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Predictors of academic achievement: The role of older sibling and peer relationship factors

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**Predictors of academic achievement:
The role of older sibling and peer relationship factors**

by

Lisa Mae Ryherd

A thesis submitted to the graduate faculty
In partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Human Development and Family Studies

Program of Study Committee:
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Ames, Iowa

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Abstract

The objective of this study was to understand the relationship between an adolescent's older sibling and peers on their academic achievement applying Bowlby's attachment theory. Data for this study originated from Wave 1 (1989), Wave 2 (1990), and Wave 4 (1992) of the Iowa Youth and Family Project (IYFP). This study utilized a sample of 217 adolescents and their older siblings to predict adolescent's academic achievement.

Structural equation modeling (SEM) analyses estimated the relationship positive older sibling warmth and support had on an adolescent's closeness to peers and their academic achievement. This study partialled out demographic characteristics that can predict an adolescent's academic achievement. The results of this study substantiate previous findings revealing that positive warmth and support from an older sibling directly influences an adolescent's academic achievement.

This study failed to find peer relationships mediating positive older sibling warmth and support and academic achievement. Observed older sibling warmth and support significantly increased academic achievement but failed to increase closeness to peers. However, this study found a significantly indirect effect that indicated, through self-reported measures, when the target adolescent felt high warmth and support from their sibling, there was a positive effect on closeness with peers which resulted in an increase in academic achievement.

Introduction

Children spend approximately 14,000 hours at school over the course of thirteen years (Elmore, 2009). Children and adolescents spend more time in schools than in any other place outside their homes. Adolescence is primarily defined as the ages of 11 to 18 (Elmore, 2009). Adolescence is characterized by a number of cognitive, emotional, physical, and attitudinal changes, which can have a positive or negative effect on the adolescent's development (Brody, 1998).

Decades of research show that adolescents' self-perception, such as self-efficacy, goal orientation, or independence are strong predictors of motivation and performance in school (Eccles & Roeser, 2009). At the same time, researchers note the social factors that influence the adolescent's motivation, such as, parents (Bassi, Steca, Fave & Caprara, 2007), siblings (Brody, 1998), and peers (Schwartz, Gorman, Dodge, Pettit & Bates., 2008). The objective of school is to enable an individual's learning. One of the indicators of learning is the level of academic achievement (Bahar, 2010). Academic achievement is important to research as the problem of school dropouts has become a major concern for policymakers and educators (Rumberger, 1995). A study conducted by Rumberger (1995) found that student's academic performance in eighth grade predicted dropping out of school. Compared to students who graduate, students who dropout are likely to have health problems, engage in criminal activities, and become dependent on government programs (Rumberger, 1995). Present research is noteworthy in detecting whether student's gender, parents, teachers, and socioeconomic status affect the adolescent's academic achievement (Bassi et al., 2007; Way & Greene, 2006). However, the knowledge about the effect of perceived social support from siblings and peers on academic success is limited. This study seeks to address the gap found

in research to better understand the effect of an adolescent's older sibling and his/her peers on their academic achievement.

This study built on previous research in three ways. First, this study included the relationship an adolescent has with his/her older sibling. Older sibling in this study is defined as a one of two individuals whom share biological parents and is older than the target adolescent by a maximum of four years. A limitation of previous studies has been a focus solely on the parent-child relationship and how that relationship influences the adolescent's academic achievement. Academic achievement is defined as a student's level of comprehension within all school subjects. Only recently have studies started investigating the outcomes siblings have on adolescent's academic outcomes.

Second, this study included the relationship an adolescent has with his/her peers. A peer relationship in this study is defined as the perceived level of relationship quality and acceptance an adolescent experiences from their peer group. Peers have been blamed for the problematic aspects of adolescent functioning and praised for contributing to adolescent well-being (Way & Greene, 2006). Many studies have found that peers influence academic outcomes but more work is needed on whether peer relationship quality serves as a mediator of other relationship patterns and effects.

Third, older sibling influences were examined in relation to competing influences from peers. Studies have only recently begun investigating the influence of siblings and peers, although decades of research document the effects of adults on children's academic achievement. Previous studies have examined the influence of siblings and peers on academic outcomes individually or combined with parents and teachers (Yeh & Lempers, 2004; Way & Greene, 2006). There has not been a study that considers older siblings and

peers in one succinct model. This study used a longitudinal design and a series of controls that separate processes of older sibling influences from processes of peer influences on the adolescent's academic achievement.

Literature Review

The literature review begins with a discussion of social support received from older siblings and peers which is supported by Bowlby's attachment theory. Figure 1 presents the basic theoretical model that was constructed from literature. The attachment theory leads into the discussion of the influence older siblings and peers have on an adolescent's academic achievement followed by the role older siblings play in an adolescent's academic achievements and the adolescent's relationships with his/her peers. Discussion continues regarding the influence peers have on an adolescent's academic achievement.

Adolescence is about attachment and differentiation while learning to form close and continuous attachments with those other than one's parents (Elmore, 2009). Youth often turn to their siblings and peers when they are developing close relationships, forming an identity, and making choices about future academic and occupational pathways. Studies revealed that when adolescents report more social support available from their brothers and sisters they are more likely to report positive school attitudes (Alfaro & Umana-Taylor, 2010; Milevsky & Levitt, 2005). Older siblings are more familiar with the educational system, therefore they are better able than parents to help adolescents with their schoolwork (Alfaro & Umana-Taylor, 2010).

Studies show that support from a sibling is associated with positive academic achievement (Smith 1990; Smith 1993; Yeh & Lempers, 2004); however, there is a need to

examine whether these findings extend to specific academic achievement. Researchers have examined how significant others (i.e. parents and teachers) influence adolescents' academic motivations (Alfaro & Umana-Taylor, 2010; Wentzel, Battle, Russell & Looney, 2010). Little is known about the process through which older sibling relationships may influence adolescents' academic achievement. Given the importance of sibling closeness, positive sibling warmth and support was hypothesized in this study to be positively associated with adolescents' academic achievement.

Furthermore, research that examines peer relationships in conjunction with sibling relationships is scarce. The peer group is an important context of development during adolescence. As adolescents develop, the amount of time they spend with their peers increases. (Ryan, 2001). Peer relationships during this period are widely viewed as more influential than those formed during early childhood (Berndt, 1982). Negative friendship qualities encompass disloyalty, hostility, and competition (Burk & Laursen, 2005). Positive friendships qualities encompass companionship, intimacy, warmth, closeness, and trust (Burk & Laursen, 2005).

Theoretical Framework

To further understand how relationships with older siblings and peers influence an adolescent academic achievement, Bowlby's attachment theory is applied in this study. Attachment theory has been suggested to serve as a model for all close relationships (Ainsworth, 1989; Nickerson & Nagle, 2004). Bowlby describes attachment as the emotional security that children derive from their perceptions of their relationships with their primary caregivers (McElhaney, Allen, Stephenson, & Hare, 2009). The child begins to develop an

inner working model after the first year of life that represents the self in relation to others (Pinquart & Silbereisen, 2005) through measured attachment styles including attitudes, feelings, and behaviors (McElhaney et al., 2009). As the child develops and encounters the world beyond the first relationship, the inner working model guides his/her behavior in subsequent relationships (Pinquart & Silbereisen, 2005). Like that of the relationship with the primary caregiver influences the relationship the adolescent has with his/her sibling which then influences the adolescent's relationship with his/her peers (Ainsworth, 1989; Pinquart & Silbereisen, 2005). Close relationships that are a result of a warm, supportive family environment, are a major contributor to resilience and well-being (Nickerson & Nagle, 2004; Paterson, Field, & Pryor, 1994; Pinquart & Silbereisen, 2005).

Attachment relationships change as individuals mature. Children with a history of secure attachments to their caregivers have been shown to function well throughout childhood and adolescence in a variety of life domains (Allen & Land, 1999). A securely attached child explores freely in the presence of his/her attachment figure, but shows distress when the attachment figure departs (McElhaney et al., 2009). Security of attachment with regard to parental relationships is also associated with having secure working models of sibling relationships and friendships (McElhaney et al., 2009). Studies show that children who have secure attachment patterns are more self-confident, competent, and socially skilled than insecure children (Allen & Land, 1999; Elicker, Englund, & Sroufe, 1992; Nickerson & Nagle, 2004; Pinquart & Silbereisen, 2005). Although attachment has been studied extensively in infancy, young childhood, and adulthood, the adolescent years represents a gap in the literature.

Early adolescence is a critical time for change in sibling and peer relationships. Adolescents perceive their parents as less supportive, therefore, siblings and peers become a greater source of support and intimacy (Allen & Land, 1999; Nickerson & Nagle, 2004; Yeh & Lempers, 2004). Close sibling and peer relationships, such as trust and communication, are very similar to concepts in attachment theory (Brown & Larson, 2009; East 2009).

