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Sibling Relationships, Stress, and Well-Being During Early Adolescence

Alisa Danielle Cox Van Langeveld

Brigham Young University - Provo

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Alisa Cox Van Langeveld

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Randal Day, Chair
Roy Bean
Jason Carroll
Laura Padilla-Walker
Jeremy Yorgason

School of Family Life

Brigham Young University

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ABSTRACT

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This study examined whether the quality of the sibling relationship can alter the negative impact of stress on child well being. Participants were of 311 families (236 two parent families and 75 single parent families) with an adolescent child (M age of child at Time 1 = 11.25, SD = .99, 51% female) who took part in the Flourishing Families Project. Data were assessed using both a multiple time point cross-section and a two wave longitudinal design. Hierarchal linear regression suggested that when assessing the direct effects of sibling on well being, sibling affection is a better predictor of well being, but when assessing indirect effects, sibling conflict is a better predictor. Little evidence was found to support the idea that siblings moderate the impact of stress by buffering or decreasing the negative impact of stress. Results did indicate that sibling conflict was a salient moderator of stress in that conflict exacerbates the already negative impact of stress. Results from this study also suggest that when assessing the buffering or exacerbating impact of siblings, cross-sectional data produces better explanatory power than when these constructs are assessed longitudinally. However a single time point, cross-sectional design does not account

for dynamic changes over time in either the sibling relationship, the level of stress or well

being. Research designs such as multiple time, point cross-sectional studies or growth curve

analyses are recommended.

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This dissertation is the most difficult thing I have ever done – not because of its technical difficulty (although it is difficult in that regard) but because it has been a test of my will and discipline and perseverance, and I often wondered which one of us would win.

Thank you especially to Randy Day who let me find my own way and in my own timing. Thank you Randy for letting me dream big and treating me as though all of these dreams could come true. Thank you for your support these five long years. Thank you to my committee and the original developers of the Flourishing Families project for their continued encouragement and accessibility. While I learned a lot in my classes and coursework during this program, most of my education, and the most important parts of my education, have come from my interaction with this group of experts who included me at the outset of this project and trusted me with data collection at a crucial and delicate time of development. Thank you for trusting me and teaching me.

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Thank you to my husband JJ, who has always let me be whatever I want to be and then supports me as I try to become it. And thank you to Nyla, for giving me a reason to finish, so that one day I can tell my daughter that once mommy did something really hard and really amazing, and that she can accomplish hard and amazing things too – and thank you to her new sister, her own sibling, coming this January.

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Chapter 1:

Introduction

The years during childhood and early adolescence involve many stressful factors such as starting middle school, maintaining peer relationships, and working out family interactions. All children experience the stress of common developmental milestones (Dockett & Perry, 2003), but some children experience more severe stress such as extreme financial hardship, high levels of family conflict, or the divorce of their parents. These types of severe stressors are typically associated with decreases in child well being (e.g., Amato & Cheadle, 2005; Rouse & Fantuzzo, 2009; Shelton & Harold, 2007). In fact, researchers have consistently demonstrated that stress negatively impacts child well being (Grant & McMahon, 2005). Children who experience high levels of stress are more likely to demonstrate several different negative outcomes, including internalized symptoms such as depression (Ge, Misaki, Neiderhiser & Reiss, 2009) and externalized problem behaviors such as poor school adjustment (Slee, 1993).

While high levels of stress are difficult for children, not all children demonstrate the expected negative outcomes associated with stress (Luthar, 2003). These resilient children do well in spite of the stressors they encounter. Resilience is defined as a "dynamic developmental process reflecting evidence of positive adaptation despite significant life adversity" (Cicchetti, 2003, p. xi). That developmental process includes many features of the child's environment and researchers have identified many factors that can minimize the negative effects of stress on well being, such as positive sibling relationships (Stocker, 1994) and positive parent-child

relationships (Hetherington, & Elmore, 2003). Positive sibling relationships have been shown to buffer a chidl's from the negative effects of peer victimization (Larmache et al., 2006), being of low-income status (Shanahan et al., 2008), marital conflict (Jenkins & Smith, 1990), and parent-child negativity (Pike et al., 2005).

The primary goal of this paper is to investigate whether the expected negative impact of stress on well being can be minimized in the presence of positive sibling relationships and whether the impact of stress is exacerbated in the presence of negative sibling relationships, or in other words does the sibling relationship moderate the impact of stress? The relationship between stress and well being as moderated by the sibling relationship is depicted in Figure 1.
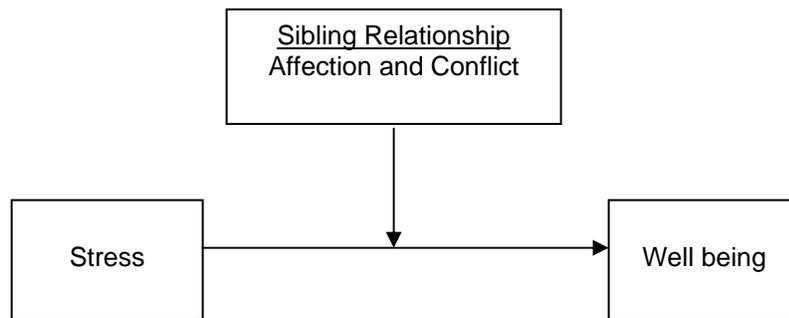
Figure 1. Conceptual Model of Stress, Sibling Relationships and Child Well being

Siblings have the potential to buffer or exacerbate stress because of the unique nature of the relationship, specifically that siblings are very present and involved in each other's lives, that siblings impact one another's daily sense of well being and that siblings impact one another's future trajectories (Criss & Shaw, 2005; Karos, Howe & Aquan-Asee, 2007).

The potential for siblings to buffer or exacerbate the impact of stress is largely understudied in the sibling literature. Recently Gass, Jenkins, and Dunn (2007) reported evidence that when experiencing stressful life events, the impact of stress is significantly decreased if

children also have a sibling relationship with high levels of affection. Or in other words, the sibling relationship can moderate the effect of stress on well being. These researchers analyzed the protective nature of sibling relationships longitudinally. The sibling relationship was measured at Time 1 and the outcome variables were measured at Time 2, two years later. This methodology does not account for changes over time in the sibling relationship. For example, as children age, they tend to experience less conflict with their siblings (Kim et al., 2007) and greater warmth (Feinberg, Neiderhiser, Simmens, Reiss, & Hetherington, 2000). This means that the quality of the sibling relationship at Time 2 might have been different than it was at Time 1 and that difference might affect the outcome variables.

The present study will continue the research from Gass, Jenkins and Dunn and will add to it by addressing two main research questions: Does the sibling relationship impact child well being? And if so, should that effect be assessed concurrently or longitudinally? To address the first question, I propose the following two hypotheses.

Hypothesis 1: The negative effect of stress on well being will decrease as sibling affect increases.

Hypothesis 2: The negative effect of stress on well being will increase as sibling conflict increases.

The outcome of the second research question (whether sibling effects should be studied concurrently or longitudinally), is unknown and will be analyzed as a research question.

By addressing these research questions, the present study can strengthen four main areas in the current literature on siblings; 1) the inclusion of positive measure of well being, or a strengths-based model of well being, 2) the use of stress as an independent variable, 3) the

simultaneous assessment of both sibling conflict and affection, and 4) the use of resilience theory as an explanatory theory for how siblings can impact one another during times of stress.

Deficit- versus Strengths-based Models of Well being

Researchers often conceptualize child well being using a deficit-based model. A deficit model approach means that researchers measure whether or not a child exhibits negative characteristics or behaviors. Using a deficit-based model, a child is assumed to be doing "well" simply if he or she does not demonstrate negative symptoms, such as delinquency or depression. One critique of the deficit-based model approach is that it fails to acknowledge that indicators of poor well being are not necessarily the same as indicators of positive well being. In other words, if a child is not doing poorly, it might not actually mean that he or she is doing well. Recently several researchers have critiqued deficit-based models and have called for research to utilize a strengths-based model that, instead, focus on the presence of characteristics or behaviors which are positive such as hope or prosocial behavior (Scales & Benson, 2005). Resilience theory provides a theoretical framework through which positive measures of well being can be explained.

