, school transitions have been found to increase perceived discrepancies in ability and resources among disadvantaged youth, leading to lower academic self-concepts and avoidance of challenging courses (e.g., Crosnoe, Riegle-Crumb, & Muller, 2007). Moreover, there is also some suggestion that the group level of peer relationships becomes more important in early adolescence (Rubin et al., 2006). For example, some researchers argue that adolescents are driven by a need to belong and that identification of a peer group is a major developmental task of early adolescence, with implications for youths' sense of identity and self-perceptions (Baumeister & Leary, 1995; Brown, 1990). For these reasons, we may expect to find stronger evidence of peer influence on achievement motivation in general after the transition to middle school, and in particular a stronger role of group-level peer influences among older youth.

Influence Processes: Socialization and Social Comparison

In this article, we explore two broad categories of influence processes that may occur to varying degrees in the context of these different types of social ties. One influence process commonly observed in the literature is the tendency for peers to become more *similar* over time, most often referred to under the umbrella term of *socialization*. Broadly defined, socialization is a set of cumulative processes throughout the lifespan by which individuals learn social norms and values and develop relational skills and habits (e.g., Hartup, 1996). A commonly noted tendency for youth to become more similar to peers over time likely reflects multiple underlying socialization processes, such as peer modeling and reinforcement, evaluative discourse and mutual agreement, or interpersonal persuasion (Bronfenbrenner & Morris, 1998).

However, peer influence processes may not always lead to increased similarity. *Social comparison* theories assert that youth evaluate their own skill level by comparing their own abilities with those of their peers, so that youths' academic self-concept should depend on their

perceptions of their own skills relative to those of their peer reference group. This means that the influence (on academic self-concept) of a peer reference group with a particular academic skill level will depend on the youths' own academic skill level. In statistical terms, this would translate to an interaction effect between individual skills and peer reference-group skills. Consistent with this perspective, there is some evidence that youths' own academic skill level moderates the effect of peers' academic skills on youths' academic self-concept (Altermatt & Pomerantz, 2005; Guay et al., 1999). Social comparative behaviors have been observed in early elementary years in the form of glances at peers' progress and comparative remarks (Altermatt, Pomerantz, Ruble, Frey, & Greulich, 2002), but youth become increasingly skilled with age at making accurate social comparisons (e.g., Butler, 1989); by early adolescence, youth are especially interested in and attuned to social comparisons (Dweck, 2002).

The processes termed here as *socialization* and *social comparison* may overlap and operate simultaneously. For instance, studies of adolescents find that affiliation with peers who are highly academically competent may, on the one hand, produce benefits for academic effort by motivating improvements in academic standards and performance, or by providing models for how to complete challenging academic tasks, serving as a form of "socialization" or increased similarity (Altermatt & Pomerantz, 2005; Blanton, Buunk, Gibbons, & Kuyper, 1999; Gibbons, Blanton, Gerrard, Buunk, & Eggleston, 2000). On the other hand, early adolescents are especially likely to incorporate social comparisons into their academic self-concepts; as such, affiliation with high-achieving peers may provoke social comparisons that undermine a youths' academic self-concept if a contrast is perceived between her own skills and her peers' skills (Altermatt & Pomerantz, 2005; Dweck, 2002; Guay et al., 1999). In the present study, our interest is in distinguishing these two types of peer influence processes: socialization processes in which youth become *more similar* to their peers over time and the more complex social comparison dynamics by which changes in youths' academic self-concept result from an *interaction* of youths' own skill level with that of affiliated peers.

Influence Processes Across Types of Social Ties

There are both conceptual and empirical reasons to expect that these two influence processes may operate to varying degrees across the three types of social ties.

Friends are a likely source of both socialization and social comparison. The "climate of agreement" existing between friends (Hartup, 1996) promotes socialization toward increased similarity as friends strive to accommodate each other's opinions, resolve conflict equitably, establish common ground, trust each other's judgment, and reach decisions by consensus (Berndt & Murphy, 2002; Hartup, 1996; Newcomb & Bagwell, 1995). Consistent with this view, friends' academic characteristics have been found to positively predict changes in youths' academic self-concept, engagement, and performance (Altermatt & Pomerantz, 2005; Berndt & Keefe, 1995; Ryan, 2001). However, friends' salience and closeness also make them a likely source of social comparison information: for instance, a couple of studies have found social comparison effects in

elementary school to only affect academic self-concept when comparisons were to reciprocated (as opposed to non-reciprocated) friends (e.g., Altermatt & Pomerantz, 2003; Guay et al., 1999). Similarly, in second through fourth grade, children's own achievement was found to be a weaker predictor of their academic self-concept when they had high-achieving friends (Guay et al., 1999). Consistently, these studies provide evidence that at least in elementary school, standards for self-evaluation are higher and "harsher" when youths' friends are higher-achieving. However, even while having detrimental effects on academic self-concept, high-achieving friends may also motivate greater effort, suggesting simultaneous socialization and social comparison effects of friends: Altermatt and Pomerantz (2005) found that low-achieving youth in fifth through seventh grade were more likely to report a *lower* academic self-concept but also *higher* academic engagement if they had high-achieving friends than if they had low-achieving friends. Overall, there is ample reason to expect that mutual friendships will be a source of both socialization and social comparison at both grade levels.