Studies show siblings play a major role in each other's cognitive development and from an early age, young children observe and imitate their older sibling (Azmitia & Hesser, 1993; Brody, 1998; Patterson, 1984). The closer the younger sibling identifies with the older sibling, the stronger the impact will be on the adolescent's efficacy (Bandura, 1977). An adolescent's perceived self-efficacy affects his/her growth of cognitive competencies (Bandura, 1977), academic interest and motivation, management of academic stressors (Bassi et al., 2007), and accomplished achievement (Bouffard-Bouchard, Parent, & Larivee, 1991).

Given the success of attachment theory as a framework for studies of close relationships from infancy through adulthood, I have chosen to apply attachment theory in this study to explain the influence of close sibling and peer relationships on an adolescent's academic achievement. Based on current literature regarding attachment patterns, this study hypothesized peer relationships mediate the relationship between older siblings and the adolescent's academic achievement.

The Theoretical Model

The theoretical model for this study depicts the influences of an older sibling's relationship on the target adolescent's peer relationships and academic achievement. As seen in the theoretical model in Figure 1, older siblings have a direct influence on an adolescent's

relationship with its peers and a direct and indirect association with the adolescent's academic achievement. The following section discusses all of the constructs and hypothesized associations in the model.

Academic Achievement

Academic success is crucial for children and adolescents to grow into adults who fully participate in the economic and civic activities of society (Li, Lerner, & Lerner, 2010). The transition to adolescence often involves a decline in academic success and it is important to identify factors that may promote academic competence (Li et al., 2010). Academic competence is defined as skills and capabilities needed to succeed in school which can be indicated by actual or perceived academic achievement (Ma, Phelps, Lerner, & Lerner 2009). The indicators for academic achievement include standard test scores, grade point average (GPA), and self-perceived academic performance (Ma et al., 2009). Academic competence predicts a youth's likelihood to continue schooling and career opportunities. Academic achievement increases the adolescent's motivation, well-being, and achievement (Eccles & Roeser, 2009). Additionally, lack of academic competence predicts lower self-esteem, lack of motivation, and dropping out of school (Ma et al., 2009; Yeh & Lempers, 2004). It is estimated that a year's cohort of dropouts costs \$3.2 billion in lost earnings and more than \$400 million in social services (Rumberger, 1995). A study conducted by Rumberger (1995) found that in eighth grade, a one-point higher grade point average reduced the predicted dropout rate by more than 70%.

Understanding how to promote academic achievement among adolescents has long been a challenging task. Studies have shown that families, schools and peers are all

important contextual predictors for adolescent development (East, 2009; Eccles & Roeser, 2009; Ma et al., 2009). Extensive research has been conducted on the parent-child relationship on adolescent development. Research results have indicated that adolescents' parents who are encouraging yet firm (i.e. authoritative) are more competent (Nickerson & Nagle, 2004), have better school performance (Ma et al., 2009; Yeh & Lempers, 2004), and more successful adjustment in adolescence (Ardelt & Day, 2002; Piquart & Silbereisen, 2005). Expectations of attachment figures based on previous experience are believed to carry on and influence the adolescent's ability to relate to others (Armsden & Greenberg, 1987). Adolescents who perceive high social support from parents, friends, and teachers tend to have higher grades, compared to those who perceive high support from none or one of the these three sources (Ma et al., 2009; Rosenfeld, Richman, & Bowen, 2000). However, less is known about how older siblings and peers influence academic achievement. These two variables (i.e. closeness with older sibling and peers) were included in this study as potential influences in adolescent academic achievement. Thus, this study hypothesized positive older sibling and peer relationships have a positive influence on an adolescent's academic achievement.

Older Siblings

Older siblings have a greater opportunity to influence younger siblings because they spend more than twice as much time with one another than with their parents (Benin & Johnson, 1984). Siblings provide guidance and advice (Dunn, 1996; Melby, Conger, Fang, Wickrama, & Conger, 2008), as well as support and companionship (Cicirelli, 1980; Conger, Conger, & Elder, 1994; Melby et al., 2008). Adolescents who have a positive relationship

with their sibling are more likely to experience warmth, encouragement, and support which results in the development of self-worth, competence, and self-confidence (East & Rook, 1992; Yeh & Lempers, 2004). Younger siblings benefit from the guidance and support offered by older siblings and tend to maintain a higher level of intimacy with them (Oliva & Arranz, 2005). Researchers have found that as adolescents reported higher levels of sibling relationship quality, they also reported higher levels of emotional support available from their sibling (Alfaro & Umana-Taylor, 2010; Yeh & Lempers, 2004). A study by Woodward and Frank (1988) reported that siblings are the ones they turn to for comfort and discussion when experiencing loneliness.

Siblings who have a positive relationship are more likely to interact with each other, thus providing more opportunities to observe and learn from one another (Brody, 1998; Yeh & Lempers, 2004). When siblings interact with each other they communicate through what they say, as well as through their tone of voice, facial expression, eye contact, and body position. All of these aspects combine to influence the messages relayed. Observed behaviors and interactions are considered part of an on-going dynamic system where over time, patterns of behaviors and ways of relating to one another develop (Melby & Conger, 2001). Children perceive their siblings as playmates during childhood and during adolescence, this role changes to providing the support and intimacy required during cognitive change (Olivia & Arranz, 2005). Updegraff and colleagues (2005) concluded that siblings closer in age tend to report a higher quality relationship. Older siblings may be facilitators, providing contacts and resources which aid the younger siblings' attainments (Benin & Johnson, 1984). Bahar (2010) concluded perceived familial support (i.e. parent or sibling) was a predictor of

academic success and Alfaro and Umana-Taylor (2010) concluded that at least one older sibling was related to a higher quality sibling relationship and more sibling academic support.

A study by Amato (1989) found that positive qualities of sibling relations were associated with adolescent school related competencies that could influence academic performance. Smith (1990, 1993) found evidence indicating that siblings can help improve adolescent academic achievement. Older siblings act as teachers when playing with their younger sibling and the younger sibling assumes the corresponding learner role (Azmitia & Hesser, 1993; Brody, 1998; Dunn & Kendrick, 1982). Siblings may be more aware of each other's strengths and weaknesses and thus be more effective teachers and learners (Azmitia & Hesser, 1993). A study by Cicirelli (1972) found that sibling tutors gave more explanations, descriptions, and concept definitions than peer tutors. Therefore, this study hypothesized positive older sibling warmth and support has a direct, positive relationship with adolescent academic achievement.

Adolescent attachment security has been linked to measures of broader social competence such as overall friendship quality, popularity, and social acceptance (McElhaney et al., 2009). Studies indicate that youth who have warm and intimate sibling relationships also have close friendships and are socially competent with peers (Brody & Murry, 2001; East, 2009; Updegraff, McHale, & Crouter, 2002). In contrast, sibling relationships have the potential to negatively affect children's development. Younger siblings who grow up with an aggressive older sibling are at considerable risk for developing conduct problems, performing poorly in school, and poor peer relations at school (Brody, 2004; Brody, 1998; Patterson, 1984). Conflictive and violent sibling relationships are linked to antisocial behavior and personal adjustment problems during adolescence (Olivia & Arranz, 2005). Older siblings'

deviant behaviors might encourage younger adolescents to experiment with deviant behaviors themselves and to seek out deviant peers (Ardelt & Day, 2002). Thus, this study hypothesizes positive older sibling relationships have a direct, positive influence on an adolescent's relationship with his/her peers.

Mediational Role of Peer Relationships

Adolescents become less dependent on their parents and more dependent on their friends for emotional support (Way & Greene, 2006). The attachment theory suggests that an increase in emotional support and intimacy in friendships will be evident during adolescence. Adolescents become better able to find equally supportive friendships while developing their own identities (Bowlby, 1969). Social support research has consistently documented that by early to middle adolescence peers are valued as equal or greater sources of companionship and intimacy (Freeman & Brown, 2001). Studies show that supportive peer attachments in late adolescence are positively correlated with self-esteem (Wentzel et al., 2010), well-being (Armsden & Greenberg, 1987), and school achievement (Nickerson & Nagle, 2004; Way & Greene, 2006). Positive peers may help ease negative attitudes toward school by providing children with encouragement, social support, and opportunities for play during the school day (Greener & Crick, 1999; Schwartz et al., 2008).

