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Longitudinal Links between Older Sibling Features and
Younger Siblings' Academic Adjustment during Early Adolescence

Abstract

This study investigated prospective relations between (1) older siblings' support and academic engagement and (2) younger siblings' academic adjustment from 7th to 8th grade. The study was unique in that it incorporated a sample of both African American and European American adolescents. Also investigated was the extent to which the sex composition (same-sex vs. mixed-sex) of sibling dyads moderated prospective associations. Findings revealed that, in mixed-sex dyads only, younger siblings' perceptions of support received from the older sibling and their positive image of the older sibling predicted declines in the younger sibling's academic self-perceptions and performance over time, even after controlling for younger siblings' background characteristics and support from parents. Older siblings' reported support to younger siblings also predicted declines in younger siblings' academic adjustment, whereas the older siblings' own level of academic engagement predicted an increase in younger siblings' academic adjustment over time. Overall, findings did not differ substantially for African and European American adolescents.

Key words: Achievement motivation, sibling relations, adolescence

Longitudinal Links between Older Sibling Features and Younger Siblings'

Academic Adjustment during Early Adolescence

The extent to which youth succeed in the academic domain has important implications for their ultimate educational and occupational outcomes. During early adolescence, a student's scholastic record can initiate a trajectory of subsequent educational opportunities and choices that either enhance or impede her ultimate socioeconomic standing. The fact that many students experience declines in motivation and scholastic achievement as they move through early adolescence is well documented (Eccles, Lord, & Buchanan, 1996; Gottfried, Marcoulides, Gottfried, Oliver, et al., 2007). Yet what motivates some students to do well during this important developmental period? Although the answer to this question is decidedly quite complex, scholars have attempted to address this complexity by investigating both the individual and relational or contextual factors that predict optimal motivation and scholastic performance.

The extant research demonstrates that parents, teachers, and peers have at least a moderate impact on children's and adolescents' scholastic beliefs, choices, and performance (see Juuvonen & Wentzel, 1996; Wigfield, Eccles, Scheifele, Roeser, et al., 2006). The aim of the present research was to extend this literature to a relatively understudied set of adolescent relationships—namely, those with older siblings. Drawing from existing work on social support and academic achievement, as well as social learning theory, the deidentification framework (Feinberg, McHale, Crouter, & Cumsille, 2003; Schachter, Gilutz, Shore, & Adler, 1978) and core principles of expectancy-value theory (Wigfield & Eccles, 2002), we investigated whether supportive relationships with and academically successful characteristics of older siblings predicted change in younger siblings' academic adjustment across early adolescence.

Achievement Socialization

Elucidation of the social-cognitive processes underlying school success has attained a central role in current research on achievement motivation. To date, an impressive array of empirical and theoretical literature documents that significant others such as parents and teachers shape the academic goals, effort put forth to succeed, and scholastic performance of individual students. Much of this work has been couched within Eccles and colleagues' (e.g., Wigfield & Eccles, 2002) expectancy-value theory, focusing on adults' belief systems and behavior as salient predictors of students' academic choices and outcomes. For instance, robust patterns with both cross-sectional and longitudinal data indicate that what parents and teachers believe regarding a particular student's academic competencies and the importance of a particular academic domain predict the adolescent's own valuing of the domain, academic self-concept, and domain-relevant educational choices and performance (Bleeker & Jacobs, 2004; Eccles-Parsons, Kaczala, & Meece, 1982; Jacobs & Eccles, 1992).

More recently, close friends and peers have been identified as important achievement socializing agents, particularly during early adolescence. Ryan's (2001) work revealed that the academic behaviors and motivational orientation of adolescents' friends within peer groups can have a powerful influence on their subsequent motivation and academic performance. In addition, associating with high-achieving friends, typically assessed via their school grade point averages, has been found to predict an increase in adolescents' own school performance across both 6-month and 1-year timeframes (Altermatt & Pomerantz, 2003; Cook, Deng, & Morgano, 2007). These findings are consistent with earlier work documenting similarity in academic study practices and performance among adolescents within close dyadic friendships (Berndt & Keefe, 1996).

Given the findings revealed from prior studies of how parents, teachers, and peers may influence scholastic adjustment, the relative lack of research exploring the role of siblings as socializing agents in the academic domain is surprising. Just as parents can serve as managers of important experiences and providers of support for their children with respect to their scholastic skills and capacities (see Furstenberg, Cook, Eccles, Elder, et al., 1999; Jacobs & Bleeker, 2004), older siblings may exert similar influence on their younger brothers and sisters. Having an older sibling who values academic effort, succeeds in the school domain, and is willing to help a younger sibling's academic efforts may provide a powerful role model for younger siblings to identify with and emulate. In addition, the relatively egalitarian nature of closely spaced siblings, particularly during adolescence when relationships become less conflict-ridden (Furman & Buhrmester, 1992), suggests that some of the socialization practices identified within close friendships and the peer network may occur within sibling relationships as well.

Support

One of the core relational processes theorized to enhance school outcomes for adolescents is the provision of supportive and accepting interaction experiences (Wentzel, 1994). For instance, a series of now classic studies on parenting styles documented that adolescents' perceptions of authoritative parenting, characterized by warmth and age-appropriate demands, were consistent correlates of academic performance (Dornbusch, Ritter, Leiderman, Roberts, et al., 1987; Steinberg, Lamborn, Dornbusch, & Darling, 1992). Instrumental and emotional support from parents and teachers has also been found to directly predict children's motivation, academic engagement, and performance (Bouchey & Harter, 2005; Furrer & Skinner, 2003; Wentzel, 1998). When young adolescents feel supported by important adults, they are more likely to value academics, put more effort into their schoolwork, and achieve better grades.

Higher levels of both perceived and actual classmate support in math/science have also been positively linked with adolescents' scholastic behavior and performance (Bouchey, 2004). Moreover, research on parents' daily involvement in their children's lives has found that adolescents whose parents show higher levels of involvement, both in general and specifically tailored to the school context, tend to have higher grades and academic self-perceptions (Furstenberg et al., 1999; Juang & Silbereisen, 2002). In sum, interactions with others characterized by warmth and support for the adolescent have consistently been associated with positive academic adjustment.

Might sibling relationships function similarly? Although relatively few studies have explored the specific role of older siblings with respect to adolescents' achievement outcomes, a considerable amount of theoretical and empirical work has demonstrated that these relationships function as important socialization contexts and sources of emotional support (Eccles, Early, Fraser, Belansky, et al., 1997; Tucker, McHale, & Crouter, 2001). The majority of this research has focused on the older sibling as a socializing influence for younger siblings' adjustment, across domains as diverse as drug/alcohol experimentation (Slomkowski, Rende, Novak, Lloyd-Richardson, et al., 2005; Trim, Leuthe, & Chassin, 2006), sexual behavior and teen pregnancy risk (East & Jacobson, 2001; Widmer, 1997), internalizing and externalizing behavior (Branje et al., 2004), delinquency rates (Slomkowski, Rende, Conger, Simons, et al., 2001), expectations of one's own adolescence (Whiteman & Buchanan, 2002), gender role attitudes and gendered leisure activities (Crouter, Whiteman, McHale, & Osgood, 2007; McHale, Updegraff, Helms-Erikson, & Crouter, 2001), intimacy and control within friendships (Updegraff, McHale, & Crouter, 2002), and empathy development (Tucker, Updegraff, McHale, & Crouter, 1999).