Interaction dyads' potential for influence lies most clearly in socialization mechanisms such as social learning and evaluative discourse (Berndt, Laychak, & Park, 1990; Dishion et al., 1995; Kindermann, 2007; Sage & Kindermann, 1999). For instance, children receive distinctive patterns of reinforcement and punishment for classroom behaviors from their frequent interaction partners (Sage & Kindermann, 1999) and come to display patterns of engagement that are similar to those of their interaction partners (Kindermann, 2007). Social comparison effects among interaction dyads, however, have not yet been empirically demonstrated. There is some evidence that comparative remarks between classmates in the early elementary grades influence children's academic self-concepts (e.g., Altermatt et al., 2002), suggesting a role of interactions, but these studies did not focus specifically on dyads characterized by frequent interaction.

Classic social-psychological theories of social *groups* highlight their potential relevance to both socialization and social comparison processes. With regard to socialization, the rewards of group membership (e.g., access to social opportunities) may motivate individuals to earn group approval through conformity, and comfortable group interactions require the development and enforcement of group norms (Thibaut & Kelley, 1959). Similarly, it has been argued that mutual reinforcement and rewards from group members are most efficient when similarity among group members is maximized (Patterson, Reid, & Dishion, 1992). Consistent with these views, empirical studies have demonstrated increased similarity within peer groups in domains such as substance use and achievement motivation (e.g., Ennett & Bauman, 1994; Ryan, 2001). There are also theoretical reasons to expect social groups to play a role in social comparison processes: Festinger's (1954) original formulation of social comparison theory was based on experiments demonstrating that adults base their aspirations and self-assessments upon group members' performance. However, it is not clear that his observed social comparison dynamics were specific to group-level ties; indeed, the evidence for social comparison effects in studies of close friends suggests that they are not. Moreover, Festinger's experimentally contrived social groups

are quite different from the informal social groups of early adolescence; as of yet, no studies have examined social comparison effects among childhood or adolescent peer groups.

The Present Study

In the present study, we explore the role of friendships, interaction dyads, and groups in influencing two components of youths' achievement motivation— academic self-concept and effort—before and after the transition to middle school, in fifth and seventh grades. We address three research questions. First, is there evidence of socialization effects for each type of social tie? That is, do peers' academic self-concept and engagement in the Fall predict Fall-to-Spring changes in youths' own academic self-concept and engagement? Based on the literature reviewed above, we expected all three peer types to play a significant role in socializing youths' academic self-concept and engagement. Second, is there evidence consistent with social comparison effects for each type of social tie? That is, do Fall-to-Spring changes in youths' academic self-concept depend on an interaction of their own Fall academic skills with the academic skills of their affiliated peers? The existing research supports a clear hypothesis for such interaction effects on academic self-concept for youths' mutual friendships; social-psychological theory supports the plausibility of social comparison effects at the level of groups and frequent interaction dyads, too, but empirical evidence thus far is insufficient to support a clear hypothesis. Third, are there developmental differences in these peer influence processes? We expected more consistent evidence of peer influence in general and by social groups in particular in seventh grade.

Method

Participants

Data for this study are drawn from a 5-year cohort-sequential longitudinal study investigating youths' peer networks and school adjustment as they transition from elementary to middle school (Gest, Rulison, Davidson, & Welsh, 2008). When the longitudinal study began in Fall of 2001, participants were enrolled in Grade 3, 4, or 5 in a small, working-class community in central Pennsylvania. Almost all students at the school (99%) were White, reflecting the demographics of the larger community served by the school district. Distributions of statewide reading and math assessment scores for fifth graders at the school closely matched the distribution for the overall population of fifth graders in the state. However, rates of several social problems (such as poverty and school dropout) exceeded state averages. This community profile is typical for the rural communities in which nearly one third of all U.S. children attend public school (Johnson & Strange, 2007). Each cohort participated in the fall and spring of every school year through the spring of seventh grade. Participation rates across all waves were high, ranging from 92% to 95% of enrolled students. For the present study, data are drawn from fifth and seventh grade only, allowing for a direct comparison of elementary to middle school students with data from all three cohorts available at each wave. The 467 students (216 girls, 251 boys) present in both fall

and spring of either or both of the targeted grades make up the sample included in the present study.

Procedure

This project originated as a component of a Safe Schools/Healthy Students grant obtained by the school district. In October and May of each school year, teachers and students completed group-administered surveys lasting 45 minutes. Several weeks prior to each survey date, parents of all youth enrolled in the targeted grades received a letter describing the study and were asked to sign and return a form if they did not wish their student to participate in the survey. Students were also free to decline to participate on the day of the assessment.