Adolescents begin to arrange themselves in cliques after the transition to secondary school. A strong desire emerges to be included in peer activities and to be accepted by peers during this transition. Adolescents strive to establish membership in a clique that is supportive and consistent with their personal interests and characteristics (Meijs, Cillessen, Scholte, Segers, & Spijkerman, 2010). Academic achievement and acceptance by others are

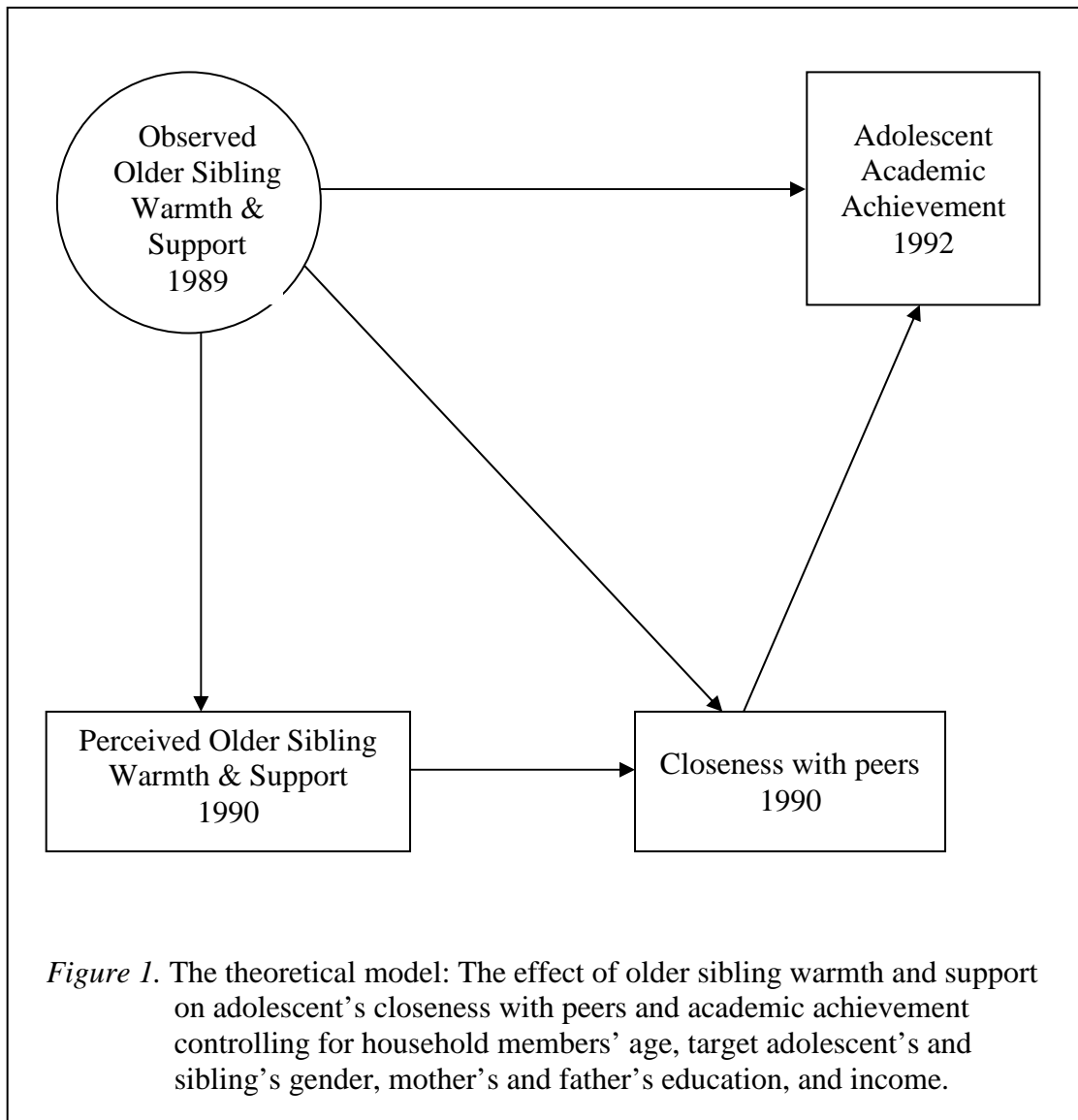
usually positively related. On average well-liked students perform better than students low in acceptance (Austin & Drapper, 1984; Frenzt, Gresham, & Elliot, 1991; Meijs et al., 2010). However, Bahar (2010) concluded perceived social support from a friend had no effect on academic success.

Friendships that are well-adjusted and socially competent can serve as positive role models. In contrast, friendships with peers who are aggressive or characterized by other behavior problems may increase the path toward negative outcomes (Whitebeck, Simons, Conger, & Lorenz, 1989). There is evidence that friendships with aggressive or antisocial peers lack important attributes such as closeness, security, and companionship (Frenzt et al., 1991). Studies show that children who experience frequent mistreatment by peers are at risk for poor psychological adjustment and lower grade point average (Burk & Laursen, 2005; Schwartz et al., 2008).

Previous literature has established an association between peer relationships and academic achievement; however, previous studies have yet to assess peer relationships as a mediator in the relationship between older siblings and academic achievement. One would not expect peers to directly influence an adolescent's academic achievement; rather, one may propose that interactions with peers expose a youth to a set of norms and values, which in turn, encourage or discourage him or her to be engaged in certain behaviors. Therefore, this study hypothesized peer relationships mediate positive older sibling warmth and support and academic achievement. As shown in Figure 2, this study utilizes an SEM framework that allows for the estimation of all possible direct and indirect pathways from the relationship with an older sibling to adolescent academic achievement.

Specific Study Hypotheses

- 1) Closeness with peers mediates positive, observed older sibling warmth and support and academic achievement.
- 2) Observed, positive older sibling warmth and support is positively associated with an adolescent's relationship with its peers.
- 3) Positive closeness with peers is positively associated with adolescent's academic achievement.
- 4) Observed, positive older sibling warmth and support directly influences an adolescent's academic achievement.
- 5) Observed, positive older sibling warmth and support is positively associated with perceived, positive older sibling warmth and support.
- 6) Perceived, positive older sibling warmth and support is positively associated with peers.



Methods

Sample

The data for this study originated from the Iowa Youth and Families Project (IYFP) that began in 1989 of 451 rural families. The IYFP data sampled white, primarily middle-class families, which included two parents, a seventh-grade adolescent, and a sibling within 4 years of age of the seventh grader (Conger et al., 1992). The families sampled resided in one of eight adjacent counties in Iowa in an area heavily dependent on agriculture with a population under 6,500. The IYFP data set consisted of 34% families residing on a farm, 12% in rural areas but not on a farm, and 54% in rural communities (Conger et al., 1992).

Families were recruited through 34 public and private schools and were sent a letter explaining the project then contacted by telephone and asked to participate. Families were paid a total of \$130 for taking part in the study. All family members were interviewed at the first contact then the family members were videotaped participating in a problem-solving task at the second contact (Conger et al., 1992). Approximately 78% of the eligible families agreed to participate in the initial wave of data collection in 1989. Of the original 451 families, 90% (406) were still part of the panel four years later.

The median income a four person family living in Iowa in 1988 was \$29,400 (U.S. Census Bureau, 2010). Family median income for this study was \$33,700 in 1988, the year before the first wave of data collection and 11% of the families had incomes below the federal poverty line (Conger et al., 1992; Whitebeck et al., 1989). The median education for mothers and fathers was 13 years with median ages of 39 (fathers) and 37 (mothers) years (Conger et al., 1992). Family size ranged from 4 to 13 persons, with a median of 5. The

sample of 406 siblings was further reduced because of missing data, so that this analysis is based on 217 targets with older siblings.

Data for this study's analyses originated from Wave 1 (N=451), Wave 2 (N=424) and Wave 4 (N=406) of the IYFP longitudinal study. The predictor variable of observed warmth and support of target adolescent and their older sibling was gathered through observational data which was collected at Wave 1 (1989). Predictor variable of perceived warmth and support of target adolescent and their older sibling was gathered through self-reported measures at Wave 2 (1990). The target adolescents were in seventh grade and in the age range of 13-15 years of age. The older sibling's age ranged from 14 to 18 years with a median age of 16.07. Wave 2 of the longitudinal study produced information on the mediating variable, peer relationships, that consisted of reported closeness to friends. Wave 4 (1992) of the IYFP study produced information on the outcome variable, the target adolescent's grade point average, which was reported by their school teacher.

Procedure

Families were recruited through 34 public and private schools in communities of 6,500 or less. Families were sent a letter from the school explaining the project and were contacted by telephone asking to participate in the study. Approximately 78% of the families agreed to participate and were compensated for their time in the study (Conger et al., 1992).