Research on the concept of hope illustrates this idea. Early research focused on measuring the absence of hope using the hopelessness measures assessing suicidal intentions of children with severe mental health issues (e.g., Marciano & Kazdin, 1994). Using a deficit-based model, a researcher could then argue that if a child scores low on the hopelessness scale, he or she is doing well. However, the simple absence of hopelessness or as it is measured, suicidal ideation, does not necessarily mean the child is doing well.

Rather than simply note that children are not doing poorly, a better representation of well being will include consideration of whether the child is demonstrating that he or she is actually

doing well. Accordingly, well being is defined as the presence of positive characteristics, traits, and behaviors (Moore & Lippman, 2005; Snyder, 2005). This is considered a strengths-based model. To more accurately assess a child's response to stress, researchers must also include positive indicators of success or a strengths-based model of well being.

Research has consistently shown that sibling relationships can have a marked impact on a child's well being, which has been assessed using negative measures of well being such as aggression (Anderson, 1999), poor academic performance (Bank, Patterson & Reid, 1996), adolescent smoking behavior (Slomkowski et al., 2005), and adolescent drinking behavior (Van Der Vorst, Engels, Meeus, Dekovic, & Van Leeuwe, 2007). Most sibling researchers have used a deficit-based model of well being. A few researchers have used a strengths-based model by studying positive measures of well being such as self-esteem (Sherman et al., 2006), peer competence (Anderson, 1999), and college attendance (Hurtado-Ortiz & Gauvain, 2007).

Siblings and Stress

Largely missing from the research on the buffering effects of siblings, is a focus on stress as the risk factor. Extant research on the effects of stress and the buffering potential of siblings assesses the presence of problematic behaviors such as peer victimization (Larmache, Brendgen, Vitaro, Perusse & Dionne, 2006) and substance use (Slomkowski, Rende, Novak, Lloyd-Richarson, & Niaura, 2005). Unfortunately, there are few examples that connect connect siblings with the experience of stress for children (for one example, see Gass, Jenkins & Dunn, 2007).

Sibling Affection and Sibling Conflict

The impact of affection on child adjustment is consistently positive across the literature: the more affection there is between siblings the more likely it is that both children will report

higher scores on well being measures both currently (Stocker, 1994) and over time (Stocker, Burwell & Briggs, 2002). Some positive outcomes that seem to be connected to sibling affect include greater emotional understanding and self-disclosure (Howe, Aquan-Assee, Bukowski, Lehoux, & Rinaldi, 2001), less risky sexual behavior and lower substance use (East & Khoo, 2005), and even a decrease in the negative impact of marital discord (Jenkins & Smith, 1990). On the other hand, conflict between siblings is associated with several negative outcomes that include greater antisocial behavior (Criss & Shaw, 2005), higher risky sex behavior for adolescence (East & Khoo, 2005), lower self-esteem, and greater loneliness (Sherman, Lansford, & Volling, 2006).

Some sibling relationships have both high levels of affection and high levels of conflict, whereas others are associated with low affection and low conflict, and others still are associated with high affection and low conflict or low affection and high conflict (McGuire, McHale, & Updegraff, 1996; McHale, Whiteman, Ji-Yeon, & Crouter, 2007; Sherman et al., 2006). Given the various constellations of sibling affection and conflict, it is important to assess these dimensions separately and also to include both dimensions of the sibling relationship in analysis.

Resilience Theory and Siblings

In the resilience literature, researchers have identified several important relationships that act as protective factors for children experiencing risk. These relationships typically involve parents (Ferguson & Horwood, 2003) but can also include a close relationship with another competent adult such as an aunt or teacher (Masten & Powell, 2003). Very few researchers have investigated the sibling relationship as a protective factor, and those who have done so have typically used unique populations such as children with a sibling with a disability (Kilmer, Cook, Taylor, Kane & Clark, 2008; Pilowsky, Nurit, Dippelt, Gross-Tsur & Shalew, 2004). Within the

framework of resilience theory, the constructs of risk and protective factors provide a clear theoretical explanation of moderation when stress (the risk factor) and the sibling relationship (the protective factor) are assessed together.

Study Rationale

The goal of the present study is to examine the potentially moderating effect of the sibling relationship on child well being for those children experiencing stressful life events. Utilizing a resilience framework, sibling affection is described as a protective factor that can buffer the negative impact of stress (see Figure 1). Sibling conflict is described as a risk factor that exacerbates the negative impact of stress (another risk factor). This study will strengthen four main areas in the current literature on siblings; 1) the inclusion of positive measure of well being, or a strengths-based model of well being, 2) the use of stress as an independent variable, 3) the simultaneous assessment of both sibling conflict and affection, and 4) the use of resilience theory as an explanatory theory for how siblings can impact one another during times of stress.

The present study will also specifically extend the research of Gass, Jenkins and Dunn (2007), who assessed the protective nature of the sibling relationship using sibling affection and stressful life events as predictors and as a moderator for internalized and externalized problem behavior. The present study extends this research by incorporating sibling conflict, by utilizing resilience as an explanatory theory and by assessing positive measures of well being or by using a strengths-based model of well being.

Chapter 2:

Literature Review

Theoretically, the buffering effect of siblings can be explained using systems theory and resilience theory. According to systems theory, every individual within a system is interconnected and every relational dyad in the system is interconnected. Further, each individual and each relational dyad impacts all other components and processes in the system (Broderick, 1995; Kim, McHale, Osgood, & Crouter, 2006). In this manner, the sibling dyad operates in a way that impacts the individual within the larger family system. While systems theory can be used to explain that siblings impact each other, it does not explain the direction of that influence. For example, does the sibling relationship help or harm the individual? Resilience theory can address this question.

Resilience Theory

Resilience theory can explain the direction in which siblings impact each other by classifying features of the sibling relationship as either protective or risk factors. Resilience theory can also be used to describe how the sibling relationship can alter the impact of stress. Researchers have identified several factors that decrease the negative impact of stress, such as a strong parent-child relationship, a supportive neighborhood community, and positive sibling relationships (e.g., Gass, Jenkins & Dunn, 2007; Gorman-Smith & Tolan, 2003; Hetherington, & Elmore, 2003). These contextual factors in the child's environment appear to protect or minimize the impact of stress.

According to resilience theory, every individual encounters a variety of risk and protective factors in lives (Luthar, 2003). Risk factors are those factors that "increase the likelihood that an individual…will manifest negative developmental outcomes (Seidman &

Pedersen, 2003 p. 318). Stress is a salient example of a risk factor because it has demonstrated empirically that the presence of stress increases the likelihood of negative development outcomes (see Hetherington, & Elmore, 2003; Gorman-Smith & Tolan, 2003).

The presence of a risk factor in an individual's life does not necessarily prescribe a given outcome for that individual. Wide variability exists in how children respond to risk factors in their lives. When an individual does not demonstrate the expected negative effects of risk factors, he or she is thought to be resilient. According to resilience theory, it is often the presence of protective factors that alter developmental outcome towards resilience (Cox, 2004). Protective factors decrease the potency of risk factors in a child's life. In turn, as risk factors are decreased so is the likelihood of attendant negative developmental outcomes (Luthar, 2003).

Researchers have identified many factors that protect or buffer a child from risk, including functional family environments (Wyman, 2003), positive sibling relationships (Gass et al., 2007; Stocker, 1994), and a positive parent-child relationship (Hetherington & Elmore, 2003). Most research on protective family factors has focused on the parent-child relationship (Amato, 1994; Kochanska, Aksan, Prisco, & Adams, 2008; Sandler, Wolchik, Davis, Haine & Ayers, 2003). Other researchers have found that parent-child relationship and sibling relationships are positively associated with one another (Dunn, 2002; Volling & Belsky, 1992). These researchers claim that the presence of strong family relationships (whether focused on the parent-child dyad or the sibling dyad) are key protective factors. Other researchers have found opposite effects, showing that positive, supportive sibling relationships can develop in families where parent-child relationships are distant or uninvolved (Boer & Dunn, 1990; Dunn, 2002) and where the marital relationship is troubled (Jenkins, 1992; Jenkins & Smith, 1990). The quality of the parent-child relationship is clearly important for children (see Amato, 1994; Kochanska et.