Measures

Reciprocated friends. Youth were provided with a roster of all students in their class (in fifth grade) or grade (in seventh grade) and were asked to list their friends. Students were allowed to list as many as they wanted. Of the classmates that a student listed as friends, those who also listed that student as a friend were considered “reciprocated friends.” For purposes of this study, we include only reciprocated (as opposed to unidirectional) friends. Our analyses on friends’ influence are limited, then, to those youth who had reciprocated friends in the fall of fifth grade (337/381) and seventh grade (388/417). Mean number of reciprocated friends in fifth grade was 3.70 ($SD = 2.11$), and mean number of reciprocated friends in seventh grade was 3.80 ($SD = 2.29$).

Social-cognitive maps (SCM) and conomination matrices. Students were also asked to list groups of youth who “hang around together a lot.” They were not required to fill all the space but were encouraged to think of as many groups as possible. These reports were aggregated across students to construct a symmetrical conomination matrix at each time point in which the rows and columns represented all individuals in the network and each cell represented the number of times two students were named together. The diagonal of the matrix contains the total number of times each student was named to a social group. Extensive classroom observations have been used to validate this method, finding observed interaction frequency to correlate reliably with the conomination matrices (Gest, Farmer, Cairns, & Xie, 2003). (See Cairns et al., 1995, and Gest et al., 2003, for a complete description of the social cognitive mapping procedure and its validity.) These matrices were analyzed to identify frequently interacting dyads and larger peer group structures, as described below.

Peer-nominated interaction dyads. Using an approach developed by Kindermann (1996) for identifying frequent interaction dyads, conomination matrices were treated as contingency tables in which each cell has an observed value and an expected value. Expected values were calculated based on the total number of times each of the two individuals was named at all (i.e., marginal totals). Binomial z tests were then used to determine whether the observed value differed significantly from the expected value. For cells in which the observed value was significantly

greater than the expected value at an alpha level of .05, the two corresponding individuals were classified as an “interaction dyad.” Our analyses of influence of interaction dyads are limited to those youth with at least one interaction dyad member in the fall of fifth grade (361/381) and seventh grade (393/417). The mean number of interaction partners identified per child was 3.36 ($SD = 1.87$) in fifth grade and 4.75 ($SD = 2.78$) in seventh grade.

Peer-nominated groups. Each of the conomination matrices was analyzed with principal components analysis. Social groups were identified as any principal components with an eigenvalue greater than 1.0 and containing at least three students with factor loadings greater than 0.32 after varimax rotation. Individuals were classified as belonging to any groups with whom they had factor loadings above this 0.32 cutoff, which was used to ensure that individuals shared at least 10% of the variance in their nominations with their groups. Individuals who did not meet this criterion were classified with whichever group they loaded on most strongly, as long as they had been named to the group at least twice. This approach to identifying group members is analogous to that used by Bagwell, Coie, Terry, and Lochman (2000), which follows in a longer line of research that has similarly used factor analytic approaches to identify group structures. Our analyses are limited to those youth with at least one group member in the fall of fifth grade (368/381) and seventh grade (411/417). The mean number of peers sharing group membership with a child was 5.33 ($SD = 2.46$) in fifth grade and 9.30 ($SD = 5.32$) in seventh grade.

Self-reports. Academic self-concept was measured with four items drawn from Harter’s (1982) Self-Perception Profile for Children. Students chose which of two statements was truer for them, then indicated whether the statement was “sort of true” or “really true.” The four statements corresponding to positive *academic self-concept* were: feel very good at school work; feel just as smart as other kids of their age; almost always figure out the answers; and do very well in their class work. Across the fifth and seventh grade assessments included in the present study, these items formed an internally consistent composite scale ($\alpha = .74$ to $.85$, with means ranging from 2.9 to 3.3 on the 1 to 4 scale). Z scores were computed to standardize scores within classroom in fifth grade and within grade in seventh grade.

Teacher ratings. Teachers responded to a series of items drawn from existing, well-validated rating scales, such as the Social Health Profile (Conduct Problems Prevention Research Group, 1999). Teachers indicated whether they agreed or disagreed with each of the 32 statements about students’ adjustment (1 = *strongly disagree*, 5 = *strongly agree*). For the present study, we focus on two of the scales derived from a factor analysis of the 32 items: academic effort and academic skills. *Academic effort* was computed as the mean of four items: works hard at school, shows poor effort [reversed], does best he or she can at schoolwork, does not try hard at schoolwork [reversed]. Across the fall and spring of fifth and seventh grade, effort items formed an internally consistent composite scale ($\alpha = .93$ to $.95$, with mean ratings ranging from 3.30 to 4.20 on the 1 to 5 scale). *Academic skills* were also computed as the mean of four items: good at reading, good at math, good at writing, and good at science. Across the fall and spring of fifth and seventh

grade, skills items formed an internally consistent composite scale ($\alpha = .87$ to $.92$, with mean ratings ranging from 3.10 to 3.60 on the 1 to 5 scale). Once again, z scores were computed to standardize scores within classroom in fifth grade and within grade in seventh grade.