Each family was interviewed at home for approximately two hours on each of two occasions. During the first visit, each of the four family members completed questionnaires that focused on demographics, family characteristics, family economic circumstances, and

self-reports on behavior and attitudes (Conger et al., 1992). Within two weeks of the first visit the second interview was conducted. During this interview, family members were videotaped as they engaged in structured interaction tasks. The video recorded interaction captured a sample of behavior at a particular point in time and had an influence on individual adjustment and relationship quality (Melby & Conger, 2001). These videos were coded using trained observational coders and the Iowa Family Interaction Rating Scale (IFIRS) (Melby & Conger, 2001; Conger et al., 1992). The IFIRS is a macro-level observational coding system designed to measure behavioral and emotional characteristics of individuals, attributes regarding overall- family processes, and behavioral exchanges from one family member to another (Melby & Conger, 2001). A trained interviewer began the session by asking each family member to complete a short questionnaire that was designed to identify issues of concern that led to disagreements within the family. The observers' ratings of sibling toward target and target toward sibling were used in this study.

Measures

Dependent Variable

Academic Achievement

Academic achievement was measured using the adolescent's grades reported by the teacher from Wave 4 (1992). Grades are standardized measurements of varying levels of comprehension within a subject area. Grades are assigned using the letters A, B, C, D, and F, with A indicating excellent, C indicating average, and F indicating failing. The target's grade point average (GPA) was calculated by assigning each letter grade a number and averaging those numerical values. An A is equivalent to a numerical value of 4.0, B (3.0), C (2.0), D

(1.0), and F (0.0). Due to an unknown method of calculation in prior waves, cumulative GPA was not used for this study. The adolescent's GPA at the time of Wave 4 (1992) will be used for this study. Scores were interpreted as the higher the score received, the higher level of academic achievement.

Independent Variables

Observed Sibling Warmth and Support

Sibling in this study was defined as one of two individuals who share biological parents. Observed sibling warmth and support in this study was assessed at Wave 1 (1989) of the IYFP study. During the second visit to the home, which occurred within two weeks of the first, the family members were videotaped as they engaged in four structured interaction tasks. Observers assigned a score on a scale from 1 to 5. A score of 1 corresponded with "behavior not at all characteristic", 2 indicated "behavior minimally characteristic", 3 indicated "behavior somewhat characteristic", 4 indicated "behavior moderately characteristic", and 5 indicated "behavior mainly characteristic". The ratings used in these analyses were based on specific behaviors of warmth and support by the sibling toward the adolescent and by the adolescent toward the sibling. Warmth and support scale was defined as expressions of care, concern, support, or encouragement toward another interactor. Warmth and support also included behaviors of endearment (personalized and unqualified approval of another interactor's personal characteristics), physical affection (affectionate physical contact such as hugs, caresses, and pats), escalate warmth and support (building on to one's own warm/supportive behaviors toward another interactor), and reciprocate warmth

and support (extent to which the focal reciprocates in like manner the warmth/support of another interactor).

Perceived Sibling Warmth and Support

Perceived sibling warmth and support in this study was assessed from eight items from the target questionnaire at Wave 2 (1990) of the IYFP study. The first home visit, the target adolescent self-reported their perceived relationship with their sibling on a scale from 1 to 7. A score of 1 indicated “always”, 2 indicated “almost always”, 3 indicated “fairly often”, 4 indicated “about half of the time”, 5 indicated “not to often”, 6 indicated “almost never”, and 7 indicated “never”. The following questions were included in the initial visit: in the past month “how often did your brother or sister in the study ask you for your opinion about an important matter?”, “how often did your brother or sister listen carefully to your point of view?”, “how often did your brother or sister let you know he/she really cares about you?”, “how often did your brother or sister act loving and affectionate toward you?”, “how often did your brother or sister help you do something that was important to you?”, “how often did your brother or sister have a good laugh with you about something that was funny?”, “how often did your brother or sister act supportive and understanding toward you?”, and “how often did your brother or sister tell you he/she loves you?”. Scores on the eight items were reverse-coded, missing values were given a system missing value, and all items were then summed. The summed scores were interpreted as the higher the score received, the higher level of perceived sibling warmth and support. The internal consistency (Cronbach’s Alpha) of the scale equaled .92 and is more than acceptable based on the benchmark of .70.

Closeness with Peers

Closeness with peers in this study was defined as the perceived level of relationship quality and acceptance an adolescent experiences from their peer group. Closeness with peers in this study was assessed from five items from the target questionnaire during Wave 2 (1990). During the first home visit, the target adolescent was asked to report their perceived closeness with peers on a scale from 1 to 5. A score of 1 indicated “strongly agree”, 2 indicated “agree”, 3 indicated “neutral/mixed”, 4 indicated “disagree”, and 5 “strongly disagree”. The following questions were included in the initial visit: regarding “I can depend on these friends for help or advice when I need it.”, “These friends are the kind of people I like to spend time with.”, “I’d like to be just like most of these friends.”, “These friends care about me.”, “These friends always criticize me.” Scores on the first four items were reverse-coded to reflect positive peer relations, missing values were given a system missing value, and all items were then summed. The summed scores were interpreted as the higher the score received, the higher level of perceived closeness to peers. The internal consistency (Cronbach’s Alpha) of the scales equaled .78. The internal consistency is acceptable based on the benchmark of .70.

Controls

This study partialled out demographic characteristics that could predict an adolescent’s academic competence which include the gender and indicators of family socioeconomic status, such as parent’s education level and household income.

Target Adolescents’ and Siblings’ Gender: This study assessed the gender of the adolescent and sibling through a self-reported item. Gender was coded as 0 equaling females and a 1

equaling males. *Household Members' Age*: The father, mother, target adolescent, and their sibling reported their ages given the statement "age of household member". For these analyses only siblings who were older than the target adolescent were assessed. *Fathers' and Mothers' Education*: Fathers and mothers reported their highest education level and scores on this scale were coded categorically. When asked "What is the highest grade of education completed or enrolled in currently?", responses ranged from "Less than high school" "High school degree/GED", "Degree from junior, vocational, or community college; attended college but did not earn 4-year degree", "Degree from 4-year college", "Master's degree", "Ph.D. or professional degree". *Household Income*: Fathers and Mothers reported their total income (before taxes and deductions) from all earnings including self-employment, and excluding income from farming, for 1987 and 1988.