As noted, only a handful of published studies to date has examined the extent to which supportive relationships with older siblings are linked to younger siblings' academic adjustment. Work by Eccles and her colleagues (Eccles et al., 1997) indicated that perceived support (regulation) from the older sibling was concurrently associated with younger siblings' GPA and perceived connection to the older sibling was associated with less academic alienation. These relations were unique to sibling relationships, as analyses controlled for parent, school, and peer effects. Tucker and colleagues (2001) reported that older siblings provided more academic-relevant support to their younger siblings than younger siblings provided to their older brothers and sisters. Support provision in this context was even higher when the older sibling him/herself excelled in the academic domain. However, additional work has also revealed that older siblings' reports of support provision to younger siblings were negatively associated with their younger siblings' academic engagement and school success (Widmer & Weiss, 2000). In sum, although preliminary evidence suggests that high-quality, supportive sibling relationships may serve as important contexts for developing academic self-perceptions, goals, and successful behavior, there is currently a need for more work, including longitudinal research, in this arena.

Older Siblings as Role Models

Extant literature also suggests that social learning and modeling of behavior (e.g., Bandura, 2001) is a key process by which older siblings influence the psychological and behavioral adjustment of their younger siblings. For instance, when thinking about their own impending adolescence, younger siblings reported expectations that were consistent with what they perceived their older siblings' adolescent experiences to be like (Whiteman & Buchanan, 2002). Evidence also suggests that older siblings' modeling of gender role orientations plays a role in the development of younger siblings' gender-based attitudes and leisure activities (McHale, et al.,

2001). Slomkowski and colleagues (2001) reported that younger siblings' deviant activity rates from ages 9 to 14 were related to their older siblings' reported delinquency at the same age. Interestingly, this pattern was stronger for girls, suggesting that sex or gender may be an important moderator of modeling effects.

One mechanism through which social modeling may exert an influence is via the academic image that adolescents hold of others, including peers and perhaps siblings. For instance, recent work indicates that, somewhat contrary to popular opinion, both suburban and urban adolescents report admiring, respecting, and wanting to be like their higher-achieving (vs. average- and lower-achieving) peers (Becker & Luthar, 2007; Graham, Taylor, & H, 1998). There is also evidence that *under*-valuing those peers who are high achievers—a pattern particularly characteristic of low-SES, African American male adolescents—is positively associated with perceived educational and occupational barriers, including poor teacher quality and diminished access to good schools (Taylor & Graham, 2007). These intriguing findings from research on peers beg the question of whether the academic image that adolescents hold with respect to their older *siblings* might also have an impact on younger siblings' academic adjustment, including whether such effects might differ as a function of sex and/or ethnicity of the respondent.

As noted, a central limitation in this research area is that few studies to date have assessed the sibling modeling process with respect to *academics* (see Whiteman, McHale, & Crouter, 2007; Widmer & Weiss, 2000 for notable exceptions). In the current study we assessed both younger siblings' perceived academic image of the older sibling and older siblings' reports of their own scholastic image and engagement, providing a potentially more direct test of the social modeling process than has previous research to date. Based on the work that has been conducted, we hypothesized that having an older sibling who excels in the academic domain should provide a

powerful depiction of success for younger siblings. From a social learning perspective, then, younger siblings would be expected to do better academically over time as a function of experiencing a positive and successful role model in the home. However, additional research suggests that this pattern might be moderated by factors such as the sex composition of the sibling dyad and/or ethnicity of the siblings.

Dyadic Sex Composition

Both classic and recent empirical evidence indicate that the sex composition of sibling dyads is associated with sibling relationship quality during childhood and adolescence. Research has established that the warmest, most affectionate and supportive sibling dyads are typically those between sisters (Buhrmester & Furman, 1990; Furman & Buhrmester, 1992). The extant literature also suggests that siblings in same-sex (i.e., sister-sister, brother-brother) dyads tend to be closer than those in mixed-sex dyads (Furman & Buhrmester, 1985a, 1985b), although some longitudinal research suggests that siblings in mixed-sex dyads experience an initial decline in intimacy from childhood through early adolescence, followed by an increase (Kim, McHale, Crouter, & Osgood, 2007; Updegraff et al., 2002), whereas same-sex siblings evidence little change in intimacy over time.

Moreover, research on adolescent delinquency suggests that older siblings of the other sex (e.g., older brothers of girls) do not have a significant impact on either younger siblings' concurrent or prospective problem behavior (Rowe, Rodgers, & Meseck-Bushey, 1992; Slomkowski et al., 2001). Rather, significant relations have been evidenced only for same-sex dyads, with potentially different mechanisms underlying connections for sister and brother dyads (Slomkowski et al., 2001). As noted earlier, however, these patterns appear to directly contrast those revealed in work on gender role attitudes and sex-typed leisure activities (McHale, Kim,

Whiteman, & Crouter, 2004; McHale et al., 2001; Updegraff, McHale, & Crouter, 2000), whereby older siblings of the other sex seem to have the strongest impact on younger siblings' outcomes. Because existing work has not investigated whether the sex composition of adolescent sibling dyads moderates the extent to which older siblings influence younger siblings' academic adjustment per se, the present research took an important first step in including this focus. Given core tenets of the social learning framework, it was hypothesized that stronger positive associations among older sibling predictors and younger sibling academic adjustment indices would be evidenced in same-sex dyads, since sharing one's gender with the older sibling would imply greater similarity and more identification with role models in these dyads as compared to mixed-sex pairs.

Deidentification from Older Siblings

Somewhat in tandem with the social learning approach, however, scholars have also posited that siblings actively strive to de-identify from each other, in an effort to reduce both psychological tension and relational conflict within the dyad and, in effect, enhance their own feelings of self-worth (see Schachter, Shore, Feldman-Rotman, Marquis, et al., 1976; Schacter et al., 1978; Tesser, 1980). Closely linked to this approach is the idea that siblings are highly motivated to construct an independent identity, unique from their siblings, by carving out their own niches through excelling in different domains. From this perspective, younger siblings of high-achieving older siblings who perpetually gets "straight A's" should be inclined to excel in a non-academic domain such as sports, fine arts, or theater in an effort to "shine" in their own right.

An emerging body of literature provides empirical support for the deidentification process. For instance, Feinberg and colleagues' (2000, 2003) work indicates that both older and younger

siblings are likely to differentiate from one another in terms of their psychological characteristics and perceived relationship qualities. Consistent with Schachter and colleagues' early work, Feinberg and Hetherington (2000) also reported that those adolescents who were most *like* their older siblings (in terms of age) were most apt to experience deidentification. On the other hand, Updegraff, McHale and colleagues' work (Crouter et al., 2007; McHale et al., 2001; Updegraff, McHale, & Crouter, 2000; Updegraff et al., 2002) suggests that sibling dyads composed of older and younger siblings of *different* sex are most likely to demonstrate deidentification processes, both concurrently and over time.

From this perspective, then, both support from one's older sibling and her success in academics should predict a *decline* in younger siblings' own academic adjustment over time as the younger sibling strives to be "different" from the older adolescent. Moreover, both Schachter and Feinberg's previous work would suggest that a stronger differentiation should occur within same-sex (i.e., more similar) sibling pairs, whereas the work of McHale and colleagues indicates that deidentification should be more pronounced in mixed-sex dyads, perhaps due to differing gender roles and gender socialization experiences.

Summarizing the study hypotheses, then, we expected that, in general, supportive relationships with and high-achieving characteristics of older siblings would positively predict change in younger siblings' own academic adjustment over time. This set of hypotheses was consistent with social learning theory. In addition, we reasoned that the social learning effect was more likely to occur in same-sex dyads as a function of their greater similarity regarding gender, which should make the modeling process more salient. However, we also noted that a pattern of *negative* relations between older sibling features and younger siblings' outcomes would be consistent with a deidentification process rather than social modeling per se. We focused on

three key components of expectancy-value theory (perceived importance of school, academic self-concept, and performance) as indices of academic success in this study. Consistent with recent calls to ensure that so-called “sibling” effects are not merely assessing the influence of third variables such as family warmth or parent-child relationship quality (see Dunn, 2007; McHale et al., 2001), we also controlled for parental support (along with stability in outcomes and demographic background factors) in all analyses. Finally potential ethnic differences concerning these hypothesized processes were also explored.