Peer profile scores. We computed scores to represent the academic characteristics of each “subset” of youths’ peer network. The standardized scores of participants’ reciprocated friends, interaction dyads, and group members were each averaged separately to compute *academic self-concept* scores, *effort* scores, and *skills* scores for each type of social tie (e.g., friends’ effort; interaction dyads’ effort; group members’ effort). These scores were used to test for similarity to and influence of each social tie type.

Data Analysis Plan

As a first step, we assess the distinctiveness among the three methods of identifying youths’ social ties, by first computing the percentage overlap among each of the social tie types and then computing correlations among fall peer profile scores. Next, to examine each type of peer influence process (socialization and social comparison), we run a series of linear regression models predicting each academic outcome (academic self-concept and effort) in the spring of fifth and seventh grade. In all analyses, students’ own fall scores are included as control variables so that prediction of spring scores can be interpreted as *changes* in youths’ motivational characteristics as a function of peers’ characteristics. Specifically, socialization is examined by predicting students’ spring academic self-concept and effort scores from their own corresponding fall scores and peer profile scores. Significant regression weights for any of these peer profile variables are interpreted as socialization effects of that particular peer type influencing within-year changes in youths’ motivational outcomes. Social comparison is examined by conducting hierarchical linear regression analyses in which youths’ academic self-concept in the spring is the dependent variable. Students’ fall academic self-concept and academic skills scores are entered at Step 1, fall peer profile scores for academic skills are entered at Step 2, and interactions between youths’ academic skills and peers’ skills are entered at Step 3. In this equation, the interaction term is used to infer social comparison processes in which the effect of peers’ academic skills on changes in youths’ academic self-concept are moderated by youths’ own academic skill level (e.g., Altermatt & Pomerantz, 2005; Guay et al., 1999). Graphs of significant interaction terms will be used to further interpret the nature of any social comparison effects found.

Table 1. Correlations among the Three Types of Social Ties for Academic Self-Concept, Effort, and Skills

	Reciprocated friends	Interaction dyads	Group members
Self-concept			
Reciprocated friends	—	.59	.49
Interaction dyads	.52	—	.75
Group members	.46	.69	—

Effort			
Reciprocated friends	—	.69	.64
Interaction dyads	.52 —	.77	
Group members	.53	.68	—
Skills			
Reciprocated friends	—	.77	.68
Interaction dyads	.52	—	.85
Group members	.47	.69	—

Note: Correlations are below the diagonal for fifth graders and above the diagonal for seventh graders. All correlations are significant at $p < .01$.

In three initial models, the predictive value of each peer type is tested separately, and in a fourth model, all three peer profile scores are included simultaneously. As the three peer scores were moderately to strongly correlated (see below and Table 1), we evaluated the possibility of multicollinearity. In all such models, tolerance values (range .207 to 1.00) and variance inflation factors (range 1.021 to 4.838) remained well within recommended levels (Tolerance $> .10$, VIF < 10 ; Kutner, Nachtsheim, & Neter, 2004). The separate tests of the profile scores for each peer type provide useful insight into their predictive value. Additionally entering all three highly correlated peer types into the final regression analyses provides the strictest test of each peer type's independent contribution.

Results

Overlap Among Peer Types

We begin by computing the percentage overlap among the three methods of identifying social ties, using relationship data from the fall assessments. Results demonstrate substantial overlap yet clear distinctiveness among the three types of social ties. Focusing first on dyadic peer relationships, we find that 61% of friends are also identified as frequent interaction dyads and 53% of interaction dyads are reciprocated friends. Both types of dyadic ties are typically embedded within social groups, though in the present study this is more true for interaction dyads (91%) than for friendships (70%) because interaction dyads and social groups are both derived from peer reports of who “hangs around together a lot.” The distinctiveness of group ties, however, is reflected in the fact that on average, only 52% of group members are also frequent interaction dyads, and only 33% of groupmates are reciprocated friends. In sum, 40% to 50% of peers showing one type of dyadic tie (friendship or frequent interaction) did not show the other; and though friendship and frequent interaction ties often exist in the context of shared group membership, groups also include many members who are not linked by strong dyadic ties. Patterns of overlap were similar across grade levels, except that the tendency of group members to be friends dropped from 48% in fifth grade to 26% in seventh grade, likely due in part to the increase in group size from approximately 5 in fifth grade to 9 in seventh grade. Correlations among peer profile (peer academic characteristic) scores provide a complementary perspective on the overlapping but distinct ties of friendship, frequent interaction, and group membership:

these correlations ranged from $r = .46$ to $r = .85$ (Table 1). Correlations were strongest between interaction dyads and group members and weakest between friends and group members.

Socialization Effects

As predicted, evidence of socialization was strongest among seventh-grade students. Results indicate modest evidence of within-year socialization processes influencing *academic self-concept* in seventh grade, especially by interaction dyads (Table 2). The seventh-grade fall academic self-concept scores of reciprocated friends (Model 1a standardized $\beta = .108, p < .01$) and dyadic interaction partners (Model 1b $\beta = .093, p < .05$) each significantly predicted within-year changes in students' academic self-concept. When all peer profile scores were entered simultaneously (Model 2), only interaction dyads remained significant ($\beta = .117, p < .05$).