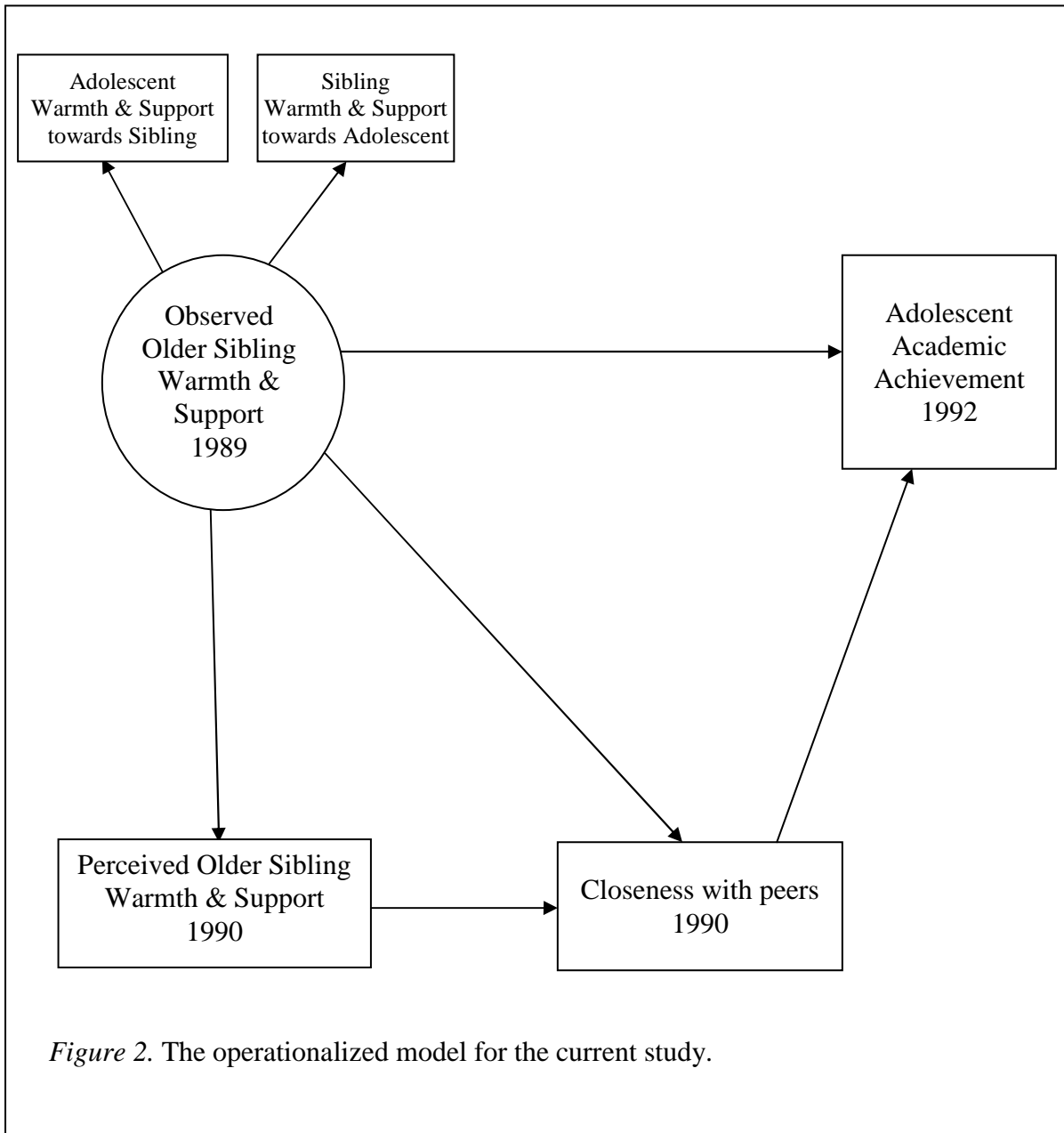
Analytical Plan

Prior to the testing of hypotheses, descriptive statistics were calculated for all of the study measures included in this study. Table 1 displays the descriptive statistics which include means, standard deviations, ranges, and Cronbach's Alpha. Table 2 displays the correlations for this study. Figure 2 displays the theoretical model using multiple indicators and Figure 5 displays the operationalized model with standardized *beta* weights. This study uses Structural Equation Modeling (SEM) to assess the predictors from Wave 1 and Wave 2 as they influence academic achievement at Wave 4. SEM in the current study was used to reduce the impact of measurement error and analyze three years of data in one succinct causal model. The latent construct of observed sibling warmth and support was captured by two indicators, sibling warmth and support towards target, and target warmth and support

towards sibling. The construct GPA was measured by teacher report. The constructs of sibling warmth and support and closeness with peers were measured directly by self-reported measures. These observed measures were constructed by summing scores of individual items and dividing the total of the items by the number of items to achieve a mean score.

The computer software program Amos version 18, was utilized to estimate standardized and unstandardized coefficients for all paths in the SEM model. Model fit information was calculated using *Chi-Square*, *Root Mean Squared Error Approximation* (RMSEA), and *Comparative Fit Indices* (CFI).

Mediation effects were assessed in the SEM framework (Baron & Kenny, 1986). The first step in this analysis was to employ an SEM model in which the latent constructs of observed sibling warmth and support directly influences adolescent academic achievement. This model also included an indirect pathway through which observed warmth and support influences adolescent academic achievement through self-reported sibling warmth and support and closeness to peers. The second step in the mediation analysis was to create a model in the SEM framework in which the latent construct of observed warmth and support directly influences adolescent academic achievement along with directly influencing self-reported sibling warmth and support and closeness to peers. The final step was to compare the model results for the operationalized model (Figure 5) with the mediation models (Figures 3 and 4).



Results

Descriptive Statistics of Study Variables

Approximately half of the target adolescents were male, 57.6%, and half of the siblings were male, 50.7%. Table 1 provides an overview of the descriptive statistics of the study variables. The means of the two measures that assessed observed sibling warmth and support were similar. The mean for warmth and support the target adolescent showed his or her older sibling was 1.84 with a standard deviation of .65 and the mean for warmth and support the older sibling showed the target adolescent was 1.86 with a standard deviation of .64. Target perceived warmth and support from his or her old sibling was a mean of 32.35 with a standard deviation of 10.36. This high standard deviation suggested that some targets did not perceive their older sibling as supportive and understanding which is also supported with the lower standard deviation of observed warmth and support the sibling showed the target adolescent. Target's perceived closeness with peers was a mean of 21.63 and a standard deviation of 2.77 which indicates on average the target adolescent felt they had a positive relationship its peers. The dependent variable, adolescent's academic achievement, had a mean score of 2.94 and a standard deviation of .71. On average, the target adolescent's grade point average indicated a letter grade of a B (3.0) or a C (2.0). The means and standard deviations for the control variables can be seen in Table 1.

Correlations Among Study Variables

Table 2 provides information on the correlations among study variables. Academic achievement was significantly correlated ($p < .01$) to father's education (.23), mother's

education (.26), observed warmth and support the older sibling showed the target adolescent (.19), and the mother's age (.14) at the .05 level. There was a significant correlation, .65 ($p < .01$), between warmth and support the target adolescent showed his or her older sibling and warmth and support the older sibling showed the target adolescent. Perceived warmth and support by the target was not significantly correlated with the observed warmth and support the target showed to his or her older sibling. However, perceived warmth and support was significantly correlated, .20 ($p < .01$), with the observed warmth and support the older sibling showed the target adolescent. There was a significant, negative correlation between closeness with peers and warmth and support the target adolescent showed his or her older sibling, -.19 ($p < .01$) indicating that as scores on closeness with peers increase, scores on the observed measure decreases. There was a significant correlation, .24 ($p < .01$), between closeness with peers and perceived sibling warmth and support.

The Operationalized SEM Model

The operationalized model can be seen in Figure 5. The operationalized model had a χ^2 of 25.86 with 14 degrees of freedom. The variables in this model were observed older sibling warmth and support, perceived older sibling warmth and support, closeness to peers, academic achievement, and the nine control variables. The p -value associated with this χ^2 was less than 0.05 which suggests that there is a better fitting model that exists besides this hypothesized model. According to Schumacker and Lomax (2010) a χ^2 is sensitive to sample size because as a sample size increases, generally above 200, the χ^2 tends to be significant. The comparative fit index (*CFI*) of the operationalized model was 0.98 and the root mean

squared error of approximation (*RMSEA*) equaled .06. A *CFI* value of 0.98 falls within the suggested range of 0.95 or higher, indicating this model is a good fit of the data (Schumacker & Lomax, 2010). A *RMSEA* value of .06 falls within the suggested range of .05 to .08 for a good model fit (Schumacker & Lomax, 2010). The ratio of χ^2 divided by degrees of freedom equaled 1.99. According to Carmines and McIver (1981) a χ^2 divided by degrees of freedom ratio of less than 2.00 suggest a good fit, thus confirming that this model fits the data.

The operationalized model controlled for education of fathers and mothers, household income, age of household members, and target and sibling gender. Older sibling's gender significantly predicted perceived older sibling warmth and support ($\beta = -.23, t = -.17, p < .01$), but failed to predict closeness to peers and academic achievement. The target adolescent's gender ($\beta = .21, t = .63, p < .01$) and age ($\beta = -.16, t = -.48, p < .05$) significantly predicted closeness to peers however, failed to predict perceived older sibling warmth and support and adolescent's academic achievement. Father's age and education, mother's age and education, household income, and sibling age failed to predict perceived warmth and support, closeness to peers, and adolescent's academic achievement

The second hypothesis, observed, positive older sibling warmth and support is positively associated with an adolescent's relationship with its peers was not confirmed in this study ($\beta = -.22, t = -2.38, p < .05$). Observed, positive older sibling relationship associated with an adolescent's relationship with its peers as a significantly, negative effect at the .05 level. The standardized coefficient for this relationship can be interpreted as: a 1 unit standard deviation increase in observed sibling warmth and support results in a .22 standard deviation decrease in the relationship the adolescent has with his/her peers. The third hypothesis was that positive closeness with peers is positively associated with adolescent's

academic achievement. This hypothesis was confirmed in this study ($\beta = .16, t = 1.98, p < .05$) as a significant relationship. The fourth hypothesis of this study was observed, positive older sibling warmth and support directly influences an adolescent's academic achievement. This hypothesis was confirmed in this study ($\beta = .21, t = 2.67, p < .05$) as a significant relationship.

The fifth hypothesis of this study was that positive, observed older sibling warmth and support is positively associated with perceived, positive older sibling warmth and support. Although the relationship was positive ($\beta = .14, t = 1.56$) it was not significant. The sixth hypothesis was perceived positive older sibling warmth and support is positively associated with an adolescent's relationship with their peers. This hypothesis was confirmed in this study as a significantly, positive relationship ($\beta = .25, t = 3.96, p < .01$).

Mediation of Closeness with Peers

The models that were used to assess the mediations of this study are shown in Figures 3, 4, and the operationalized model in Figure 5. Figure 3 presents a simple SEM model in which observed sibling warmth and support directly influences adolescent academic achievement. Figure 4 presents an SEM model in which observed sibling warmth and support influences closeness with peers and adolescent academic achievement. Figure 3 can be compared to Figure 4 to assess the mediational effect of closeness with peers on the association between observed sibling warmth and support and adolescent academic achievement. The model in Figure 4 adds closeness with peers to address the first hypothesis of this study. The model in Figure 3 found a significant pathway between observed sibling warmth and support and adolescent academic achievement. In Figure 4, the pathway between

observed sibling warmth and support and adolescent academic achievement was still significant ($\beta = .21, t = 2.67$). This study argued that the relationship between observed sibling warmth and support and adolescent academic achievement was mediated by closeness to peers based on the mediation methods proposed by Baron and Kenny (1986). However, a mediation effect was not confirmed due to the significant pathway between observed sibling warmth and support and adolescent academic achievement in addition to a significant pathway between closeness to peers and adolescent academic achievement. Therefore, there is an indirect pathway between observed sibling warmth and support on adolescent academic achievement through perceived sibling warmth and support and closeness to peers.