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al., 2008); positive sibling relationships, however, have shown a unique impact on child well being above and beyond that of the parents (Stocker, Burwell & Briggs, 2002). For example, Brody and Sooyeon (2003) found that child social competence was elevated when both sibling relationships and parent relationship were assessed. Moser and Jacob (2002) found that sibling behavior is a significant predictor of deviant behavior (even when parenting effects were statistically controlled).

Resilience theory is appropriate for this study because it implies the use of positive measures of well being, or resilience outcomes. Resilience theory is also appropriate because it includes consideration of potentially negative factors (such as sibling conflict) as well as potentially buffering factors (such as sibling affection) and then describes how these operate simultaneously to elicit a resilient outcome or not.

How Siblings Buffer or Exacerbate

Resilience theory explains how siblings buffer or exacerbate the impact of stress using the concepts of mediated, moderated and additive risk. The mediated model of resilience describes the ability for protective factors to neutralize the effect of risk factors (Masten, 2000). This model can be thought of as the balancing of a ledger sheet. In the first column of the ledger sheet all current risk factors in the life of a child are listed and quantified (for example, risks might be weighted more heavily based on how severe or chronic the risk). In the next column of the ledger sheet all current protective factors are listed and quantified (among these, a positive sibling relationship). Each column is summed and compared. If the overall balance of factors sways toward risk, negative outcomes are expected. If the overall balance of factors sways toward protective factors, a positive or resilient outcome is expected

This mediated model of resilience points to the importance of the quality of the sibling relationship. If the relationship is affectionate, supportive and positive, and in very high magnitudes, then the relationship could outweigh the stress listed on the risk side of the ledger sheet. In practical, statistical terms, evidence for a mediated model would be demonstrated if the coefficient value of direct effect of the risk factor variable decreases or goes to zero when the positive factor is also included in the analysis.

The mediated model can explain the expected outcome of the sibling relationship, but it does not explain the internal family process by which this balancing occurs. The moderated model of resilience better describes this process. The moderated model explains that certain processes are activated as a response to risk. Once activated, these processes can then insulate the individual from risk (Masten, 2000). Factors that moderate the impact of risk can be thought of as air bags, which are deployed only after an accident has occurred but remain dormant and largely unseen until they are needed. The air bags are activated as a response to the situation. For example, when a child faces the challenge of a parent getting into trouble with the law, the family system may be activated through increased sibling warmth and empathy as children discuss event and as children mobilize to continue family life after the event.

The concept of additive risk explains that as the number of risk factors increases, the likelihood of a negative outcome increases (Samerhoff, Gutman & Peck, 2003). For example, stressful life events might lead to marital conflict, which might lead to parent-child conflict, which all can impact child well being. Additive risk explains how siblings might exacerbate the impact of stress. If siblings experience high levels of conflict while also dealing with high levels of stress, this additive risk is likely to exacerbate the negative impact of stress.

In this study, I will specifically test the moderated model of resilience by assessing whether the sibling relationship can moderate the relationship between stress and child well being. I will also test the concept of additive risk by assessing whether the additive risk factor of a sibling relationship with high levels of conflict can exacerbate the impact of stress on well being.

The Protective Nature of the Sibling Relationship

Sibling relationships are the most enduring of all human relationships and are an important part of most children's developmental contexts (Dunn & Slomkowski, 1992). Sometimes referred to as the 'womb to the tomb' relationship, siblings are present in each other's lives for longer than in any other relationship. An estimated 80% of individuals grow up with a sibling (Dunn, 2002), and 80% of families in the United States include siblings (Sanders, 2004). For most, the sibling relationship begins very close to birth and endures while peers come and go, which makes the sibling relationship a unique and pervasive context to include in the study child development.

Children spend more of their free time with their siblings than they do in any other relationship; outside of school hours children spend more time with siblings than they do with parents or even with peers (Larson & Richards, 1994; McHale & Crouter, 1996). The prevalent and present nature of the sibling relationship supports the study of siblings as a protective factor in the face of stress and also as a risk factor.

In addition to simply being present in each other's lives, siblings also have an impact on the daily well being of one another. This means that siblings have the potential to make the daily experience of stress less difficult, or, in resilience terms, that siblings have the potential to buffer the daily experience of risk. For example, Karos and colleagues (2007) found that sibling

relationships that were more egalitarian were associated with happier daily exchanges, while hierarchal (or controlling, assertive) interactions were associated with upsetting daily exchanges. Sherman and colleagues (2006) also found that siblings with high levels of warmth and low levels of conflict experienced higher self-esteem and less loneliness on a daily basis.

Stocker (1994) found that the quality of sibling relationship impacts a child's current psychological well being including both positive (such as self-esteem) and negative (such as loneliness and depressive mood) emotions. In other words, children experiencing low quality sibling relationships are more likely to be lonely and depressed on a daily basis. Conversely, children who enjoy high quality sibling relationships are more likely to experience high self-esteem on a daily basis. In this manner, the quality of the sibling relationship can make the daily lives of children better or worse.

Sibling relationships also impact a child's developmental trajectory toward future success or future hardship. Stocker and colleagues (2002) found that sibling conflict during middle childhood was predictive of psychological adjustment in early adolescence. Specifically, children who experience high levels of sibling conflict demonstrate increased anxiety, depressed mood and delinquent behavior 2 years later. Criss and Shaw (2005) also found evidence that sibling conflict in childhood is associated with negative outcomes (antisocial behavior) years later. In this manner, poor sibling relationships will not only fail to buffer a child to the risk of stress but will likely exacerbate the already negative experience with stress (Criss & Shaw, 2005; East & Khoo, 2005).

Whereas overall stress decreases child well being (Haggerty, Sherrod, Garmezy & Rutter, 1996), high quality sibling relationships are associated with higher levels of child well being (Stocker, 1994). Positive sibling relationships can decrease the negative impact of risk factors

such as living in a single-parent household (East & Khoo, 2005), living in a low income

household (Criss & Shaw, 2005; Shanahan et al., 2008), experiencing peer victimization

(Larmache et al., 2006), parental or peer smoking (Slomkowski et al., 2005), and experiencing

high marital conflict among parents (Jenkins & Smith, 1990).

Recent work by Gass, Jenkins, & Dunn (2007) showed evidence for the protective nature

of sibling relationships in decreasing the negative impact of stressful life events. These

researchers found that sibling affection moderated the relationship between stress and

internalized problem behaviors but not between stress and externalized problem behaviors. In

other words, children experiencing stress who also enjoy highly affectionate sibling relationships

do not demonstrate the expected negative internal symptoms associated with stress (such as

depression) but they do demonstrate the expected levels of negative externalized behavior (such

as aggression and problems in school).

Quality of the Sibling Relationship: Affection and Conflict

Research on the quality of the sibling relationship centers along two dimensions of affect:

levels of warmth/affection and conflict/hostility (Gass et al., 2007; Modry-Mandell et al., 2007).

Research consistently demonstrates that these two dimensions should be assessed separately and

that sibling relationships vary based on levels of affection and conflict, which are not mutually

exclusive nor are they dichotomous. Nearly all research demonstrates a correlation between

affection and conflict (as one goes up, the other goes down), but these correlations do not

entirely explain the qualitative nature of the sibling relationship. Some sibling relationships have

both high levels of affection and high levels of conflict, whereas others are associated with low

affection and low conflict, and others still are associated with high affection and low conflict or

low affection and high conflict (McGuire, McHale, & Updegraff, 1996; McHale, Whiteman, Ji-Yeon, & Crouter, 2007; Sherman et al., 2006).