Results provide more robust evidence of within-year socialization processes influencing students' *academic effort* in both grade levels (Table 2). Once again, results are strongest for seventh graders: when tested separately, significant effects emerged for each of the three peer profile scores predicting changes in youths' effort (Model 1a: $\beta = .161, p < .001$ for reciprocated friends; Model 1b: $\beta = .142, p < .001$ for interaction dyads; and Model 1c: $\beta = .136, p < .001$ for group members). When all three peer types were entered simultaneously, only the unique influence of reciprocated friends on changes in students' academic effort emerged as statistically significant (Model 2 $\beta = .114, p < .05$). Results from the fifth-grade effort models suggest similar effects, but weaker (Table 2). In the separate tests by peer type, reciprocated friends' effort significantly predicted students' fifth-grade effort (Model 1a $\beta = .075, p < .05$). No peer scores significantly predict youths' spring effort in the combined fifth-grade models, although reciprocated friends continue to make the largest contribution of approximately the same magnitude seen in the separate test.

Social Comparison Effects

When tested individually, analyses revealed a statistically significant interaction term for reciprocated friends in fifth grade (Model 1a $\beta = .136, p < .05$) influencing youths' *academic self-concept*, which may be interpreted as a social comparison effect (Table 3). When all peer types are tested together in Model 2, reciprocated friends remain the only significant interaction term ($\beta = .129, p < .05$) predicting academic self-concept. The seventh-grade models yield a different pattern: in the separate tests by peer type, significant interaction terms suggest social comparison to interaction dyads and group members (Model 1b $\beta = .121, p < .01$; Model 1c $\beta = .101, p < .05$, respectively), but none of the terms are significant in the seventh-grade combined test (Model 2).

To interpret the significant interactions, we plotted changes in students' academic self-concept as a function of peers' skill level, dichotomized into relatively low ($-1 SD$) and highly ($+1 SD$) skilled peers (Cohen, Cohen, West, & Aiken, 2003). Separate lines for low versus highly skilled youth demonstrate how the influence of peers' skill levels on youths' academic self-concept

varies depending on their own skill level. Figure 1 depicts the interaction of students' skills with those of reciprocated friends in fifth grade (top), interaction dyads in seventh grade (middle), and group members in seventh grade (bottom). In all cases, we see a pronounced difference in self-concept between low and highly skilled peers *only* when their affiliated peers are high-achieving. Having high-achieving peers appears to boost academic self-concept among highly skilled students, while the academic self-concept of low skilled students suffers most when tied to high-achieving peers.

Interactions with gender were also tested across all analyses described above to ensure consistency of our conclusions across genders. None of these interactions were significant, suggesting consistent processes across genders, and therefore are not reported.

Table 2. Multiple Regression Models Predicting Spring Academic Self-Concept ($N = 284$ for Fifth Grade, 359 for Seventh Grade) and Effort ($N = 308$ for Fifth Grade, 347 for Seventh Grade) from Fall Peer Scores: Socialization Effects

Independent variables (Fall)	Fifth grade				Seventh grade			
	Model 1a Friends	Model 1b Dyad	Model 1c Group	Model 2 All ties	Model 1a Friends	Model 1b Dyad	Model 1c Group	Model 2 All ties
1. DV: Spring self-concept								
Individual self-concept	.406***	.394***	.426***	.374***	.689***	.682***	.689***	.696***
Friend self-concept	.002			-.011	.108**			.065
Interact dyad self-concept		-.023		-.108		.093*		.117*
Group self-concept			.042	.139†			.066†	-.042
R^2	.165	.158	.181	.154	.514	.490	.494	.531
2. DV: Spring effort								
Individual effort	.753***	.754***	.757***	.749***	.613***	.595***	.612***	.593***
Friend effort	.075*			.069	.161***			.114*
Interact dyad effort		.063†		.039		.142***		.075
Group effort			.059†	-.020			.136***	.010
R^2	.578	.585	.586	.579	.464	.446	.453	.478

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3. Hierarchical Multiple Regression Models Predicting Fall-to-Spring Changes in Academic Self-Concept ($N = 265$ for Fifth

Grade, $N = 278$ for Seventh Grade) from Interactions of Individual Fall Scores with Fall Peer Scores: Social Comparison Effects

Independent variables (Fall)	Fifth grade				Seventh grade			
	Model 1a Friends	Model 1b Interact dyad	Model 1c Group	Model 2 All ties	Model 1a Friends	Model 1b Interact dyad	Model 1c Group	Model 2 All ties
DV: Spring self-concept								
Individual self-concept	.345***	.354***	.371***	.327***	.627***	.618***	.626***	.628***
Individual skills	.133*	.109†	.126*	.116†	.123*	.079	.096†	.099†
Friend skills	.024			.031	.025			-.070
Interaction dyad skills		.063		-.014		.075		.124
Group skills			.078	.054			.057	.017
Individual skills × Friend skills	.139*			.129*	.026			-.032
Individual skills × Interaction dyad skills		.031		-.001		.121**		.089
Individual skills × Group skills			.052	.036			.101*	.008
R^2	.088	.066	.084	.084	.166	.167	.164	.194

† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

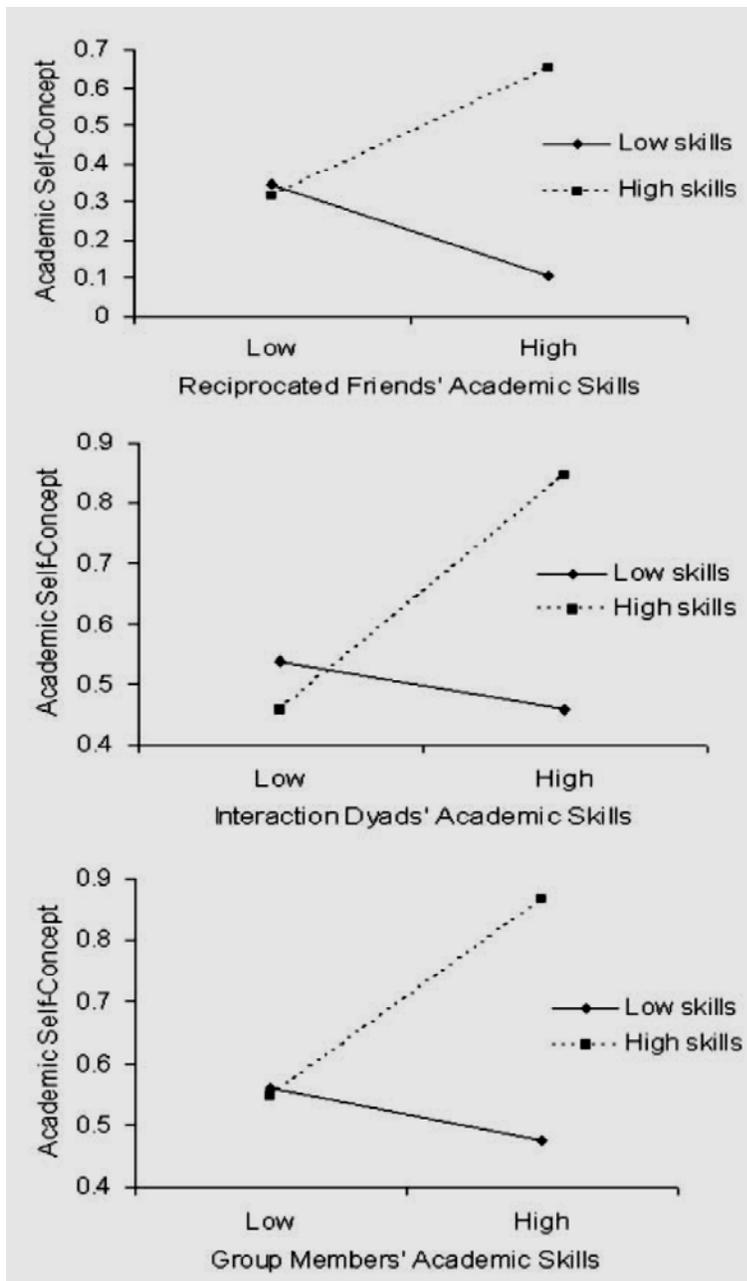


Figure 1. Self-concept as predicted by the interaction of youths’ teacher-rated academic skills and the skills of their friends in fifth grade (top), interaction dyads (middle), and group members in seventh grade (bottom)

Discussion

In the present study, we use longitudinal data to examine peer relationship patterns associated with changes in youths’ academic self-concept and engagement within two school years (fifth grade and seventh grade). We contribute to the literature by examining two broad categories of peer influence processes—socialization and social comparison—within peer relationships

defined in three distinct ways: reciprocated friendship, frequent interaction, and shared group membership. As hypothesized, results indicate only moderate overlap among the different relationships, suggesting it is plausible to consider whether each may be associated with distinct influence processes. As expected, results provide evidence of socialization across all three types of peer relationships, with the most consistent evidence emerging in seventh grade and for peers' influence on academic effort. Furthermore, results provide some evidence of social comparison by each peer type influencing youths' academic self-concept, with an apparent shift in comparison target from friends in fifth grade to interaction dyads and group members in seventh grade. Last, different patterns of influence across grade levels bolster evidence that academic motivation may be especially susceptible to influence after the transition to middle school and that interaction dyads and group members may increase in distinctness and salience during early adolescence.