Ethnicity

The majority of research on adolescent siblings to date has been conducted with European American middle-class samples, and it remains unclear whether previously reported sibling interaction patterns and associated links with adjustment are also typical of ethnic minority adolescents. Indeed, Dunn (2007) recently commented on the field’s ignorance with respect to potential ethnic differences in the nature or significance of sibling relationships. A handful of studies has investigated sibling relationships and their correlates within African American families (McHale, Whiteman, Kim, & Crouter, 2007) and Mexican American families (McHale, Updegraff, Shanahan, Crouter, et al., 2005; Updegraff, McHale, Whiteman, Thayer, et al., 2005), but none has explicitly focused on academic adjustment. However, Updegraff and colleagues (2005) reported that due to greater familism, ethnic minority (i.e., Mexican American) adolescents spend a greater amount of time with siblings as compared to adolescents from the majority culture. Such results suggest that the hypothesized sibling processes in this paper might perhaps be even more relevant for African American than European American youth. Moreover, African American girls tend to maintain relatively high levels of self-esteem across the transition through middle school and have reported more adaptive academic beliefs than both African

American boys and ethnic majority adolescents in some research (Feagans, Rowley, Kurtz-Costes, & Mistry, 2002). Perhaps African American girls' more positive achievement trajectories are initiated or maintained by support and role modeling from successful older siblings. Given persistent differences in academic achievement between African American and European American youth, even after controlling for socioeconomic disparities (see Byrnes, 2003; Peng, Wright, & Hill, 1995), we explored whether sibling socialization effects were similar across different ethnic groups with relatively equivalent socioeconomic backgrounds.

Method

Participants

Data for this report came from the Maryland Adolescent Development in Context (MADIC) study (see Guttman & Eccles, 2007; Jodl, Michael, Malanchuk, Eccles, et al., 2001). To our knowledge, longitudinal analyses on the sibling data from this larger study have not been published. In the MADIC study, a stratified sampling procedure was used to obtain a representative sample of adolescents and their families drawn from 23 junior high schools in an ethnically diverse county in the mid-Atlantic region. Of the 1961 families who expressed an interest in the study, 1498 participated at Time 1 when adolescents were in the seventh grade. Relative to the larger population of adolescents in the county, this sample was somewhat wealthier and more likely to be European American than the larger population sample (Cook, Habib, Phillips, Settersten, et al., 1999).

Our subsample consisted of 341 target adolescents (M age = 12.23 years at Time 1) and their next-oldest sibling (M age = 15.00 years at Time 1) between one and six years older living in the family home at Time 1. The mean age differences between siblings was 2.76 (SD = 1.21) years. McHale and colleagues (2006) note the inherent difficulties of studying normative sibling

development given the extensive range of potential family constellations. Accordingly, from the full sample we selected only those seventh graders with an older brother or sister living in either a never-divorced or single parent family. We did not include adolescents growing up in either stepfamilies or families including a parent's live-in romantic partner ($n=123$, 26% of original sibling sample) because we wanted to maximize the likelihood that the target siblings we analyzed had spent approximately equal lengths of time residing with their next-oldest siblings. Using these criteria, 47.5% of the younger siblings and 51% of the older siblings were female. The subsample contained a relatively equivalent number of dyads in which siblings were both female ($n=82$, 24%), both male ($n=88$, 25.8%), older sibling male and younger sibling female ($n=79$, 23.2%), and older sibling female with younger sibling male ($n=92$, 27%). Nearly fifty-seven (56.6) percent of the target siblings were African American and 43.4% were European American.

The median family income for European American families in our subsample was \$50,000-54,999 and for African American families was \$45,000-49,999 per annum. In terms of the highest education level within the household, the median level for European American families (15.5 years) was comparable to obtaining an LPN, RN, or PT assistant degree. For African American families, the median education level (13.5 years) fell between completing some college courses and completing an associates-level degree. This ethnically diverse sample is unique in that adolescents come from families of relatively comparable and largely middle-class socioeconomic circumstances.

Two hundred and fifty-one target adolescents were used in our longitudinal analyses; 90 target adolescents dropped out of the study from Time 1 to Time 2. Across a variety of demographic indicators (e.g., sex, sex composition of the dyad, ethnicity, total family income)

and outcome measures (grades, academic self-perceptions), no significant differences were found between adolescents who dropped out of the study and those who remained in the study.

Procedure

The majority of data was obtained using both face-to-face interviews and self-administered questionnaires collected from the target adolescents and their next oldest sibling during the fall of the target adolescent's seventh-grade year. Each participant filled out a large battery of self-administered items and an additional set of questions administered by trained interviewers in the family home. A broad array of constructs was assessed including indicators of the quality of the sibling relationship, adolescents' values and attitudes about school, and academic self-concept and performance. Participants were instructed to answer questions only about the older (or younger) sibling that was closest to them in age. Outcomes in the current study were assessed one year later, immediately following the target adolescent's completion of eighth grade.

Measures

Demographic measures and statistical controls. Relevant characteristics of the target adolescents and their families were used as statistical controls in this study. These measures included target adolescents' sex (-1 = male, 1 = female), ethnicity (-1 = European American, 1 = African American), and their primary caregiver's highest completed grade of school (range = 7 to 26). A combined measure of parental academic support and warmth was also included to control for the potential confounding of sibling effects with family socialization effects on outcomes. This measure was comprised of the average of two standardized scales: positive relationship with primary caregiver, 7 items (Cronbach's $\alpha = .77$) such as "How close do you feel to your parent? (1 = not very close to 4 = extremely close); and academic support from primary caregiver, 4 items (Cronbach's $\alpha = .79$) such as "How often does your (mother) help you with

your schoolwork (1 = almost never to 6 = almost every day). These two scales were highly correlated ($r = .61, p < .001$) in our sample. A score representing the age difference between the older and younger sibling was also included in this study as a potential statistical control.¹

Sibling Features. Questionnaire measures administered within face-to-face interviews at Time 1 assessed both younger and older siblings' perceptions regarding support from the older sibling and her academic behavior. All scale scores were computed by averaging responses for items when respondents had answered at least 75% of the items included in the scale. Additional information regarding convergent and discriminant validity of sibling scales may be obtained from the first author.

Perceived Support from Older Sibling. Using a 6-point Likert-style scale (1 = almost never, 6 = almost every day), target adolescents responded to 5 items completing the stem "How often..." such as "...does your older sibling help you with homework?" and "...do you and your older sibling do things together?" This scale was adapted from the parent-child communication scale in Furstenburg and colleagues' (1999) Philadelphia Study on urban adolescents. A nearly identical scale (with only four items) was used by Widmer and Weiss (2000) in their study of sibling support. Cronbach's alpha for this scale in the current study was .80 (.76 in the Widmer and Weiss study). Sample-wide, participants used the full range (1-6) of responses for all items in the scale.² At Time 2, three items from this perceived older sibling support scale were available in the MADICS dataset (Cronbach's alpha = .76). Test-retest reliability across the one-year time period was fairly strong ($r = .55, p < .0001, n = 247$).

Scholastic Image of Older Sibling. Three items were used to assess the extent to which younger siblings perceived their older sibling to be academically oriented and a good student. Target adolescents responded to questions such as "How much do you agree or disagree that

your older sibling is a good student?" using a 4-point Likert type scale (1 = strongly disagree, 4 = strongly agree). Similar items were used by Widmer and Weiss (2000). A Cronbach's α of .74 (.80 in the Widmer and Weiss study) suggests an adequately internally consistent and reliable scale. Across the sample, respondents used the full range (1-4) of scores for all items in this scale. Test-retest reliability for this scale was .52, $p < .0001$, $n = 245$. The same items were available at Time 2 as used at Time 1 (Cronbach's $\alpha = .71$, Time 2).