Sibling Affection. Previous research tells us that the affective quality of sibling relationships (e.g. affection or hostility) is important not only for the subjective value of positive relationships, but also because positive siblings relationships appear to buffer children from risk factors. Previous researchers have found evidence that affectionate sibling relationships can protect siblings from the negative effects of peer victimization (Larmache et al., 2006), of being low-income status (Shanahan, McHale, Courter, & Osgood, 2008), and marital conflict (Jenkins & Smith, 1990). Jenkins and Smith (1990) found that even after controlling for child temperament and family processes, sibling warmth and affection made a significant and unique contribution to child adjustment. The impact of affection on child adjustment is consistently positive across the literature. Positive outcomes include greater emotional understanding and self-disclosure (Howe et al., 2001), less risky sexual behavior and lower substance use (East & Khoo, 2005) and even a decrease in the negative impact of marital discord (Jenkins & Smith, 1990).

The mechanism by which sibling affection might contribute to well being can be explained using social learning theory (Bandura, 1977), which describes how modeling and reinforcing among siblings teaches and rewards certain behavior. For example, siblings with high levels of affection model warm relationships and reward each other for kindness and positive interactions. In this manner, siblings learn and are allowed to practice social skills that translate into skills used in other relationships such as with peers. Subsequently, we would expect siblings with high levels of affection to also demonstrate higher levels of positive well being, such as prosocial behavior or hope. Using to resilience theory, sibling affection would be classified as a

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protective factor, based on empirical evidence that positive sibling relationships lead to greater well being (Howe et al., 2001).

Sibling Conflict. Sibling conflict can begin as early as 18 months (Dunn & Munn, 1986) and centers around a variety of topics, such as insufficient parental attention, the emotional climate of the family, parental response to conflict, differential treatment by parents, and the characteristics of the siblings (Cicirelli,1995). Whatever the cause, conflict between siblings is associated with greater antisocial behavior (Criss & Shaw, 2005), higher risky sex behavior for adolescents (East & Khoo, 2005), lower self-esteem and greater loneliness (Sherman et al., 2006).

The mechanism by which sibling conflict might influence well being can also be explained using social learning theory (Bandura, 1977). According to this theory, mechanisms of modeling of negative behavior or reinforcing negative behavior would explain subsequent decreases in child well being. For example, children who argue and fight provide an example of aggression and hostility, which is displayed in the sibling dyad and reinforced through continued aggression. Subsequently, we would anticipate that siblings with high levels of conflict in their relationship would demonstrate higher levels of negative measures of well being such as delinquency or depression. According to resilience theory, sibling conflict would be classified as a risk factor based on empirical evidence that child well being is lower among children with high levels of sibling conflict (Criss & Shaw, 2005).

A precursor to sibling conflict may be found in the larger family context. Criss and Shaw (2005) found that poor mother-child relationships are associated with higher levels of sibling conflict. Stocker and Youngblade (1999) found that parental hostility mediates the relationship between marital conflict and sibling relationships, meaning that families experiencing marital

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conflict are also likely to contain siblings who experience more hostile relationships, which is exacerbated even more when the parents are hostile toward the children. Stocker, Ahmed and Stall (1997) found that both mother's negative emotional expressiveness and marital dissatisfaction are associated with hostile sibling relationships. Therefore, it is important to also analyze the parent-child relationship when studying the sibling relationship.

Structural Features of the Sibling Relationship

Structural features of the sibling relationship include age disparity between siblings and the gender composition of the sibling dyad. Research on the impact of age disparity between siblings is mixed in the literature. Some researchers have found little or no impact of age difference on outcomes such as siblings' social interaction (Abramovitch, Pepler, & Corter, 1982), whereas others report that siblings who are closely spaced do seem to experience higher levels of conflict (Bryant, 1982). Research on the effects of the gender composition in the sibling dyad is also mixed. Some research indicates a modest difference in the quality of the sibling relationship among same gender pairs (Whiteman & Loken, 2006) while other research shows no gender difference in the quality of the relationship (de Leeuw, Snoek, van Leeuwe, van Strein, & Engels, 2007; Shanahan, Kim, McHale, & Crouter, 2007).

Research on sister pairs has demonstrated that sisters typically enjoy more warmth and affection than any other gender composition of siblings, although those differences are often modest (Cicirelli, 1982; Kim et al., 2007; Whiteman & Loken, 2006). Brother pairs tend to engage in more conflictual relationships (Whiteman & Loken, 2006) and to demonstrate more sibling rivalry (Karos et al., 2007), although these differences are often modest.

Whereas research on sister-pairs indicates more warmth and research on brother-pairs indicates more conflict, mixed-gender dyads are not uniquely different. For example, Kettrey and

Emery (2006) asked respondents to select the sibling with whom they experience the most conflict and found that the selection of siblings was fairly even based on gender (meaning similar numbers of males selected brothers or sisters and similar numbers of sisters selected brothers or sisters). This finding indicates that although some evidence of increased warmth or increased conflict may be evident in group data, sibling relationships of all gender compositions are similar in their likelihood of experiencing conflict. Other research has found no gender effects for the quality of the sibling relationship or the perceived experience in the family (Shanahan et al., 2008).

The Family Context, Siblings and Well being

Several features of the family context likely impact the sibling relationships and the child's well being such as socioeconomics status, family structure and the parent-child relationship. Socioeconomic status (SES) impacts family processes (Kim-Cohen, Moffitt, Caspi & Taylor, 2004) which may confound the sibling relationship variables. Family income also impacts child outcomes, especially low levels of income and especially poverty status, which have consistently been associated with decreased child well being (Entwisle & Alexander, 1993; Seccombe, 2002; Zick & Smith, 1991). Family structure also has a well-documented impact on child well being. In general children in families with one parent tend not to fare as well as children in two-parent families (see Entwisle & Alexander, 1993; Hetherington, Clingenpeel, Anderson, Deal & Hogan, 1992; Luoma et al., 1999; McLanahan & Sandefur, 1994). However, children living in single-parent families do not always exhibit negative outcomes. Some research has shown that children in single-parent families fare just as well as their peers living in two-parent families (Garfunkel & McLanahan, 1986; Hetherington, Camara & Featherman, 1983).

Parent-child relationships are associated with a variety of child outcomes, such as internalized problem behavior (Brumariu & Kerns, 2010). Brody and Sooyeon (2003) found that the prediction of an individual child's competence was more accurate when sibling relationships AND parent relationship were assessed.

Concurrent versus Long-term Effects of the Sibling Relationship

The impact of sibling relationships includes both daily effects and long-term outcomes and researchers have used both methodologies. In this study, I seek to determine which of these methods is preferred for research on the moderating effect of siblings. The concurrent effects of the sibling relationship are the every day positive or negative impact the sibling relationship can have on a child, or in other words the impact of the sibling relationship on a child's daily sense of well being. For example, Stocker (1994) found that the sibling relationship impacts several internal psychological measures both positive (such as self-esteem and behavioral conduct) and negative (such as loneliness and depressive mood). In other words, children experiencing low quality sibling relationships are more likely to be lonely and report depressive symptoms on a daily basis. Conversely, children who enjoy high quality sibling relationships are more likely to experience high self-esteem on a daily basis. Stocker, Burwell and Briggs (2002) reported that sibling relationships in middle childhood could predict a child's adjustment in adolescence, including the child's anxiety, depressed mood and delinquent behavior. Pomery and colleagues (2005) found that an older siblings level of willingness to use substances (alcohol, tobacco, and marijuana) at Time 1, predicted whether their younger sibling would be using any of those substances at Time 2 and the effect of the sibling was stronger than the impact of peers (whether peers were using these substances).

The potential negative effect of the sibling relationships is not merely the case of setting an early trajectory (positive or negative) and following it through development but rather, the sibling relationship can change dynamically which will alter the long-term effects of the relationship on the child. For example, Richmond, Stocker & Rienks (2005) found that as sibling relationships improve, the predicted long-term effects of those relationships would also change. The authors reported a decrease in depressive symptoms for participants whose sibling relationships improved (across 3 time points, spanning 6 years). These findings support the dynamic nature of the sibling relationship, wherein as the dyadic relationship changes, the individual well being also changes and point to the use of cross sectional data in the study of the moderating effect of siblings.