Three Types of Social Ties

There is considerable overlap yet distinctiveness among the different types of peer relationships, and moderate correlations among the peer profile scores leave room for distinct influence processes associated with each peer type. Less than two thirds of reciprocated friends are identified as frequent interaction dyads; and only about half of frequent interaction dyads are reciprocated friends. While many friends and interaction dyads share social groups, we see relatively sparse friendship and dyadic interaction nominations within groups. It is interesting to note that the proportion of group members also identified as reciprocated friends drops to only 26% in seventh grade. Considered together with a notable increase in group size from about five members in fifth grade to nine in seventh grade, perhaps these findings suggest that the shift in affiliation opportunities from classroom-wide to grade cohort-wide between grade levels makes the formation of informal social groups more developmentally distinct and meaningful in early adolescence. More broadly, our findings support the hypothesis that these three types of social ties are both conceptually and empirically distinct, and worth further investigation.

Grade-Level Differences

More robust evidence of influence in seventh grade than in fifth for both academic self-concept and effort is consistent with past research suggesting that the transition to middle school is a time when youths' academic development is especially vulnerable to contextual influences. More time spent with peers and greater "dependence on" peer approval and advice among early adolescents have been reported and interpreted as greater susceptibility to peer influence during this age period (Brown, 1990; Bukowski et al., 2000). In addition, changing cognitive capacities make middle school youth more attuned to peers' academic behaviors and feedback (Dweck, 2002), while greater competition for grades and a larger peer reference group may further prime changes in achievement motivational patterns (Crosnoe et al., 2007; Schunk & Pajares, 2002).

Our findings may also be indicative of the hypothesized shift in the developmental significance of informal social groups in middle school as well as a shift in the importance of frequent interaction dyads, which are almost entirely embedded within social groups. Both interaction dyads and especially group members became more empirically distinct from friendships in seventh grade. Furthermore, socialization effects for interaction dyads and group members were only significant in seventh grade but not fifth, and youths' most salient social comparison "targets" appeared to shift to interaction dyads and group members in seventh grade. Some research has pinpointed identification of a peer group as a major developmental task of early adolescence, with implications for youths' self-perceptions and identity (Baumeister & Leary, 1995; Brown, 1990). In addition, it is reasonable to expect that the influence processes hypothesized to operate among interaction dyads and social groups may become more prominent in middle school: gains in cognitive development and an often posited peak in anxiety about "fitting in" during early adolescence may produce greater sensitivity to peers' feedback and selective reinforcement and greater likelihood of adopting group "norms" (e.g., Brown, 1990; Bukowski et al., 2000; Dweck, 2002). Together, these developmental phenomena may increase the impact of group members and frequent interaction partners during early adolescence.

Socialization Effects

As hypothesized, youth in both fifth and seventh grade showed some evidence of increased similarity to peers over time. Findings suggest some socialization of youths' achievement motivation by each of the three peer types, but with variation by age and outcome in the relative strength of each peer type. Youths' *self-concept* became most similar to that of their dyadic interaction partners during seventh grade: their effect was strongest even when the relative strength of all three peer types was tested simultaneously. Past research and theory suggest that social groups are an important source of youths' identity (Thibaut & Kelley, 1959). Given our findings, perhaps group members with whom youth "hang around" or interact most frequently have the greatest impact on self-evaluations. In contrast, friends were most important for socializing youths' *engagement* in school across both grade levels, in support of traditional developmental views (Berndt & Keefe, 1995; Ryan, 2001). Friends' effort was the most significant predictor of effort change in seventh grade and the only significant peer score in fifth grade. In the combined test of all peer types, friends became the only significant predictor of seventh-grade effort. Although their contribution dropped to non-significance in the fifth-grade combined test, friends remained the strongest predictor.

Results also provide some support for our expectation that effort is open to socialization by multiple peer types: isolated tests suggest socialization of youths' effort by all three peer types in seventh grade. School effort is an overt, observable behavior, making it a visible group norm (Thibaut & Kelley, 1959), susceptible to reinforcement patterns within interaction dyads (e.g., Sage & Kindermann, 1999), and a likely area of agreement among friends (Berndt et al., 1990).

Social Comparison Effects

Limited research has examined how social comparison processes operate among different types of peer relationships. Past research on social comparison has typically either focused on comparisons to friends (e.g., Altermatt & Pomerantz, 2003; Guay et al., 1999) or comparisons to classmates in general (e.g., Blanton et al., 1999; Marsh, Kong, & Hau, 2000). However, the present study suggests that youths' skill level moderates the effect of *friends' skills* in fifth grade and *interaction dyads' and group members' skills* in seventh grade on changes in academic self-concept, interpreted as social comparison processes. These results highlight the usefulness of considering multiple types of social ties in studies of academic social comparison.

Graphs of each significant "social comparison" interaction suggest that consistently across grade levels, high- versus low-achieving students' self-concepts only differ when youth are tied to high-achieving peers. High achieving students' self-concept is best when tied peers are also high-achieving, supporting the idea that high-achieving youth may "bask in the glory" of their peers' success (e.g., Marsh et al., 2000). In contrast, low-achieving youth appear to partake in unfavorable social comparison processes, such that academic self-concept is lowest when their comparison reference is high achievers (e.g., Altermatt & Pomerantz, 2005).