Reported Support from Older Sibling. Older siblings completed nearly identical items as their younger siblings for this scale, except they reported on their *own* support behaviors with respect to the target adolescent (e.g., "How often...do you help your younger sibling with homework?" and "...do you and your younger sibling do things together?") A 6-point Likert-style scale (1 = almost never, 6 = almost every day), was used for the 9 items comprising this scale. As was the perceived support scale for younger siblings, this scale was adapted from the parent-child communication scale in Furstenburg and colleagues' (1999) Philadelphia Study. The same scale was used by Widmer and Weiss (2000) in their study of sibling support. Cronbach's alpha for this scale in the current study was .85 (.87 in the Widmer and Weiss study). Across the sample, respondents used the full response range (1-6) for all items in the scale. At Time 2, 7 of the original 9 items from the Time 1 scale were available (Cronbach's $\alpha = .87$, Time 2); test-retest reliability across the one-year period was strong ($r = .63$, $p < .0001$, $n = 197$).

Older Sibling's Academic Engagement. Older siblings reported on their own academic engagement in the form of scholastic behavior and attitudes regarding schoolwork. Scores from five standardized items were used to construct this scale. Sample items included "In general, which of the following best describes the grades you get in school?" (1 = mostly F's, 5 = mostly A's); "My teachers think I am a good student" (1 = strongly agree, 5 = strongly disagree);

recoded) and “How much time did you spend on homework each day (during last two weeks)? (1 = less than 10 minutes; 6 = more than 4 hours). Cronbach’s alpha for this scale was .75. At Time 2, four of the original five items were available in the MADICS dataset (Cronbach’s $\alpha = .70$). Test-retest reliability across the one-year timeframe was strong ($r = .65, p < .0001, n = 199$).

Academic Adjustment. Younger siblings’ perceived valuing of school, academic self-concept, and grade point average at Time 1 (beginning of the 7th grade) and Time 2 (immediately following the end of 8th grade) were the primary outcomes in this study. Developed previously by Eccles and colleagues, these scales possess good psychometric properties (see Eccles-Parsons, 1983; Eccles, Wigfield, Flanagan, Miller, et al., 1989; Jodl, et al., 2001, for further detail). In the MADIC study, each of these scales was created with identical items across both waves of the study in order to more effectively assess change over time in academic adjustment. As with the sibling scales, all scale scores were computed by averaging responses for items.

Perceived Value of School. Four items assessed younger siblings’ valuing of school and education for the future. This measure tapped how much adolescents viewed school as a pathway for later opportunities in life. Using a 5-point Likert-style scale (1 = strongly disagree, 5 = strongly agree), younger siblings responded to statements such as “I have to do well in school if I want to be a success in life” and “Schooling is not so important for kids like me” (reverse coded). Cronbach’s α was .69 for both Times 1 and 2 of the MADIC study.

Academic Self-Concept. Four items assessed adolescents’ perceptions of their academic competence in math and other school subjects relative to their same-age peers. For example, teens responded to “Compared to other kids your age, how well do you do in math?” and “How good are you in other school subjects?” using a 7-point scale (1 = much worse/not at

all good, 7 = much better/very good). Cronbach's α for this scale was .78 at Time 1 and .82 at Time 2 of the MADIC study.

Grade Point Average (GPA). A composite grade point average (GPA) was calculated from students' self-reported answers to the following question: "On your semester report card last year, how many...A's did you get?" Participants responded about the number of A's, B's, C's, D's and F's they received. These responses were then standardized across the sample and converted into a GPA scale (0-4) for each participant at both Times 1 and 2.³

Sex Composition of the Sibling Dyad. An effect-coded dichotomous variable based on the sex make-up of the sibling pair (-1 = mixed-sex dyad, 1 = same-sex dyad) was employed in the current study. Where appropriate based on significant findings for mixed- vs. same-sex dyads, post hoc analyses for female-female, male-male, female-male, and male-female dyads were also conducted and are reported in the results section.

Results

Preliminary Analyses

Given the relative lack of normative data on adolescent sibling relationships, particularly among ethnic minority populations, a multivariate analysis of variance (MANOVA) examining mean level differences for perceived support from older sibling and academic image of older sibling by ethnicity (African American, European American) and sibling dyad type (mixed-sex, same-sex) was conducted. As demonstrated in Table 1, adolescents with same-sex older siblings reported higher levels of support from ($M = 3.58, SD = 1.17$) and more positive academic images of ($M = 3.12, SD = .48$) their older sibling than did adolescents with other-sex older siblings (M 's = 3.02, 2.94; SD 's = 1.24, .60, for support and academic image, respectively). Older siblings in same-sex dyads also reported more frequent support ($M = 3.16, SD = 1.14$) given to their

younger siblings than did those in mixed sex dyads ($M = 2.83$, $SD = 1.10$). In addition, both African American younger ($M = 3.50$, $SD = 1.24$) and older ($M = 3.20$, $SD = 1.20$) siblings reported greater support than did European American adolescents (M 's = 3.03, 2.73, SD 's = 1.18, .98 for younger and older siblings, respectively). Effect sizes for dyad type ranged from nearly one-third to nearly one-half of a standard deviation difference (see Table 1). Regarding ethnic differences in support, only the older siblings' reports appeared practically meaningful given that the effect size for younger siblings' reports was negligible. No significant ethnicity by dyad type interactions were found with respect to the assessed measures of sibling relationships.

A series of repeated-measure MANOVAs was also conducted to examine mean level differences in academic adjustment from seventh to eighth grade, as a function of both sibling dyad type and target adolescent ethnicity. As indicated in Table 2, for the sample as a whole both perceived importance of school ($M_{7th} = 4.03$, $SD = .59$; $M_{8th} = 3.84$, $SD = .71$) and perceived academic self-concept ($M_{7th} = 5.40$, $SD = 1.11$; $M_{8th} = 5.14$, $SD = 1.20$) declined from seventh to eighth grade. In addition, adolescents in same-sex sibling dyads ($M = 5.41$, $SD = 1.18$) reported higher academic self-concept than did those in mixed-sex dyads ($M = 5.14$, $SD = 1.12$). European American adolescents ($M = 3.31$, $SD = .51$) also had higher GPAs than African Americans ($M = 3.00$, $SD = .62$). Effect sizes for these significant findings were typically modest, averaging approximately one-quarter of a standard deviation difference between groups or across time (see Table 2). However, the ethnic difference regarding academic performance was a bit more substantial with African American adolescents reporting nearly three-fifths of a standard deviation lower performance than did European American adolescents.

Table 3 presents zero-order correlations among the major variables of interest in this study.⁴ As shown, younger and older siblings' perceptions of both support from the older sibling

and the academic image or engagement of the older sibling were moderately positively correlated for both same-sex and mixed-sex dyads (r 's from .31, $p < .001$ to .43, $p < .001$). With respect to older sibling characteristics and younger siblings' academic outcomes, perceived support from older siblings was not strongly correlated with younger siblings' 8th grade academic adjustment in either same-sex (r 's = -.03 to .15, $p < .05$) or mixed-sex (r 's = -.04, ns to -.15, $p < .05$) dyads. However, older siblings' reports of support were *negatively* correlated with younger siblings' academic adjustment, particularly for same-sex dyads (r 's = -.15, $p < .05$ to -.29, $p < .01$). Moreover, the extent to which younger siblings held a positive academic image of their older sibling was correlated with higher academic adjustment (r 's = .14, ns to .28, $p < .01$) in same-sex dyads, whereas it was not significantly associated with academic adjustment in mixed-sex dyads (r 's = .02 to -.09, ns). Older siblings' self-reported academic engagement was positively correlated with younger siblings' academic outcomes, particularly for mixed-sex dyads (r 's = .14, ns to .24, $p < .001$).