Discussion

This study contributes to the body of literature on adolescent academic achievement by simultaneously examining the warmth and support from older sibling and peer relationships as they influence adolescent academic achievement. This study's results provide support for Bowlby's attachment theory whereby an adolescent's academic outcome is influenced by the warmth and support he/she receives from their older sibling and their peer relationships. A longitudinal sample of older siblings and target adolescents (N=424) assessed the theoretical pathways. A comparison of these results with prior research, are discussed.

Older Sibling Warmth and Support on Adolescent's Academic Achievement

The attachment theory set a foundation for this study indicating that close sibling relationships, such warmth and support, trust, and communication, relate to various aspects of life satisfaction such as academic achievement (Brown & Larson, 2009; East, 2009; Nickerson & Nagle, 2004). This study cited research by Smith (1990, 1993) that support from a sibling is associated with positive academic outcomes. The closer the younger sibling identifies with the older sibling increases the adolescent's self-efficacy (Bandura, 1977) which in turn affects his or her academic interest and motivation, management of academic stressors (Bassi et al., 2007), and accomplished achievement (Bouffard-Bouchard et al., 1991). The results of this study substantiate these previous findings and provide support for positive, observed warmth and support from an older sibling directly influences an adolescent's academic achievement. Specifically, observed older sibling warmth and support

at Wave 1 significantly predicted increases in the target adolescent's academic achievement at Wave 4.

Previous research has documented that youth who have warm and intimate sibling relationships also have close friendships and are socially competent with peers (Ardelt & Day, 2002; Brody & Murry, 2001; East, 2009; Updegraff et al., 2002). This study found observed warmth and support had a significantly negative effect on closeness with peers. This negative relationship can be explained by the compensation hypothesis. The compensation hypothesis posits that adolescents who experience low levels of affection in a relationship will turn to a different relationship to provide the missing desired affection (Milevsky, 2005). Therefore, when the observed target adolescent interacts with their older sibling the results show the higher warmth and support they receive from their older sibling causes them to not have the desire to seek out close relationships with their peers. When the observed target adolescent interacts with their older sibling the results show the lower warmth and support they received from their older sibling causes them to seek out close relationships with their peers to fulfill their missing desired affection from their sibling.

However, through self-reported measures this study found when the target adolescent reported higher warmth and support from their sibling actually had a significantly positive effect on their closeness with peers. This conclusion coincides with Bowlby's attachment theory that early established attachment patterns influence development of later close social relationships (Pinquart & Silbereisen, 2005). Previous studies have also indicated youth who have warm and intimate sibling relationships also have close friendships (Brody & Murry, 2001; East, 2009; Updegraff et al., 2002).

Closeness with peers

Studies have shown that supportive peer attachments in late adolescence are positively correlated with self-esteem (Wentzel et al., 2010), well-being (Armsden & Greenberg, 1987), and school achievement (Nickerson & Nagle, 2004). This study found evidence in favor of Nickerson and Nagle (2004), closeness with peers positively influences the target adolescent's academic achievement. Contrasting to a study by Bahar (2010) which concluded perceived social support from a friend had no effect on academic success.

This study failed to find peer relationships mediating positive older sibling warmth and support and academic achievement. However, found a significantly indirect effect that indicated when the target adolescent had positive interaction with their older sibling they were likely to perceive that relationship high in warmth and support; therefore, the target adolescent's increased their relationship with their peers. When an adolescent has a positive relationship with their older sibling they develop self-confidence and competence (East & Rook, 1992) which leads the adolescent to interact with peers (Greener & Crick, 1999). As the adolescent gains the self-confidence, competence, and interaction with peers, the target adolescent's academic achievement increases (Ma et al., 2009; Nickerson & Nagle, 2004; Yeh & Lempers, 2004). This study found a significantly, positive relationship with closeness to peers and academic achievement.

Adolescent Academic Achievement

Extensive research has been conducted on the importance of adolescent academic competence. Ma and colleagues (2009) defined academic competence as skills and

capabilities needed to be succeed in school which is indicated by actual or perceived academic achievement (i.e. grade point average). Adolescents who perceive high social support from family and friends tend to have higher grades compared to those who do not perceive high social support (Ma et al., 2009; Rosenfeld et al., 2000). The results from this study substantiate these findings that high warmth and support from older siblings and closeness with peers significantly increases adolescent academic achievement.

Limitations and Future Research

The results of this study are limited by the sample it was derived from which was consisting of mostly Caucasian adolescents from a rural population. Very few minorities were included in the sample and information on adolescents living in an urban setting was not assessed. Giordano, Cernkovich, and Pugh (1993) found African American adolescents tended to report higher levels of family intimacy and lower levels of perceived intimacy with friends than did European American adolescents. Future research should incorporate more of a diverse sample from various ethnic backgrounds and both rural and urban settings to improve the generalizations made in this study.

Another limitation of this study involved the outcome variable. This data set did not contain teacher reported grade point average of the older sibling. Research shows that older sibling growth and language achievement during adolescence is positively associated with teaching younger siblings (Smith 1990, 1993). This study did not control for either opposite or same-sex siblings. Research shows that older siblings can serve as role models for younger siblings, particularly if both siblings are of the same gender (Ardelt & Day, 2002; Smith, 1990). Future researchers should aim to see how positive observed and perceived warmth and support from an older sibling effects academic outcomes for both the older sibling and younger sibling of the same gender. In addition, this study did not address how a sibling relationship would differ from living in a rural community versus an urban community and should be taken into consideration.

This study also failed to address the gender of the target adolescent's peer group. Research shows that girls prefer dyadic interaction which would lead to interactions

involving only females and likewise, boy's emphasis on group play in middle childhood would lead to behaviors amongst males (Greener & Crick, 1999).

However, despite its limitations, this study expands our understanding about the relationships between older siblings, peers, and academic achievement with the influences of target adolescents' and older siblings' gender, father's and mothers' education, household members' age, and household income being controlled. Overall, the results indicated that the higher perceived warmth and support from the older sibling has a positive influence on the relationship the target adolescent has with his/her peers which also results in positive academic achievement. The findings highlight both the importance of addressing the issue of academic achievement in siblings and peers, which is a growing target of such research, and the value of capitalizing on developmental assets in promoting academic achievement among those adolescents.

Conclusion and Implications

In conclusion, the current findings highlight the significance of positive warmth and support from older siblings which in turn influences closeness to peers and academic achievement. When an adolescent interacts with their older sibling and evidence shows the interaction is high in warmth and support this study found that the target adolescent was less likely to seek out close relationships with their peers. This finding coincides with the compensation theory stating that if a specific relationship is not supplying the desired affection, the adolescent may compensate for the void by turning to a different relationship to provide the missing affection (Milevsky, 2005). However, when the adolescent perceives high warmth and support from their older sibling this study found the adolescent seeks additional positive relationships with their peers. This is supported by Bowlby's attachment theory which states early established attachment patterns influence development of later close social relationships (Pinquart & Silbereisen, 2005).

Bowlby's attachment theory is important to consider when looking at warmth and support of older siblings and peers. The attachment theory sets the foundation for this study stating that children who have secure attachment to their parent(s) will demonstrate secure attachments in other relationships, such as sibling and peer relationships (Ainsworth, 1989). Previous studies have found that support from a sibling is associated with positive academic outcomes (Bahar, 2010; Smith, 1990; Yeh & Lempers, 2004); however there was a need to examine these findings to specific academic achievement. This study contributes to the identified gap in research showing that adolescents who reported high warmth and support from their older sibling had a significantly positive influence on the adolescent's academic achievement.

Bowlby's attachment theory also states that early established attachment patterns (i.e. parent and sibling) influence development of later close social relationships (i.e. peers). This study found that adolescents who perceived close relationships with their peers had a significantly positive influence on the adolescent's academic achievement. This concludes that children need to have secure attachment from their primary caregivers starting at an early age as the attachment pattern carries over in other social relationships, like with siblings and peers. Primary caregivers should facilitate and maintain strong sibling relationships. Parents need to foster and respect the sibling relationship among their children and provide them opportunities to share time and activities (Cicirelli, 1972). These relationships will serve as models of healthy sibling interaction for their children and lead to strong healthy peer relationships.