For a more in-depth review of the sibling research literature, please see Appendix A.

Chapter 3:

Methods

Participants

Study participants come from the *Flourishing Families Project (FFP)*. The FFP is an ongoing, longitudinal study involving families with a child between the ages of 10 and 14 years. Participant families for the FFP were randomly and purposively selected from a large northwestern city and were interviewed at Time 1 in 2007, Time 2 in 2008, and Time 3 in 2009. Families were interviewed in their homes, with each interview consisting of a 1-hr video (not reported here) and a 1.5 hr self-administered questionnaire completed by the child, mother, and father. The overall response rate of eligible families was 61% (see Day & Padilla-Walker, 2009).

The sample used for this study consists of 311 families. Respondents without a sibling were eliminated, as were respondents whose closest sibling's age difference was greater than one standard deviation above the mean age difference between siblings (greater than 4 years age difference). Independent sample *t*-tests were conducted to determine whether the mean level for the outcome variables at Time 1 differed between respondents who did and did not have a sibling. No significant differences were found during means comparison testing, which indicates that the decisions used to eliminate respondents for the sample in this study are not biased. Tests between respondents who did and did not have a sibling: prosocial: $t(493)=-.26$, $p>.05$; hope: $t(493)=-.02$, $p>.05$; internalized problem behavior: $t(493)=.54$, $p>.05$; delinquency: $t(496)=.78$, $p>.05$. Between respondents with sibling age differences greater than 7.5 years: prosocial: $t(419)=-.11$, $p>.05$; hope: $t(419)=-.69$, $p>.05$; internalized problem behavior: $t(419)=-.09$, $p>.05$; delinquency: $t(422)=1.87$, $p>.05$.

The sample used for this study included the adolescent child (*M* age at Time 1 = 11.25 years, *SD*=.99, range 9 – 14, at Time 1), mother (*M*=43.20.81, *SD*=5.77, range 28 – 60), and father (M=45.29, *SD*=5.96, range=27 – 62). Seventy-six percent of families were two-parent, married families, and the remaining 24% were single-parent families. Among the single parents, 86% were single mothers and 14% were single fathers. Family ethnicity was determined by combining the reported ethnicity from each parent and the parent's report of the child's ethnicity. Most families were European American (73%). Multiracial families were the next most common category (16%), followed by African American (10%). Asian American and Hispanic families each comprised less than 1% of the total sample. Most parents have at least a bachelor's degree (76% of moms and 70% of dads). The average household size was 4.38 (*SD*=1.16, range 2 – 10) and 62% of the families reported a combined income of more than $50,000.

Each respondent was asked to identify the brother or sister nearest to them in age. To determine age difference between siblings, the absolute value of the difference between the respondent's age less the sibling's age was calculated. The average age difference between siblings was 2.98 years (*SD*=1.52, range 0 – 7). Sixty-nine percent of the respondent's ages were within 3 years of their sibling.

Half (49%) of the child respondents were male and half (51%) were female. When reporting on their sibling, 50% of our respondents reported on a brother and 50% reported on a sister. Of the male respondents, 56% had a brother and 44% had a sister. Of the female respondents, 44% had a brother and 56% had a sister. Fifty-six percent of the sibling dyads are brother-sister pairs, 22% are sister pairs, and 22% are brother pairs. Gender composition of the sibling dyads in this sample is normally distributed (see Appendix B).

Data Collection Procedure

Families were selected using a purchased randomized national telephone survey database (Polk Directory/Info USA) that included presence and age of children. To be eligible, families had to reside within the geographic area of the sampling frame and they had to have a fifth-grade child. Eligible families were first contacted using a letter of introduction. Interviewers made phone calls and home visits to confirm eligibility and willingness to participate in the study. Appointments were then made to conduct an assessment interview.

Initial sampling efforts did not produce enough lower-income families and/or racial/ethnic minority families to satisfy sampling frame requirements. As a remedy, already-selected families were asked to nominate additional families who had a child of the appropriate age for sample consideration. A total of 1,064 eligible families were identified using one or both methods of the purchased database and family nomination methods. Of those, 744 were determined to have a fifth-grade child and were geographically eligible to be contacted. Sixty-eight percent agreed to participate ($n = 501$). The most frequent reasons cited by families for not wanting to participate in the study were lack of time and concerns about privacy. From these 501 families, respondents with a sibling who was greater than one standard deviation (4 years) in age older or younger than the respondent were eliminated. Respondents who were no longer in the sample at Time 3 were also eliminated leaving a total sample size of 311

Frequency analysis of the sample shows that 85% of the sample was first contacted based on information from the Polk Directory, and 15% were first contacted based on a referral or a response to a flyer or newspaper ad. Independent sample t-tests were computed, comparing mean scores at Time 1 for the outcome variables between respondents who were recruited through the Polk Directory compared to those recruited through a referral or other means. Results indicate that there are no differences among respondents on the outcome variables based on recruitment type

(prosocial: $t(493)=.92$, $p>.05$); hope: $t(493)=-1.70$, $p>.05$; internalized problem behavior: $t(493)=.78$, $p>.05$).

Sample Attrition and Missing Data.

Sample attrition is a relevant concern for all longitudinal research. Sample attrition refers to the loss of respondents from the total sample between subsequent waves of data collection and it threatens the internal and external validity of study results (Barry, 2005). In the *Flourishing Family Project*, respondent attrition between Time 1 and Time 3 among those respondents who had a sibling was 10% of the total sample size at Time 1.[1]

Sample attrition creates missing data among variables that are included in multiple waves of data collection, such as the outcome variables used in this research. As suggested by Tabachnick and Fidell (2007), the amount of missing data is less important than the pattern of missing data. To determine whether a pattern exists in the missing data, outcome variables should be assessed to see if differences exist between those respondents who remained in the study and those who did not continue (Ahern & Le Brocque, 2005).

Independent sample t-tests were computed, comparing mean scores at Time 1 for the outcome variables. These tests showed that the respondents who remained in the sample were not significantly different on the outcome variables from those respondents who dropped out of the study by Time 3 (prosocial: $t(493)=1.66$, $p>.05$; internalized problem behavior: $t(493)=-.51$, $p>.05$; delinquency: $t(496)=.60$, $p>.05$).

Additional comparison of means testing was computed to determine whether outcome variable means varied due to some child-specific demographic variable. Again, no significant differences were found (for example: race/ethnicity of the family ($x^2 = .709$, $p>.05$); gender of

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[1] Time 1 sample size = 427 respondents, Time 3 sample size = 386 respondents
(386 / 427 = .90 remain in the sample).

respondent ($x^2 = 1.51$, *p*>.05); or age of the child ($x^2 = -1.34$, *p*>.05). These findings indicates

that missing data in the sample are missing at random (MAR) (see Allison, 2001) and that no

statistical adjustment of missing data is required for further analysis (Ahern & Le Brocque,

2005). For additional discussion of handling missing data for specific questionnaire items, see

Appendix B.

Measures

Variables analyzed in this study are drawn from the child questionnaire at Times 1, 2 and

3. Variables are summarized in Table 1. See Appendix B for additional psychometric testing of

Table 1

Variables Used in This Study

Dependent Variables	Independent Variables
- Prosocial Behavior	- Stressful Life Events
- Hope	- Sibling Conflict
- Externalized Problem Behavior	- Sibling Affect
- Internalized Problem Behavior	

Control Variables (from Time 1)

Socioeconomic status, family structure, race/ethnicity, child gender, sibling gender, child's age, age difference between siblings, and parent-child relationship

these variables, including item-level descriptive statistics, handling missing data, and justifying

the use of summed, composite scales for analyses.