Predicting Change in Academic Adjustment over Time

Next, a series of hierarchical linear regression analyses was performed to examine perceived and actual older sibling support, younger siblings' scholastic image of the older sibling, and older siblings' actual academic engagement as predictors of *change* in younger siblings' academic adjustment from 7th to 8th grade (which cannot be readily assessed by inspecting the correlations in Table 3). For each analysis, the younger sibling's sex and ethnicity, parents' highest level of education, and perceived parental support were entered into the equation first followed by the Time 1 stability coefficient for the dependent variable of interest (i.e., 7th grade measure of school valuing, academic self-concept, or grade point average). Following Aiken and West (1991), mean-centered indicators of the sibling relationship (i.e., perceived

support and scholastic image; reported support and academic engagement) and the contrast-coded sex composition of the sibling dyad were entered next as a third block. To assess the relative predictive validity of each perceived sibling characteristic, both reports by younger siblings were included in the same analysis. Likewise, to assess the relative predictive validity of each older sibling reported feature, both were entered into the same equation. The 2-way interaction term between each indicator of the sibling relationship and the sex composition of the sibling dyad (i.e., perceived support by sex composition, scholastic image by sex composition; reported support by sex composition, and academic engagement by sex composition) was entered last into the equation. Preacher's (Preacher, Curran, & Bauer, 2006; www.quantpsy.org) methods were used for post hoc probing of significant interaction effects.

First Order Effects. It was anticipated that both younger adolescents' perceived support from their older siblings and older siblings' own reported support would predict an increase in younger siblings' academic adjustment over time. However, we found no evidence to support this initial set of hypotheses. In fact, the results obtained were in direct contrast to these hypotheses. As depicted in Tables 4 and 5, both perceived support and reported support from older siblings predicted a significant *decline* in younger siblings' valuing of school and their academic self-concept once background variables and stability in the outcome were controlled. Older sibling reports also predicted a near-significant decline in younger siblings' academic performance (GPA) after controlling for background and stability factors (see Table 5).

Consistent with a social modeling paradigm, it was also initially hypothesized that younger siblings' academic image of their older siblings and older siblings' reported levels of their own academic engagement would predict an increase in younger siblings' academic adjustment over time. Results were only partially consistent with this set of predictions. Older

siblings' reported levels of academic engagement did positively predict change in all three indices of their younger siblings' academic adjustment (see Table 5). Importantly, these positive effects were significant above and beyond the obtained negative effects for support and net of the demographic effects as well. The direction of effects for support from older sibling and their own academic engagement were also *opposite* in sign (see Table 5). For the sample as a whole, younger siblings' perceptions regarding the extent to which their older siblings were good students were not associated with change in their own academic adjustment over time (see Table 4).

Interaction Effects. Above and beyond the presence of any first-order "main" effects, it was also hypothesized that the sex composition (same-sex versus mixed-sex) of sibling dyads might be an important moderator of associations among older sibling support, academic image/behavior, and younger siblings' academic adjustment. As illustrated in Table 4, this set of hypotheses was partially confirmed. However, the direction of effects was somewhat counter to the social learning hypothesis per se. Specifically, among younger siblings in *mixed-sex* sibling dyads, higher perceptions of academic support from the older sibling predicted a decline in their valuing of school for the future ($b = -.16, p < .001$; see Figure 1). For same-sex dyads, support did not predict change in younger siblings' valuing of school ($b = .00, ns$). A similar pattern was revealed for change in younger siblings' academic self-concept over time (see Table 4 and Figure 1). In mixed-sex sibling dyads, the extent to which younger siblings' reported academic support from their older sibling predicted a decline in their academic self-concept ($b = -.27, p < .01$). For same-sex dyads, perceived support from the older sibling did not predict change in academic self-concept ($b = .04, ns$; see Fig. 1).⁵

A less consistent pattern of findings was observed for younger siblings' scholastic image of their older sibling (see Table 4). Namely, the interaction between scholastic image and the sex composition of the sibling dyad predicted change only in the younger siblings' GPA over time. Further, as illustrated in Figure 2, younger siblings in same-sex dyads holding a more positive scholastic image of their older sibling experienced an increase in their own grades over time ($b = .17, p < .01$) whereas any change in performance of younger siblings in mixed-sex dyads was unrelated to their scholastic image of the older sibling ($b = -.09, ns$).

For the sample as a whole, younger siblings' perceived support and their academic image of older siblings also interacted to predict change in the younger siblings' perceived importance of school (see Table 4). Although this interaction was not initially hypothesized, post hoc probing of the simple slopes revealed that the negative effect of perceived support on younger adolescents' perceived importance of school over time was particularly salient when they also perceived their older siblings as relatively more ($b = -.53, p < .01$) versus less ($b = -.19, p < .01$) academically engaged. Likewise, in the context of high levels of perceived support from older siblings, younger siblings reported a decline over time in their own perceived importance of school as a function of a higher academic image of their sibling ($b = -.66, p < .05$), whereas their image of the sibling was not linked with their own perceived importance of school in the context of low perceived support from the older sibling ($b = -.09, ns$).

Inconsistent with younger siblings' reports, none of the first-order effects concerning older siblings' reports was qualified by the sex composition of the sibling dyad (see Step 4, Table 5). Moreover, neither of the two-way interactions involving older siblings' reported academic engagement (i.e., engagement by support, engagement by sex composition of dyad) was statistically significant.

Further Exploration of Dyadic Sex Composition. To explore whether any of the three interactions involving sex composition obtained for younger siblings' reports could be attributed to a specific constellation within each dyad type (e.g., younger brothers paired with older sisters within mixed-sex dyads; sisters within same-sex dyads), unstandardized regression coefficients between the two groups within each dyad type were compared [see Howell (2007), p. 257]. However, there were no statistically significant differences between pairs of siblings within each dyad type for any of these analyses.

Ethnicity as a Moderator of Sibling Effects on Academic Adjustment

To test whether the effects of sibling features on younger adolescents' change in academic adjustment over time differed as a function of ethnicity, the final set of analyses for this study consisted of reanalyzing the preceding hierarchical regressions while also entering mean-centered 2-way interaction terms between both (1) ethnicity and sex composition of the sibling dyad and (2) ethnicity and the sibling feature of interest at the 4th step of the equation, as well as introducing a 3-way interaction among the sibling feature of interest, ethnicity, and sex composition at the final step of the regression equation. Results revealed only one significant three-way interaction [$b = -.09, p < .01$; R -square change for step = .03; $F(3, 204) = 3.22, p < .05$]. Namely, the negative effect of perceived support from older siblings on grades was significant only for European American adolescents in mixed-sex sibling dyads ($b = -.12, p < .05$; see Figure 1). There was no effect of perceived support on grades for either African American adolescents or European American adolescents in same-sex dyads. One statistically significant two-way interaction between image and ethnicity was also revealed [$b = -.12, p < .05$; R -square change for step = .01; $F(6, 234) = 3.97, p < .01$]. However, post hoc probing of this interaction indicated that having a positive image of one's older sibling was not associated with

perceived importance of school for either European American ($b = .14, p = .11$) or African American younger siblings ($b = -.10, ns$).

Discussion

The aim of this research was to investigate the extent to which support from and academic characteristics of older siblings predicted prospective associations in younger siblings' academic adjustment. As expected, older siblings who reported high engagement and academic success themselves had younger siblings whose academic adjustment increased over time. Importantly, these hypothesized effects held net of parental support and demographic background factors, suggesting that academically successful older siblings may, in fact, function as salient role models with respect to the academic achievement of their younger brothers and sisters. However, the full complement of results suggests that a more nuanced set of conclusions is also called for.

Somewhat inconsistent with our expectations, results for the entire sample revealed that younger siblings' perceptions of their older siblings' academic status did not predict change in the younger siblings' own academic self-perceptions and performance over time. Further, both older and younger siblings' perception of support provided or received from the older sibling were associated with a *decline* in younger siblings' academic adjustment over time. And these findings were further qualified by a relatively consistent set of interactions whereby perceived support from older siblings predicted this decline predominantly for younger siblings within mixed-sex dyads (including European American younger siblings in mixed-sex dyads with respect to academic performance).