Academic achievement is important to research as the problem of school dropouts has become a growing concern. Low academic achievement leads to school drop outs which cost \$3.2 billion in lost earnings and more than \$400 million in social services each year (Rumberger, 1995). Statistics show that a one point increase in grade point average can prevent an adolescent from dropping out of school, as early as the eighth grade (Rumberger, 1995). Researchers need to look at all of the social contexts that influence an adolescent's academic achievement as studies show more than one factor influences academic achievement. This study investigated how older siblings and peers influence an adolescent's academic achievement and found that the higher warmth and support an adolescent perceived their relationship with their older sibling and their peers had a positive effect on their academic achievement

It is also important for parents and siblings to encourage friendships in adolescence. Conger & Rueter (1996) found that peers have an even greater influence on adolescents than do siblings if family relationships are weak. Closeness to peers can encourage the adolescent to stay away from persons who are deviant, harmful, and engage in illegal activities which can all decrease academic achievement and lead to dropping out of school. This study concluded the closer the target adolescent identified with their peers had a positive influence on the adolescent's academic achievement.

To prevent school drop outs efforts should be devoted to developing different programs for parents, adolescents, and school personnel to learn how to help adolescents develop and maintain positive relationships with siblings and peers. This study found siblings and peers to have an effect on academic achievement; therefore, it would be useful to identify positive ways to enhance sibling and peer relationships. Based upon the questions the target adolescent was asked in this study to measure perceived sibling warmth and support and closeness to peers, programs should focus on ways to deal with sibling conflict, effective communication strategies, and expressing support and affection. When sibling-child and child-peer relationships are characterized by warmth, respect, love, and consistency, the adolescent's self-esteem, social skills, and cognitive abilities will flourish. Future research needs to continue examining factors that can increase academic achievement.

Figures and Tables

Figure 3. Observed older sibling warmth and support direct influence on adolescent academic achievement.

Note: Standardized coefficient, (p-value in parenthesis), and t-value

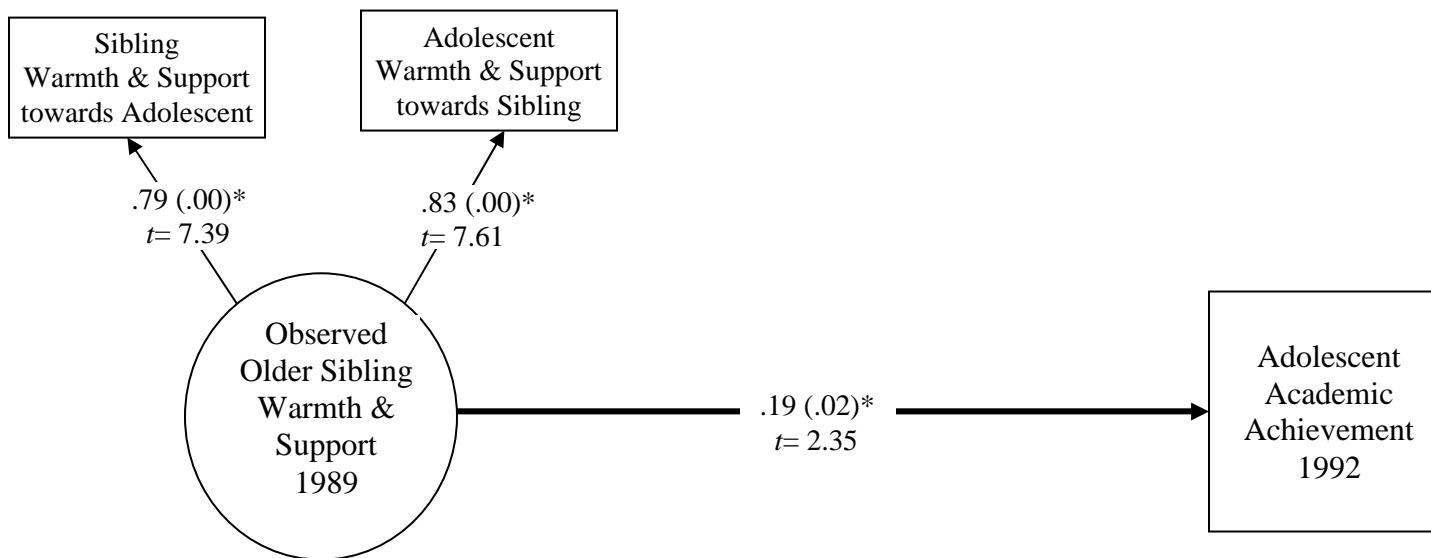


Figure 4. Observed older sibling warmth and support influencing closeness to peers and adolescent academic achievement.
 Note: Standardized coefficient, (p-value in parenthesis), and t-value

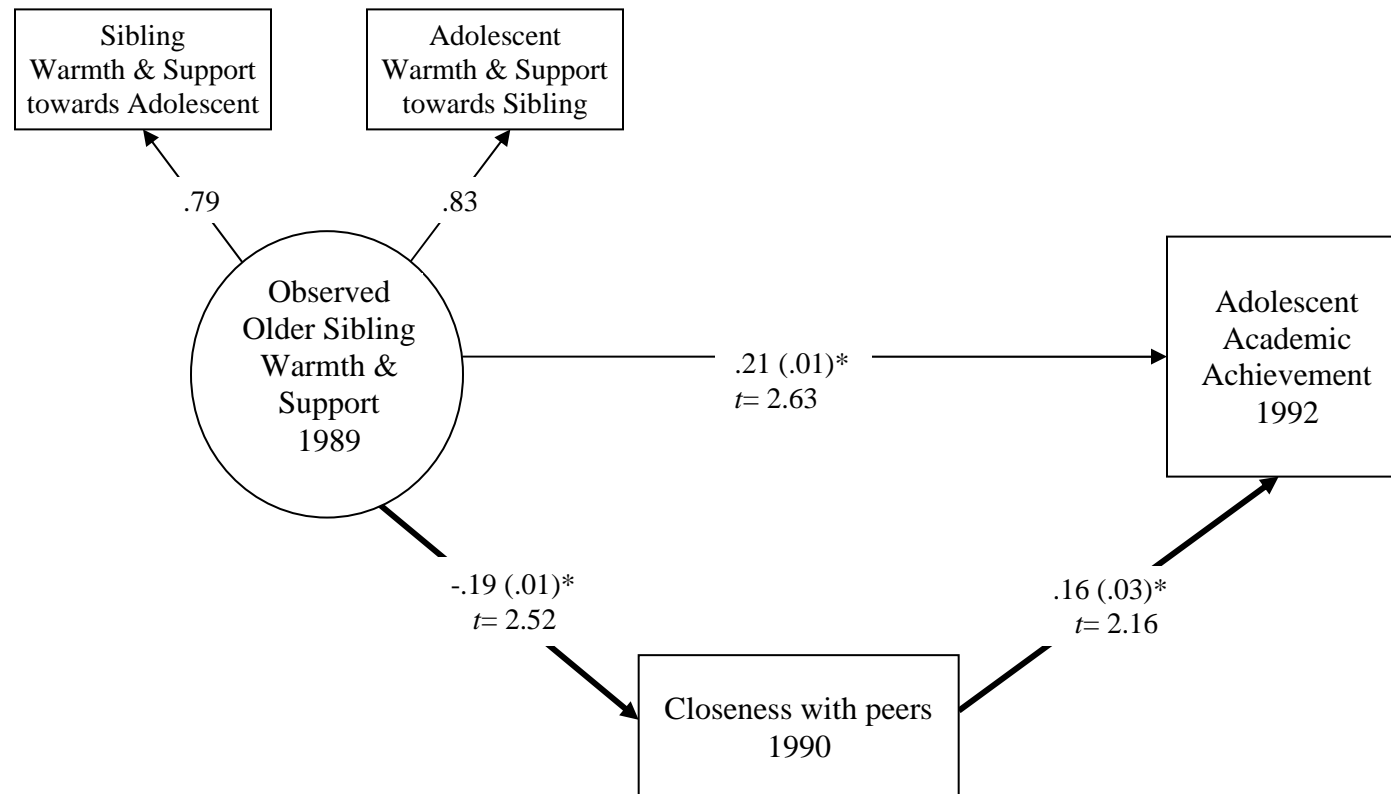


Figure 5. Model results for the operationalized associations for this study controlling for household members' age, target adolescent's and sibling's gender, mother's and father's education, and income.
 Note: Standardized coefficient, (p-value in parenthesis), and t-value