Influence Processes across Types of Social Ties

Past literature has rarely teased apart the multiple mechanisms by which peers shape academic outcomes throughout development. When considering the properties of each relationship, each may be theoretically linked to certain influence processes. This longitudinal study allows parallel analyses of peer influence in fifth versus seventh grade, yielding informative preliminary evidence about developmental differences in the role of each relationship.

Reciprocated friendships are defined by mutual liking and closeness; as such, their potential for influence lies in a supportive "climate of agreement" consisting of trust in each other's judgment, decisions by consensus, and effective conflict resolution (Hartup, 1996; Newcomb & Bagwell, 1995). In this study, reciprocated friends showed greater influence than other peers on students' effort in both elementary and middle school. We may tentatively infer, then, that such friendship qualities are the strongest peer processes driving youths' engagement in school and that friends maintain their role as an important source of academic socialization across grade levels. Furthermore, friends' relative skill level showed the greatest implications for elementary school students' self-concept. Perhaps, as hypothesized, the sharing and disclosure within children's mutual friendships make them the most psychologically meaningful and accessible target for social comparison (Altermatt & Pomerantz, 2003; Guay et al., 1999).

Interaction dyads, however, are defined by frequent contact; as such, evaluative discourse and social learning processes underlie the theoretical importance of these peers in socializing academic outcomes (Kindermann, 2007; Sage & Kindermann, 1999). Though no previous empirical work has examined social comparison among "interaction dyads," observed tendencies for younger children to engage in comparative discourse and glances at peers' progress suggest

potential relevance of “hanging around together” in social comparison processes. In the present study, dyadic interaction partners most significantly influenced self-concept through both socialization and social comparison but only among middle school youth. Perhaps the peers that youth most often “hang around with”—a set of peers who become more distinct from reciprocated friendships in middle school—increase in significance for youths’ self-standards in early adolescence (e.g., Brown, 1990).

Last, rewards provided by *group* membership, such as access to resources and a source of identity and status, may motivate conformity to group norms (Brown, 1990; Thibaut & Kelley, 1959). Most developmentalists believe that dyadic-level relationship processes mostly overshadow these group-level processes, as in the present study: Other social ties consistently emerged as more significant than groups (Kindermann & Gest, 2008). However, evidence of significant group influence in the seventh grade isolated tests indicates that group membership may take on some developmental significance during middle school (Baumeister & Leary, 1995; Brown, 1990). When considering their distinctness from other social ties in seventh grade (only 26% of group members were also friends and only 48% were dyadic interaction partners), it seems social groups should not be dismissed as trivial, especially during middle school (and perhaps beyond).

Strengths, Limitations, and Future Directions

This study has important methodological strengths that contribute to the literature on peer relationships and academic development. The multi-method approach to identifying peer relationships allowed us to investigate the relative influence of conceptually and methodologically distinct types of social ties, and in doing so, highlight the distinct theories of influence associated with each tie. In addition, high rates of participation and low rates of attrition allowed us to examine differences before versus after the transition to middle school in the context of a strong developmental design. The generalizability of our findings is, however, somewhat limited by the rural, racially homogeneous setting for this study. Youth attending much larger or more diverse schools may have different peer experiences; and the factors shaping academic views and behaviors likely also vary by school or community.

A challenge in the literature is empirically identifying the distinct theoretical processes associated with adolescent peer groups. As all methods for identifying peer groups build on some form of dyadic ties, substantial overlap between peer groups and the dyadic tie upon which group assignment is based is inevitable (Gest, Moody, & Rulison, 2006). An additional limitation, shared by much of the developmental literature on peer relationships, is the use of two assessments separated by roughly 6 months. The time frame over which peer influence processes unfold is uncertain, and it may be that peers have already exerted much of their influence before the first assessment date or that important influence processes would be best revealed over periods of days or weeks. Building a better understanding of the timescale of these processes is

an important goal for future research. Finally, future studies that include younger and older children and compare the impact of different school structures on the course of youths' academic development could help provide a stronger context for the grade-level differences identified in the present study.

A major challenge for future research will be figuring out how to reliably yet realistically obtain clearer answers to the research questions investigated in the present study and achieve a more nuanced understanding of peer influence processes in general. One promising direction may be shifting to a within-person framework, involving many more occasions of measurement. Such approaches would allow for investigation of more micro-level processes of influence and academic development and provide insight into the timescale during which such processes truly unfold. Gaps in our current understanding of these processes and the inconsistency of results in existing studies reveal the need for new, more sophisticated approaches to peer influence and achievement motivation research than those typically used.

Concluding Remarks

Within the framework of two broad forms of peer influence (socialization and social comparison), this study examines the developmental significance of three conceptually and methodologically distinct types of peer relationships and their associated influence processes. In demonstrating differential influence effects by each relationship type across age levels, this study provides unique insight into potential developmental differences in the role of different relationship types. As the field of peer influence research proceeds, the present study demonstrates that investigators should keep these distinctions (and their implications) in mind, and should aim to establish a careful match between research questions and the methods selected to measure peer relationships and their influence. More broadly, this study demonstrates the need to gain a more complete and nuanced understanding of peer influence processes and highlights how much we still need to learn about peers and academic development.

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