The findings obtained in this research are noteworthy given the incorporation of statistical controls regarding potential third-factor causal variables (i.e., parental relationship

features and parental education level) that may have accounted for these results. Inclusion of these latter constructs in longitudinal work has recently been discussed as critical for advancing the field of sibling socialization research (Kim et al., 2007; McHale et al., 2001). Moreover, although at first glance the size of these sibling effects appears modest (5-8% change in partial R-square for younger siblings' reports; 4-6% for older siblings' reports), it is encouraging that the hypothesized variables accounted for *any* variance at all given that we controlled for what is typically the strongest predictor of academic outcomes—their stability over time. Overall, as discussed in further detail below, the patterns obtained in this investigation provide evidence for both social learning processes (when considering the older siblings' reported academic status) *and* differentiation processes (when considering younger adolescents' "meaning-making" of supportive experiences in the context of mixed-sex dyads).

The results revealed novel information regarding the nature of adolescent sibling relationships within African and European American middle-class populations. For instance, in this study African American adolescents reported more academic support from and admiration of their older siblings than did European American adolescents. These findings are consistent with previous evidence of moderately high support in African American sibling dyads (McHale, Whiteman, Kim, & Crouter, 2007). The currently reported findings are important in that they extend this pattern to academics. Namely, to the extent that these typically positive indices of sibling relationships are predictive of academic *maladjustment* over time (as in the current findings), they may shed light on long-standing patterns whereby African Americans underperform (as compared to European Americans) in the academic domain. It is also important to note, however, that the potential processes whereby features of older siblings were linked with

younger siblings' academic adjustment did not appear to differ by ethnicity, despite mean-level group differences in older sibling characteristics.

Consistent with McHale, Crouter, and colleagues' studies (McHale et al., 2001, 2004; Updegraff et al., 2000), the present research indicated that at least some of the developmental "effects" on our outcomes of interest occurred in the context of other-sex, as opposed to same-sex, dyads. Despite the fact that same-sex older siblings were perceived to be both more supportive and better students than mixed-sex older siblings, mixed-sex older siblings seemed to have more of an impact on their younger siblings' academic adjustment. This further illustrates the importance of investigating both mean-level differences and putative predictive effects within the same study, as unique patterns may be evidenced for each.

Why might older siblings within other-sex dyads be particularly relevant for younger siblings' perspectives regarding their own academic adjustment? It is possible that the gendered nature of achievement plays an important role. Traditionally, achievement has been viewed as a masculine domain (see Choi, 2004; Tuss, 2004). As such, younger sisters of high-achieving brothers may be especially likely to "turn off" to the academic success route. Alternatively, recent evidence indicates that African American girls, as compared to boys, are much more likely to value academics during 7th grade (Taylor & Graham, 2007). It might be difficult for the younger brothers of such girls to pursue academic goals and place high value on the academic domain, particularly if their sisters are already doing quite well in a traditionally masculine arena. Currently, we cannot test whether either (or both) of these potential mechanisms undergird our findings. However, the integration of sibling deidentification frameworks with information on the sex composition of sibling dyads and sibling reports of gender roles, gender salience, and gender beliefs in addition to academic adjustment might be a fruitful avenue for further research.

As well, replicating our findings with more domain-specific academic outcomes (e.g., math and science) would be an important step for potentially clarifying the roles of sex and gender in the sibling socialization process.

High levels of instrumental academic support from an older sibling may also possess different meaning as a function of the dyad's sex composition. Given that mixed-sex dyads are typically not as warm and intimacy-laden (Furman & Buhrmester, 1985a, 1985b), it might be that younger siblings in these dyads view academic support from their older siblings as a noxious experience. In this sense, receiving more levels of such support might make the adolescent feel less confident and less positive about school over time. Since we tested only the perceived frequency of such support in this study, it will be important in future research to collect information regarding how siblings experience and interpret the academic support and homework help interactions.

We also recognize the need to be cautious in over-stating conclusions regarding mixed-sex sibling effects. It is possible that we did not assess the particular components of interactions with older siblings within same-sex dyads that do predict academic adjustment over time. Further, similar processes might be occurring within same-sex dyads, but at an earlier time point than was studied (perhaps because same-sex siblings are closer with each other throughout development). Consistent with this, we note the evidence of same-sex modeling over time for GPA in the present study. To the extent that adolescents' self-perceptions mediate the effects of social forces on school performance (see Bouchev & Harter, 2005), it is possible that we may have seen effects on younger siblings' academic self-perceptions (i.e., valuing and self-concept) *prior* to Time 1 within same-sex dyads. Following this logic, we should therefore expect to see strong effects on GPA for mixed-sex younger siblings (which were somewhat weak in this study)

during the timeframe after Time 2. This explanation remains quite speculative, but we find it nonetheless intriguing.

Integrating our results with some of the other work on sibling influence—namely that on delinquency and problem behavior, which indicates that same-sex older siblings function as particularly salient role models for younger siblings' outcomes (e.g., Slomkowski et al., 2001)—it seems reasonable to conclude that a “one size fits all” model may not apply when it comes to sibling influence. Rather, it appears that for some outcomes (and within certain dyadic constellations) older siblings may function as positive role models, whereas in others they function as negative or *antithetical* role models—individuals that younger siblings actively strive to be “not like.”

Further, our results illustrate that scholars would do well to distinguish between perceived and (so-called) objective indices of relational features. In this study, younger and older sibling reports were not so highly correlated that they could have reasonably been collapsed into a uniform index of either support or academic status/image of the older sibling. Moreover, as noted previously, the pattern we obtained *differed* depending on which sibling in the dyad reported on her experiences. From the perspective of older siblings, their successful academic status was associated with a positive impact on their younger siblings' scholastic self-perceptions and performance. Younger siblings in same-sex dyads demonstrated a somewhat similar pattern, as their own academic performance increased to the extent that they considered their older sibling a good student. With respect to support, however, both older siblings and younger siblings (in mixed-sex dyads, in particular) reported that a greater frequency of support was linked with later academic *risk*, especially in terms of younger siblings' academic self-perceptions. This study represents an initial brushstroke at describing and delineating the specific

mechanisms that may underscore older sibling influence in the academic arena. Future research will need to adopt a more nuanced and developmentally relevant approach to pinpoint exactly how interacting with siblings in purported “supportive” contexts and believing that they are a good student can affect younger siblings’ own academic goals and behavior.

Limitations and Future Directions

An important limitation of this study is that all of the data were analyzed using ordinary least squares regression techniques. Such analyses do not capture the “dyadic” nature of relationships; future research, using perhaps hierarchical linear modeling or similar approaches, could more fully test the relational phenomena underlying siblings as achievement socialization agents. Recently, the field has seen a shift toward long-term longitudinal analyses (e.g., latent growth curve models over multiple waves of data), and we concur that there is a need to move in that direction here as well. The goal of the current study was to investigate predictors of short-term longitudinal change in academic adjustment as early adolescents moved through middle school, a timeframe critical for the establishment of subsequent educational trajectories (see Eccles, Vida, & Barber; 2004). However, it would also be beneficial to investigate potentially similar sibling achievement socialization effects both earlier and later in development. Similarly, looking at whether *change* in sibling characteristics (e.g., witnessing one’s older sibling become a better student over time) is linked with change in younger siblings’ own adjustment is an important future direction. Consistent with much of the extant literature, this study focused solely on older siblings as the “agents” of socialization. Future research that investigates how older siblings might be influenced by the academic achievement of their younger siblings, perhaps in a reciprocal or transactional manner, would be a useful contribution.