Dependent Variables

Four dependent variables are used to operationalize well being as the outcome construct for this

study. This includes measures of positive and negative well being as well as internal and external

indicators of well being as shown in Table 2. Negative measures of well being are characterized by the

absence of negative behaviors, such as the absence of depression or delinquency, whereas positive

measures of well being are characterized by the additional presence of some type of positive behavior or internal psychological state, such as being happy or prosocial.

Well being is also operationalized to include both internal and external indicators, meaning indicators of well being that can be observed externally (such as delinquent behavior) as well as indicators that are self-reports of internal states of being (such as feeling hopeful).

Table 2

Variables Used to Operationalize Well being

	Internal Indicators	External Indicators
Positive Indicators	Hope	Prosocial Behavior
Negative Indicators	Internalized Problem Behavior	Externalized Problem Behavior

Dependent Variable – Prosocial Behavior. Prosocial behavior is a positive and external measure of child well being: "positive" because it measures the presence of an indicator of well being rather than its absence, and "external" because prosocial behavior can be observed behaviorally, external to the respondent. Prosocial behavior was measured at all time points using a modified version of the Inventory of Strengths: Kindness/Generosity and Prosocial Behaviors (Peterson & Seligman, 2004). Respondents rated how much they agreed with nine statements describing themselves using a scale from 1 (not like me at all) to 5 (very much like me). Higher scores represent more prosocial behavior. Sample items include: "I watch out for kids at school, even if I do not know them" and "I voluntarily help my neighbors." Based on results from factor analysis and Cronbach's alpha reliability statistic (see Appendix B), all nine prosocial behavior items were summed to created one composite variable (alpha = .87).

Dependent Variable – Hope/Optimism. Hope is a positive and internal measure of child well being: "positive" because hope measures the presence of an indicator of well being rather than its absence, and "internal" because hope reflects an internal psychological state. Hope was measured at all time points using the Children's Hope Scale (Snyder, 2005). Respondents reported how often certain statements described them using a scale from 1 (*none of the time*) to 4 (*all of the time*). Higher scores represent more hope. Sample items include: "*I know that I will succeed with the goals set for myself*" and "*I can always find the positive in what seems negative to others*". Based on results from factor analysis and Cronbach's alpha reliability statistic (see Appendix B), all nine prosocial behavior items were summed to created one composite variable (alpha = .87).

Dependent Variable – Externalized Problem Behavior. Externalized problem behavior is a negative and external measure of child well being: "negative" because delinquency measures the absence of an indicator of well being rather than its presence, and "external" because delinquency can be observed behaviorally, external to the respondent. Externalized problem behavior was measured at all time points using a measure taken from the Youth and Family project (Barber, Stolz, Olsen, & Maughn, 2005) .Respondents rated how often nine statements were true in describing themselves using a scale from 0 (*not true*) to 2 (*very true or often true*). Higher scores represent more delinquency. Sample items include: "*I destroy things belonging to others*" and *"I steal things from places other than home."* Based on results from factor analysis and Cronbach's alpha reliability statistic (see Appendix B), all nine delinquency items were summed to created one composite variable (alpha = .75).

Dependent Variable – Internalizing Problem Behavior. Internalizing problem behavior is a negative and internal measure of child well being: "negative" because internalizing problems measures the absence of an indicator of well being rather than its presence, and "internal" because internalized problems reflects an internal psychological state. Internalizing problem behaviors was measured at all time points using a measure taken from the Youth and Family project (Barber, Stolz, Olsen, & Maughn, 2005) Respondents rated how often 13 statements were true in describing themselves using a scale from 0 (*not true*) to 2 (*very true or often true*). Higher scores represent more internalized problem behavior. Sample items include: *"I am unhappy, sad or depressed" and "I am nervous or tense".* Based on results from factor analysis and Cronbach's alpha reliability statistic (see Appendix B), all 13 delinquency items were summed to created one composite variable (alpha = .85).

Independent Variable – Stressful Life Events

Stressful life events are considered to be more episodic in nature and refer to specific events that cause immediate stress such as the death of a parent, a period of financial struggle, or a sibling leaving home. Chronic stress is different from "episodic" stress. Chronic stress refers to environmental factors that remain largely unchanged over time and yet place a heavy burden on those in that environment. Chronic stressors include extreme poverty, parental absence, or continued family conflict. Research indicates that the effect of episodic stressful events can be as great as the effect of chronic stress (Hankin & Abela, 2005), and often episodic stressful events can lead to chronic stress. For example, the episodic stress of divorcing parents can lead to the more chronic stress of poverty.

To better assess the total impact of stress on the child, the stress variable used in this study includes indicators of both chronic and episodic stress and combines them to generate an overall stress level. Stress was measured using the Stressful Life Events Scale (Cohen, Kamarck & Mermelstein, 1983). Stress was measured at Times 1, 2, and 3. Respondents reported how recently seven stressful life events had occurred using a scale from 1 (*happened this year*), 2 (*has happened but more than a year ago*), or 3 (*happened this year*) (*has never happened*). All items were reverse coded so higher scores indicate higher levels of stress.

Based on results from factor analysis and Cronbach's alpha reliability statistic (see Appendix B), all seven stress items were summed to created one variable (alpha = .59). Stress was normally distributed. Skewness was -.77 and kurtosis was -.31, which were within the normal range (-1 through 1) (Mertler & Vannatta, 2005).

Moderating Variable – The Sibling Relationship

The sibling relationship was measured at all time points using the Sibling Relationship Inventory (SRI) originally created by Stocker & McHale (1992). Several researchers have also used this measure to assess the quality of sibling relationships (Gass et al., 2007; Verte, Hebbrecht & Roeyers, 2006; Kim, McHale, Crouter & Osgood, 2007). Respondents rated how often 10 behaviors occur between siblings using a scale from 1 (n*ever*) to 5 (*always*).

Based on results from factor analysis, two subscales were identified – sibling affection and sibling conflict. Sample items for sibling affection include: "t*each each other or help one another figure things out?*" and "*share secrets with one another.*" Sample items for sibling conflict include: "*fell mad or angry with each other*" and *"teach each other or call each other names."* For statistical and theoretical reasons, these two subscales were assessed as independent scales (see Chapter 2 and Appendix B).

A Pearson bivariate correlation shows that the affection and conflict scales are correlated with each other ($r = -.18$, $p<.0001$), although the strength of that correlation is low. Based on results from factor analysis, Cronbach's alpha reliability statistic and the Pearson bivariate correlation (see Appendix B), sibling affection and sibling conflict were assessed as two separate scales, both with an alpha of .85.

Control Variables

To address potentially confounding variables, several control variables were included in the regression analysis. Socioeconomic Status (SES) was assessed at Time 1 using a self-report of total income, combined with a partner if applicable. Sixty-two percent of the sample makes over $50,000 annually. Income was normally distributed (skewness = -.64, kurtosis = -.65) Skewness and kurtosis were within the normal range (-1 through 1) (Mertler & Vannatta, 2005).

Family structure was assessed by combining self-reports from both parents (if applicable). In the analysis family structure was a dummy variable. Married is the omitted category. Of the 311 families, 76% were married, two-parent families, and the remaining 24% were single-parent families.

Race/ethnicity was reported by the child and both partners. Responses were combined to create an overall "family ethnicity" variable. In this sample, 73% of the children were European American, 10% were African American, 16% were multiethnic, and less than 1% of the families' were Asian American, Hispanic or another race. Dummy variables were created for each of the following: African American, Multiethnic, and "other" with Asian and Hispanic combined. European American (White) is the omitted category.

Age of the respondent was added to control for changes that may occur in the sibling relationship as children grow older. Research indicates that as children age, their sibling relationships become more egalitarian and become less intense (Buhrmester & Furman, 1990), warmth increases (Feinberg, McHale, Crouter, & Cumsille, 2003), sibling rivalry decreases (Cicirelli, 1982) and conflict declines (Kim et al., 2007). To account for potential confounding, age of the respondent was included as a control. Age is measured as a parent-report at Time 1 (M=11.3 years, SD=.99, range 9-14).