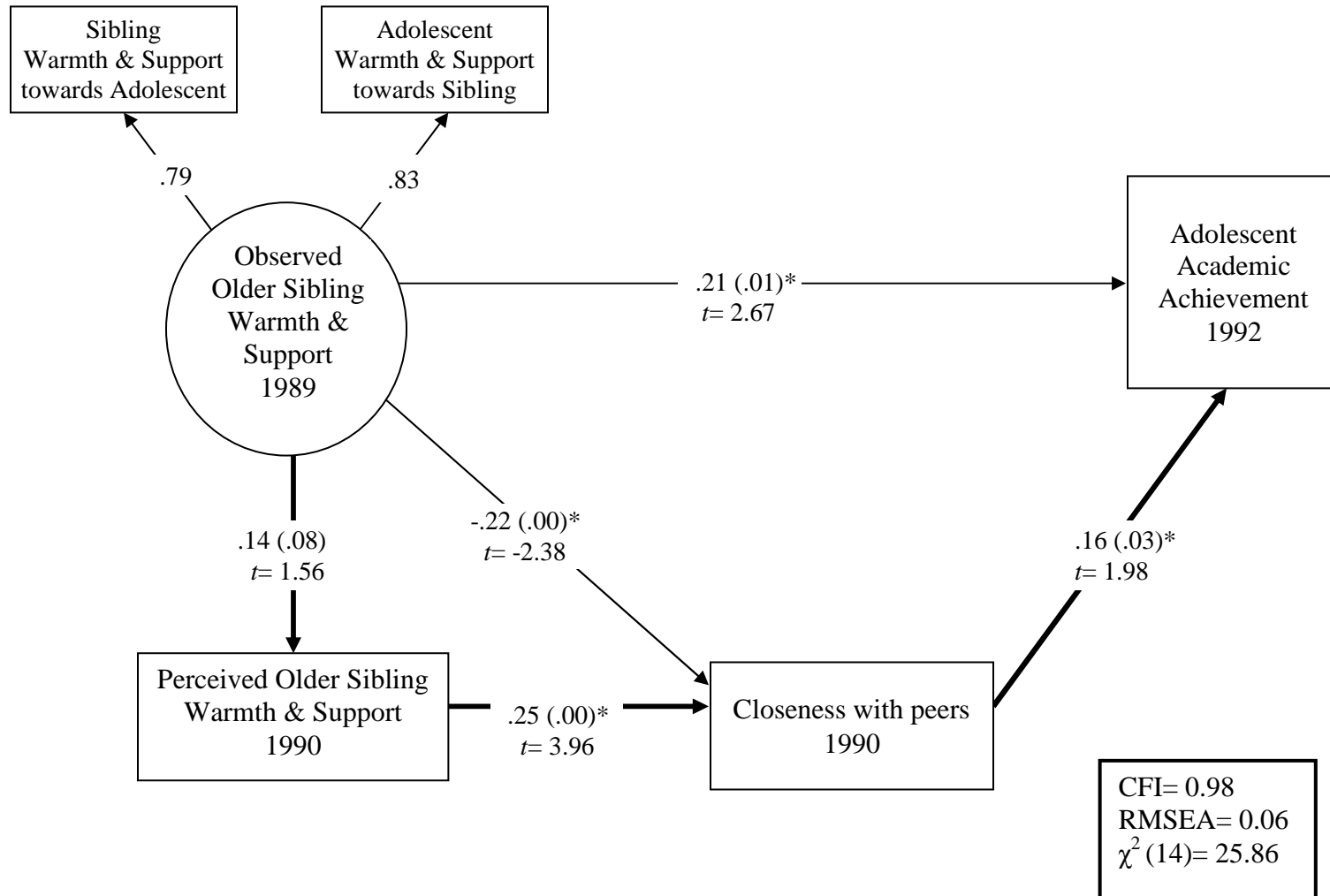


Table 1

Descriptive statistics of study variables

Variable	N	Mean	Standard Deviation	Range	Skewness	Alpha
Academic Achievement	201	2.94	0.71	.77-4.00	-.71	.71
Observed Warmth & Support towards Sibling	208	1.84	0.65	1.00-5.00	.60	--
Observed Warmth & Support towards Target	208	1.86	0.64	1.00-4.00	.24	--
Perceived Sibling Warmth and Support	217	32.35	10.37	8.00-56.00	-.02	.92
Closeness to peers	217	21.63	2.77	9.00-25.00	-1.21	.78
Education-F	217	13.59	2.23	8.00-12.00	.74	--
Education- M	217	13.24	1.62	9.00-18.00	.73	--
Income per thousand	217	30.18	19.83	0.00-110.00	.72	--
Age- F	217	40.87	4.56	32.00-57.00	.99	--
Age- M	217	38.90	3.98	30.00-53.00	.67	--
Age- T	217	13.51	0.54	13.00-15.00	.34	--
Age- S	217	16.07	1.04	14.00-18.00	.18	--
Sex-T	217	.42	0.50	0.00-1.00	.31	--
Sex-S	217	.49	0.50	0.00-1.00	.03	--

Note: F- Father, M- Mother, T- Target, S- Sibling

Table 2

Correlations among study variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Academic Achievement	--													
2. Observed W&S towards Sibling	.13	--												
3. Observed W&S towards Target	.19*	.65**	--											
4. Perceived Older Sibling W&S	.13	.09	.20**	--										
5. Closeness to peers	.12	-.19**	-.05	.24**	--									
6. Education- F	.23**	.00	-.10	.01	-.07	--								
7. Education- M	.26**	.07	.02	.21**	-.00	.43**	--							
8. Income per thousand	.07	.12	.06	.08	.03	.30**	.16*	--						
9. Age- F	.07	.09	.01	.12	-.6	.08	.24**	-.06	--					
10. Age- M	.14*	.11	.06	.13	-.08	.22**	.35**	-.00	.80**	--				
11. Age- T	-.13	.12	.01	-.03	-.20**	-.05	-.05	.07	.07	.13	--			
12. Age- S	-.01	.09	.13	-.01	-.08	-.03	-.04	.12	.17*	.19*	.33**	--		
13. Sex- T	-.09	.02	-.02	-.02	-.35**	-.06	.06	.06	-.07	-.08	.11	-.03	--	
14. Sex- S	-.14	-.18**	-.12*	-.25**	-.02	-.01	-.02	.01	.08	-.01	-.07	-.04	.01	--

Notes: F-Father, M-Mother, T-Target, S-Sibling, W&S-Warmth & Support

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

Table 3

Factor loading of the study measures for observed older sibling warmth and support

Measure	Standardized β	Standard Error	T-Value
Observed W&S towards sibling	.79	.10	7.39**
Observed W&S towards target	.82	.11	7.61**

Note: W&S- Warmth and Support

**p<.01

Table 4

Structural Equation Models with independent variables predicting academic achievement

Pathway	Model 1			Model 2			Model 3		
	β	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>	β	<i>b</i>	<i>SE</i>
Observed Older Sibling Warmth & Support	.19*,	.26,	(.11)	.21*,	.30,	(.11)	.21*,	.30,	(.12)
Closeness with peers		--		.16*,	.04,	(.02)	.16*,	.04,	(.02)
Controls									
Education-F	.20,	.06*,	(.02)	.22,	.07*,	(.02)	.22,	.07*,	(.02)
Education- M	.07,	.01,	(.01)	.08,	.01,	(.01)	.08,	.01,	(.01)
Income	.01,	.00,	(.00)	-.01,	.00,	(.00)	-.01,	.00,	(.00)
Age- F	-.05,	-.01,	(.02)	-.04,	-.01,	(.02)	-.04,	-.01,	(.02)
Age- M	.11,	.02,	(.02)	.11,	.02,	(.02)	.11,	.02,	(.02)
Age- T	-.15,	-.20*,	(.10)	-.12,	-.16,	(.10)	-.12,	-.16,	(.10)
Age- S	.01,	.00,	(.05)	.01,	.01,	(.05)	.01,	.01,	(.05)
Sex- T	-.06,	-.09,	(.10)	-.01,	-.02,	(.10)	-.01,	-.02,	(.10)
Sex- S	-.11,	-.16,	(.10)	-.09,	-.13,	(.10)	-.09,	-.13,	(.10)
R ²									
Observed Older Sibling Warmth & Support		.15			.16			.17	
Closeness with Peers		--			.23			.27	
Perceived Warmth & Support		--			--			.12	

Note: F- Father, M- Mother, T- Target, S- Sibling

*p<.05

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To: Lisa Ryherd
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CC: Dr. Kimberly Greder
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From: Office for Responsible Research

Title: Predictors of Academic Achievement: The Role of Older Sibling and Peer Relationships

The Co-Chair of the ISU Institutional Review Board (IRB) has reviewed the project noted above and determined that the project:

- Does not meet the definition of research according to federal regulations.
- Is research that does not involve human subjects according to federal regulations.

Accordingly, this project does not need IRB approval and you may proceed at any time. We do, however, urge you to protect the rights of your participants in the same ways you would if IRB approval were required. For example, best practices include informing participants that involvement in the project is voluntary and maintaining confidentiality as appropriate.

Please also know that any change to this project must be communicated to the IRB to determine if the project has become research with human subjects requiring IRB approval.