Finally, there is a need to move toward situating sibling effects within the broader family context. For instance, McHale and colleagues' (McHale, Crouter, & Tucker, 1999) adoption of a family systems approach has demonstrated that the *conjunction* of parents' traditional gender beliefs and the sex composition of the sibling dyad is the salient predictor of adolescents' own gender beliefs and sex-typed activity development. Similarly, one might imagine that either parents' gender beliefs or their specific beliefs about the younger adolescent's academic capacities could potentially enhance or buffer the older sibling effects studied here. Given the long history of documenting how teachers and parents influence academics, the simultaneous study of siblings (and peers) along with these important adults will allow us to more readily understand the myriad sources and mechanisms of social influence with respect to achievement.

In summary, this research provides novel information regarding the older sibling context as a potential source of achievement socialization during early adolescence. The findings indicated that overall, higher achieving older siblings can present a powerful positive role model to their younger siblings. However, too much support provision from older siblings may serve to undermine these effects, particularly in the context of mixed-sex sibling dyads. As such, younger siblings of high-achieving, other-sex older siblings might be at particular risk for declining scholastic adjustment across middle school. Gathering information about younger siblings' perceptions of and comparisons with their older siblings might be a fruitful endeavor, both as a logical next research step and for educators and parents hoping to better understand and optimize adolescents' academic success.

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This research was supported by NIH grant R01 HD 33437 awarded to Jacquelynne Eccles and Arnold Sameroff, and partially supported by NIH fellowship T32 HD07109 awarded to the University of Michigan Developmental Psychology program.

We thank Todd Bartko, Elaine Belansky, Nick Butler, Diane Early, Kari Fraser, Ariel Kalil, Linda Kuhn, Oksana Malanchuk, Karen McCarthy, Alice Michaels, Leslie Morrison, Stephen Peck, Dairia Ray, Kate Rosenblum, Robert Roeser, Sherrie Steele, Erica Taylor, Cynthia Winston, and Carol Wong. We also thank the anonymous reviewers for their helpful comments.

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Footnotes

¹The total number of siblings in each family was not available in this dataset. However, the total number of family members was available. This figure could be conceptualized as a rough approximation of sibling number within each family, and it was accordingly correlated with all study variables to explore whether it should serve as an important statistical control. Within mixed-sex dyads, family size was not significantly correlated with any of the other study variables. Within same-sex dyads, it was significantly correlated with the target adolescent's ethnicity ($r = -.17, p < .05$) and with the siblings' difference in age ($r = -.17, p < .05$). Based on this weak pattern, family size was not included in subsequent regression analyses.

² Exploratory factor analysis with principal components extraction and varimax rotation of these items plus those of the subsequently discussed academic image scale revealed distinct perceived sibling support and academic image constructs, with 2 eigenvalues > 1 . Rotated factor loadings for the support scale ranged from .71 to .81, and those for the academic image scale ranged from .72 to .88.

³ For the smaller subsample of the MADIC study that had school record data, participants' Time 2 GPA obtained from school records was highly correlated with Time 2 self-reported GPA ($r = .79, p < .01$).

⁴ In mixed-sex sibling dyads only, the mean age difference between siblings was significantly related to the extent to which younger siblings perceived support from their older sibling ($r = .20, p < .01$) and the extent to which older siblings reported both providing support ($r = .22, p < .01$) and being academically engaged ($r = .19, p < .05$). Age difference was accordingly entered as a control variable in the subsequent regression analyses. However, it was not a significant

predictor in any of these analyses and results were nearly identical when it was omitted. Thus, it is not included as a predictor in Table 5.

⁵A subsequent section of the Results discusses a significant three-way interaction (with ethnicity as a second moderator) that addresses the non-significant effect regarding younger siblings' GPA.

Table 1. Means, standard deviations, and Analysis of Variance (ANOVA) results for sibling characteristics by dyad type and ethnicity.

Sibling Characteristic	Dyad Type				Dyad (D)	ANOVA F ^(^d)	
	<u>Same-sex</u>		<u>Mixed-sex</u>			<u>Ethnicity (E)</u>	<u>D x E</u>
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>			
<u>Younger Sibling Report</u>							
<i>Support from Older Sibling</i>							
African-American	3.75	1.15	3.23	1.29	16.15***	10.91**	.00
European-American	3.32	1.15	2.79	1.14	(.46)	(.05)	
<i>Image of Older Sibling</i>							
African-American	3.12	.46	2.94	.61	8.78**	.07	.00
European-American	3.13	.51	2.96	.59	(.33)		
<u>Older Sibling Report</u>							
<i>Support to Younger Sibling</i>							
African-American	3.35	1.20	3.03	1.19	5.59*	12.43***	.03
European-American	2.89	.98	2.61	.97	(.30)	(.42)	
<i>Academic Engagement (self)</i>							
African-American	-.04	.64	-.04	.74	2.03	1.60	2.06
European-American	.18	.64	-.05	.84			

Note. Degrees of freedom for ANOVA F's = 1, 332 for YS analyses; 1, 302 for OS analyses. Effect sizes, calculated as η^2 (see Howell, 2008), reported in parentheses under significant *F* statistics. Multivariate *F*'s (2, 331) for YS analyses were 10.16*** for dyad type (D), 6.01** for ethnicity (E), and .01, *ns* for D x E. Multivariate *F*'s (2, 301) for OS analyses were 3.60* for dyad type (D), 7.29** for ethnicity (E), and 1.06, *ns* for D x E. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 2. Means, standard deviations, and repeated measures ANOVA results for younger siblings' academic adjustment by dyad type and ethnicity.

Adjustment	Dyad Type				Between Groups Analyses ¹			Repeated Measures Analyses ²				
	<u>Same-sex</u>		<u>Mixed-sex</u>		<u>Dyad (D)</u>	<u>Ethnicity (E)</u>	<u>D x E</u>	<u>Time (T)</u>	<u>T x D</u>	<u>T x E</u>	<u>T x D x E</u>	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>								
<i>Importance of School for Future</i>					<i>F(1, 247)</i>							
African-American												
7 th grade	4.17	.64	3.99	.59	1.98	3.77*	.24	14.18***	.18	.34	3.89+	
8 th grade	3.89	.79	3.95	.66		(.22)		(-.32)				
European-American												
7 th grade	4.00	.60	3.95	.52								
8 th grade	3.86	.60	3.66	.72								
<i>Academic Self-Concept</i>					<i>F(1, 242)</i>							
African-American												
7 th grade	5.54	1.17	5.30	1.07	4.39*	.20	.01	10.97**	.16	.05	.01	
8 th grade	5.32	1.19	5.04	1.10		(.24)		(-.23)				
European-American												
7 th grade	5.50	1.19	5.26	1.02								
8 th grade	5.27	1.19	4.95	1.31								
<i>GPA</i>					<i>F(1, 219)</i>							
African-American												
7 th grade	3.01	.59	3.01	.71	.03	21.69***	.80	.52	.00	.01	3.21+	
8 th grade	2.91	.62	3.06	.54		(-.56)						
European-American												
7 th grade	3.32	.48	3.34	.45								
8 th grade	3.36	.55	3.24	.55								

Note. *F* ratios are Wilks' Lambda approximations. ¹Effect sizes, calculated as η^2 (see Howell, 2008), reported in parentheses under significant *F* statistics. ²Effect sizes represent gain in terms of SD at baseline (see Howell, 2008, p. 354). *** $p < .001$, ** $p < .01$, * $p \leq .05$, + $p < .10$.

Table 3. Intercorrelations among study variables by sibling dyad type.