Age difference between siblings was calculated by subtracting the age of the sibling from the age of the respondent and using the absolute value of that number. The absolute is used to determine whether siblings who are spaced further apart have differential effects on child outcomes. Higher values mean the siblings were spaced further apart. The average years between siblings was 2.48 (SD=1.02, range 0 – 4). Fifty-one percent of the respondents were spaced 2 years or less apart. Assessment of outlying data found a negative skew in the distribution,

meaning several respondents had siblings who were much older. Considering the high end of the range of age difference in the original sample (18 years older than the respondent) and the skewness of the data, respondents who reported on a sibling whose age differences was greater than 1 standard deviations above the mean (4 years) were eliminated in this analysis. Conceptually, the quality of the sibling relationship is most likely to be impactful when that sibling is near in age and co-resident with the respondent, both of which are less likely as the age difference between the sibling's increases.

Sex of the respondent and sex of the sibling were included as separate, dummy variables. Male is the omitted category. Exactly half (50%) of the child respondents are male and half are female. Exactly half (50%) of the respondents reported on a female sibling and half reported on a male sibling. For more information on the sex composition of the sibling dyad, see Appendix B.

The parent-child relationship was measured at Time 1 using a modified version of the Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987). Respondents rated how true six statements were in describing the relationship with their primary caregiver using a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores represent a stronger parent-child attachment. Sample items include: *"My parent respects my feelings"* and *"When we discuss things, my parent considers my point of view"* (M=19.98, SD=2.80, range 9.0 – 25.0). Cronbach's alpha for the scale was .70 for this sample.

The primary caregiver was a mother for 97% of the respondents. The remaining 3% identified their father as the primary caregiver. Among those identifying the father as the primary caregiver (n=12), one family comprised two male same-sex partners and the remaining 11 families were single fathers. Because the purpose of this control variable is to account for a close relationship with a primary caregiver, there is no additional conceptual concern with whether that

parent is a mother or father. For this reason, the fathers remained in the sample when assessing

the parent-child relationship.

Chapter 4:

Results

The present study investigates two hypotheses and one general research question. The hypotheses assess whether sibling relationships moderate the effect of stress on child well being. Hypothesis 1 (the buffering hypothesis) states that the negative effect of stress on well being will decrease as sibling affection increases. Hypothesis 2 (the exacerbating hypothesis) states that the negative effect of stress on well being will increase as sibling conflict increases. The research question asks whether the moderating effect of the sibling relationship should be studied concurrently or longitudinally.

To assess whether sibling relationships moderate the effect of stress on child well being, hierarchal regression analyses were completed. Theoretically, hierarchal regression was appropriate because using this method makes it is possible to assess several first-order relationships that must be established before moderation can be tested. To assess whether the moderating effect of siblings should be assessed using cross sectional or longitudinal data, all regressions were competed using variables from Time 1, then variables from Time 3, and finally a longitudinal model incorporating predictor variables at Time 1 and outcome variables at Time 3. Time 2 data was only used to demonstrate changes in the sibling relationship over time (see Appendix B).

Analysis Plan

Each well being measure was evaluated separately using successive hierarchal regression models. In each model, additional predictor variables were included at each successive step, an approach that has been used in previous studies in this area (see Becker & Luthar, 2007; Gass et al., 2007, Pike, Coldwell, & Dunn, 2005; Stocker et al., 2002).

In this analysis, several child and family controls were added to minimize the risk of Type I error and account for confounding variables. These controls include socioeconomic status, family structure, parent-child attachment, race/ethnicity, sex of the child, sex of the sibling, age of the child, age disparity between siblings, and child self-regulation.

In Step 1, all control variables were regressed on well being variables. In Step 2, stress was added to the model, to determine the unique effect of stress without consideration of the sibling relationship. In Step 3, the sibling relationship variables were added to demonstrate the unique effect of the sibling relationship on well being. To determine whether moderation is occurring, interaction terms were generated between stress and sibling affection and stress and conflict. These interaction terms were added in Step 4 to determine whether the interaction terms contribute uniquely to the overall variance in child well being. These four steps were repeated for each dependent variable at Time 1 and for each dependent variable at Time 3. When assessing the longitudinal model, an additional step was included before to step 1, where prior levels of well being were established by regressing Time 1 well being variables on Time 3 well being variables.

When interaction terms are included in a regression model, multicollinearity is likely to increase because of the presence of both a first-order and higher-order version of the predictor variables. This problem is addressed by centering the predictor and outcome variables as recommended by Cohen, Cohen West and Aiken (2003). Centering is a data transformation that involves subtracting the mean of the predictor variable from the raw data value of that variable for each respondent. This transformation forces the mean for centered variables to be zero.

Table 3

Variables and Regression Equations for Cross-Sectional Analysis

	Variables	Regression Equation
Step 1	Control variables	$CHILD_i = \alpha_i + \beta_1 X_i + \varepsilon$
Step 2	Stressful Life Events	$CHILD_i = \alpha_i + \beta_1 X_i + \beta_2 STRESS_i + \varepsilon$
Step 3	Sibling relationship	$CHILD_i = \alpha_i + \beta_1 X_i + \beta_2 STRESS_i + \beta_3 SIBLINGS_i + \varepsilon$
Step 4	Interaction terms added (Affection x stress) (Conflict x stress)	$CHILD_i = \alpha_i + \beta_1 X_i + \beta_2 STRESS_i + \beta_3 SIBLINGS_i + \beta_4(STRESS_i \times SIBLING\ AFFECTION_i) + \beta_5(STRESS_i \times SIBLING\ CONFLICT_i) + \varepsilon$

The outcome of child *i* is shown as a function of well being (WELLBEING), stress (STRESS), the sibling relationship (SIBLING) and several control variables (X_i).

NOTE: For longitudinal analysis, an additional step was added before Step 1. Time 1 well being was regressed on Time 3 well being. ($\beta_1 WELLBEING_i$).

Descriptive Results

Descriptive statistics and correlations among the variables at Time 1 and Time 3 are shown in Table 4. In this table, coefficients for correlations between Time 1 variables are presented, followed by correlations for Time 3 variables. Correlational analysis showed that all outcome variables were associated with each other in expected ways. Positive measures of well being were positively associated with each other (prosocial and hope: $r_{T1} = .54$, p<.000), and negative measures of well being were associated with each other (externalized and internalized problem behavior: $r_{T1} = .39$, p<.000). Additionally, negative indicators of well being were inversely correlated with positive measures of well being (see Table 4).

Unexpectedly, internalized and externalized problem behaviors were never significantly associated with sibling affection and internalized behavior was not association with prosocial

behavior. At Time 3, sibling affection and conflict were not associated with stress. In general,

Time 1 data better correlated with each other in terms of significance level and coefficient value.

Perhaps as children age, their lives become more complex and more variables must be used to

determine well being.

Table 4

Correlations, Means and Standard Deviations for Dependent and Independent Variables at Time 1 and

Time 3

	1	2	3	4	5	6	7
1. Sibling Affection	1.00						
2. Sibling Conflict	-.32*** (T1) -.12 *** (T3)	1.00					
3. Stressful Life Event	-.19*** (T1) -.05 (T3)	.29*** .06	1.00				
4. Prosocial	.41*** (T1) .34*** (T3)	-.21*** -.11	-.15** -.14*	1.00			
5. Hope	.35*** (T1) .25*** (T3)	-.21*** -.14*	-.26*** -.11*	.54*** .52***	1.00		
6. Internalized Problem Behavior	-.09 (T1) .02 (T3)	.39*** .30***	.36*** .25***	-.07 .06	-.25*** -.21***	1.00	
7. Externalized Problem Behavior	-.03 (T1) -.06 (T3)	.30** .05	.26*** .35***	-.15** -.29***	-.21*** -.34***	.39*** .22***	1.00
Variable mean	18.35 (T1) 18.70 (T3)	13.06 12.93	11.57 10.56	36.83 27.93	28.95 36.97	5.27 17.36	1.12 9.52
Standard Deviation	5.03 4.99	3.87 3.86	2.78 2.66	6.40 6.57	3.62 6.39	4.73 4.25	1.80 2.06

*** $p<.000$ **$p<.01$ *$p<.05$

NOTE: Time 3 results are listed below Time 1 results.