Construct/Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Control Variables</i>														
1. YS Gender	----	-.13	-.01	-.02	-.01	.09	.02	.32	.04	.22	-.04	-.03	.18	.23
2. YS Ethnicity	.13	----	-.22	.17	.19	-.01	.20	-.17	.15	.02	.01	.02	-.22	-.36
3. Parental Education	-.02	-.18	----	-.02	-.16	.11	-.24	.09	.08	.19	.20	.27	.36	.40
4. Parental Support	.00	.17	-.05	----	.47	.25	.18	.01	.31	.34	.34	.34	.14	.15
<i>Sibling Characteristics</i>														
5. YS Received Support	-.11	.19	.01	.46	----	.18	.31	-.04	.11	.10	.14	.15	-.02	-.03
6. YS Image of OS	-.29	-.02	.13	.33	.27	----	.01	.38	.15	.20	.10	.14	.17	.28
7. OS Report of Support	-.18	.20	-.11	.25	.43	.09	----	.03	-.15	-.26	-.02	-.15	-.12	-.29
8. OS Academic Engagement	-.32	.01	.27	.09	.10	.32	.06	----	.02	.11	.03	.05	.13	.24
<i>YS Academic Adjustment</i>														
9. Importance of school (7 th)	.14	.00	.12	.24	.06	.04	-.16	.11	----	.33	.33	.27	-.01	.13
10. Importance of school (8 th)	.24	.21	.05	.05	-.15	-.02	-.10	.14	.28	----	.10	.46	.23	.37
11. Academic self-concept (7 th)	.05	.00	.11	.13	.11	.01	-.01	.13	.19	.36	----	.49	.25	.26
12. Academic self-concept (8 th)	.01	.05	.21	.11	-.12	.07	-.11	.23	.16	.46	.44	----	.23	.39
13. GPA (7 th)	.09	-.23	.34	-.13	.07	-.03	-.08	.06	.07	.03	.36	.14	----	.60
14. GPA (8 th)	.19	-.16	.30	-.02	-.04	-.09	.00	.24	.10	.20	.47	.38	.45	----

Note. Values above the diagonal represent correlations for same-sex dyads. Correlations below the diagonal are for mixed-sex dyads. For same-sex dyads, $.15 < |r| < .23$, $p < .05$. $.23 < |r| < .29$, $p < .01$. $|r| > .29$, $p < .001$. For mixed-sex dyads, $.17 < |r| < .20$, $p < .05$. $.20 < |r| < .30$, $p < .01$. $|r| > .30$, $p < .001$. N's range from 112 to 170, due to missing data.

Table 4. Younger sibling's perceptions of older sibling characteristics and sex composition of dyad as predictors of younger sibling's academic adjustment following the 8th grade.

Construct/Variables	Younger Sibling's Academic Adjustment											
	Importance of School				Academic Self-Concept				GPA			
	β	ΔR^2	R^2_{Adj}	pR^2	β	ΔR^2	R^2_{Adj}	pR^2	β	ΔR^2	R^2_{Adj}	pR^2
<i>Step 1. Control Variables (7th grade)</i>												
YS Gender	.23***				-.01				.21**			
YS Ethnicity	.13*				.06				-.19**			
Parental Education	.15*				.21**				.31***			
Parental Support	.17**				.26***				.07			
			.10				.10				.18	
<i>Step 2. Stability Coefficient (7th grade)</i>												
	.24***	.05***	.15		.41***	.16***	.26		.42***	.15***	.33	
<i>Step 3. Predictors (7th grade)</i>												
Support from OS	-.16*				-.14*				-.08			
Image of OS	.06				.02				.02			
Sex Composition of Dyad	-.02	.02+	.16		.09	.02+	.27		-.03	.01	.33	
<i>Step 4. Interaction Term</i>												
Support X Sex Composition	.14*				.16**				.05			
Image X Sex Composition	.09				.04				.18***			
Support X Image	-.18**	.05**	.20	.08	-.10	.03*	.29	.07	-.07	.03*	.35	.05

Note. YS = younger sib, OS = older sib. β 's are standardized coefficients at variable's entry into the equation. R^2_{Adj} = adjusted R-square. pR^2 = proportion of residual variance after Step 2 accounted for by next statistically significant step (see Cohen et al., 2003). *** $p < .001$, ** $p < .01$, * $p \leq .05$, + $p < .10$

Table 5. Self-reported older sibling characteristics and sex composition of dyad as predictors of younger sibling's academic adjustment following the 8th grade.

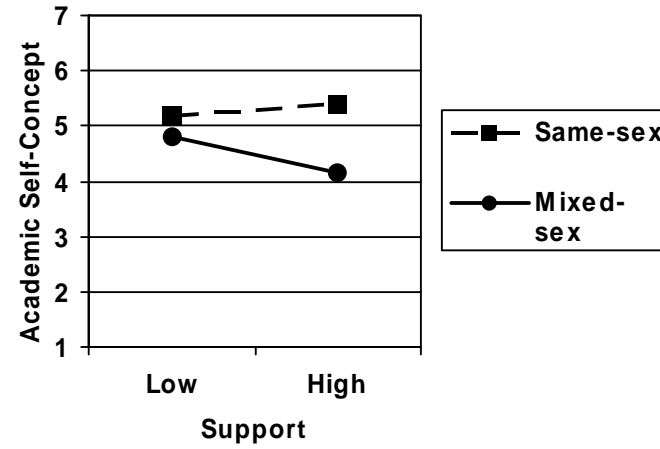
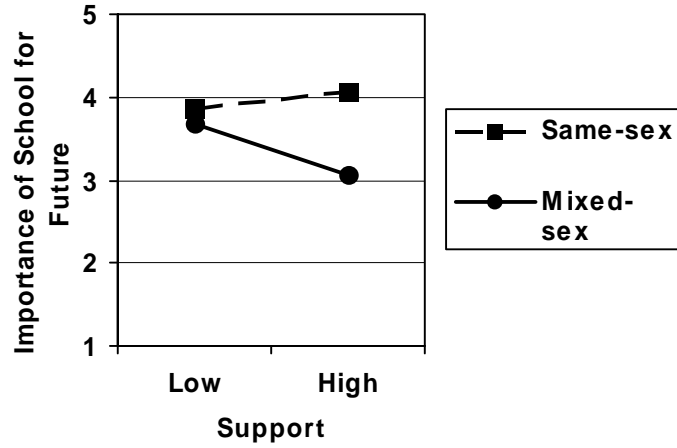
Construct/Variables	Younger Sibling's Academic Adjustment											
	Importance of School				Academic Self-Concept				GPA			
	β	ΔR^2	R^2_{Adj}	pR^2	β	ΔR^2	R^2_{Adj}	pR^2	β	ΔR^2	R^2_{Adj}	pR^2
<i>Step 1. Control Variables (7th grade)</i>												
YS Gender	.23***				.00				.18**			
YS Ethnicity	.14*				.07				-.20**			
Parental Education	.20**				.28***				.32***			
Parental Support	.15*				.20**				.10			
			.12				.11				.20	
<i>Step 2. Stability Coefficient (7th grade)</i>												
	.25***	.06***	.17		.41***	.16***	.27		.42***	.15***	.37	
<i>Step 3. Predictors (7th grade)</i>												
Support from OS	-.19**				-.15*				-.12+			
OS Academic Engagement	.14*				.12*				.16**			
Sex Composition of Dyad	-.01	.05**	.21	.06	.09	.03*	.29	.04	.00	.03*	.39	.05
<i>Step 4. Interaction Term</i>												
Support X Sex Composition	-.04				.03				-.08			
Engagement X Sex Composition	-.08				-.04				-.03			
Support X Engagement	-.03	.01	.20		.07	.01	.28		.00	.01	.39	

Note. YS = younger sib, OS = older sib. β 's are standardized coefficients at variable's entry into the equation. R^2_{Adj} = adjusted R-square. pR^2 = proportion of residual variance after Step 2 accounted for by next statistically significant step (see Cohen et al., 2003). *** $p < .001$, ** $p < .01$, * $p \leq .05$, + $p < .10$

Figure Captions

Figure 1. Effect of support from older sibling on academic adjustment as function of sibling dyad type and ethnicity.

Figure 2. Effect of perceived academic image of older sibling on younger sibling grade point average as a function of sibling dyad type.



African-Americans

European-Americans