Correlations among variables used in the longitudinal analysis are included in Table 5.

Consistent with the cross sectional data (see Table 4), sibling affection was not associated with

either negative measure of well being (internalized or externalized). Stressful life events were not associated with either of the positive measures of well being (hope or prosocial behavior). This finding may indicate that the negative impact of stress has been mitigated over time and may point to the use of cross sectional data when analyzing potential buffers to the negative impact of stress on well being.

Table 5

Correlations for Dependent Variables at Time 3 and Independent Variables at Time 1

	1	2	3	4	5	6	7
1. Sibling Affection	1.00						
2. Sibling Conflict	-.32***	1.00					
3. Stressful Life Event	-.19***	.29***	1.00				
4. Prosocial	.36***	-.14*	-.10	1.00			
5. Hope	.27***	-.16**	-.09	.52***	1.00		
6. Internalized Problem Behavior	.03	.23***	.16**	.06	-.21***	1.00	
7. Externalized Problem Behavior	-.06	.15***	.16***	-.29***	-.34***	.22***	1.00

*** $p<.000$ **$p<.01$ *$p<.05$

Multivariate Results

Results of the regression analyses are summarized in Tables 6, 7 and 8. For each step, the adjusted R^2, change in R^2, significance of the change in R^2 and F-test are presented. Multicollinearity was reviewed for all variables at each stage of regression. Specifically, variance of inflation (VIF) scores were reviewed for each variable at each step. No VIF coefficients were greater than 2, which is well below the recommend threshold of 10 by Mertler and Vannatta (2005), thus multicollinearity was not a concern for any of the models.

In each cross sectional regression analysis, control variables were entered at Step 1. Stress was entered at Step 2. Sibling affection and sibling conflict were entered at Step 3 and two 2-way interactions were entered at Step 4. In the longitudinal regression analysis, an additional step was added before step 1 where well being at Time 1 was entered.

Predicting Prosocial Behavior. The direct effect of stress was never a significant predictor of prosocial behavior in cross-sectional or longitudinal analyses, even though the zero-order correlation between stress and prosocial behavior was significant ($r_{T1} = -.15$, $p<.01$; $r_{T3} = -.14$, $p<.05$, see Table 4). This finding indicates that some other variable is likely confounding the effect stress on prosocial behavior. In the longitudinal model, the only significant variable was the age of the child. The change in prosocial behavior from Time 1 to Time 3 was then investigated through paired sample *t*-tests. Prosocial behavior significantly decreased from Time 1 to Time 2, ($t(370) = 30.81$, $p<.001$) and between Time 2 and Time 3 ($t(370)=-3.74$, $p<.001$). This decrease over time may indicate that prosocial behavior should be assessed using a methodology that allows for consideration of changes in the dependent variables over time and that the impact of the child's age on prosocial behavior should be more closely considered. Perhaps as children grow up they respond to the messages in the media and elsewhere which indicate that to be a teenager means to be vulgar and oppositional (Aird, 2004) and therefore, a predictable decline in prosocial behavior will occur independent of other buffering or exacerbating factors.

In all models, the direct effect of sibling affection was significant and positively associated with prosocial behavior. Sibling conflict was never a significant predictor of prosocial behavior, even though the zero order correlation was significant for Time 1 variables and longitudinal variables.

Table 6

Hierarchal Regressions showing the Effects of Stress and Sibling Relationship Quality on Well being Time 1 , Full Sample (N=311)

		Prosocial	Hope	Internalized Problem Behavior	Externalized Problem Behavior
Step 1	Parent-child Relationship	.09	.19**	-.19***	-.19***
	Child Self-regulation	.27***	.28***	-.48***	-.26***
	Sex of child	.22***	.07	.04	-.06
	Sex of sibling	-.02	-.08	.01*	-.00
	Age disparity between siblings	-.03	.01	-.03	-.12*
	Age of child	-.13*	.05	-.11*	.19***
	Single parent family	-.05	-.05	-.05	.21***
	Family income	-.09	-.08	.05	.05
	African American	.07	.14*	.09	.10
	Multi-ethnic	-.02	-.05	.04	.06
	Other race/ethnicity	.10	.03	.10	-.00
	Final R^2	.15	.15	.33	.28
	F test	F(11,299)= 5.80	F(11,299)= 5.89	F(11,299)= 15.05	F(11,299)= 11.78
Step 2	Stress –Time 1	-.07	-.12*	.14**	.09
	Final R^2	.15	.16*	.35***	.28
	F test	F(1,298)= 1.41	F(1,298)= 4.37	F(1,298)= 7.71	F(1,298)=2.78
Step 3	Sibling Affection – Time 1	.35***	.25***	.11*	-.16***
	Sibling Conflict – Time 1	.01	.05	.20*	.27***
	Final R^2	.25***	.21***	.38***	.34***
	F test	F(2,296)= 21.89	F(2,296)= 9.99	F(2,296)= 7.52	F(2,296)=13.39
Step 4	Affection x stress	-.01*	-.01*	.01*	.01**
	Conflict x stress	.05*	.02*	.05*	.02**
	Final R^2	.25	.21	.39*	.34
	F test	F(2,294)= 1.57	F(2,294)= .96	F(2,294)= 3.51	F(2,294)=1.46

 * p < .05   ** p < .01   *** p < .001

NOTE: As recommended by Aiken & West (1991) Beta values for main effects are standardized while Beta values for interaction effects are unstandardized.

Table 7

Hierarchal Regressions showing the Effects of Stress and Sibling Relationship Quality on Well being Time 3 , Full Sample (N=311)

		Prosocial	Optimism	Internalized Problem Behavior	Externalized Problem Behavior
Step 1	Parent-child Relationship	.13*	.17***	-.12*	-.12*
	Child Self-regulation	.21***	.30***	-.36***	-.30***
	Sex of child	.24***	.09	.20***	-.11*
	Sex of sibling	.03	.08	-.10	-.06
	Age disparity between siblings	-.02	-.10	.10*	-.06
	Age of child	-.09	-.01	-.01	.26***
	Single parent family	-.09	-.04	.05	.14*
	Family income	-.03	.00	.08	.08
	African American	.03	.18***	.05	-.01
	Multi-ethnic	-.09	-.01	.08	.06
	Other race/ethnicity	.01	-.02	-.01	-.04
	Final R^2	.13	.16	.21	.23
	F test	F(11,299)= 5.25	F(11,299)= 6.28	F(11,299)= 8.42	F(11,299)= 9.44
Step 2	Stress –Time 3	-.06	-.03	.13*	.23***
	Final R^2	.13	.16	.22*	.27***
	F test	F(1,298)= 1.14	F(1,298)= .20	F(1,298)= 5.48	F(1,298)= 18.58
Step 3	Sibling Affection – Time 3	.27***	.21***	.08	.08
	Sibling Conflict – Time 3	-.05	-.02	.21***	.04
	Final R^2	.20***	.19***	.26***	.28
	F test	F(2,296)= 13.25	F(2,296)= 7.49	F(2,296)= 9.01	F(2,296)= 1.23
Step 4	Affection x stress	-.05	-.02*	.03*	.01**
	Conflict x stress	-.03	-.09*	.06*	.01*
	Final R^2	.20	.21*	.28*	.27
	F test	F(2,294)= .48	F(2,294)= 3.54	F(2,294)= 4.67	F(2,294)= .48

* p < .05   ** p < .01   *** p < .001

NOTE: As recommended by Aiken & West (1991) Beta values for main effects are standardized while Beta values for interaction effects are unstandardized.

Table 8

Hierarchal Regressions showing the Effects of Stress and Sibling Relationship Quality on Well being From Time 1 to Time 3 – Full Sample (N=311)

		Prosocial	Hope	Internalized Problem Behavior	Externalized Problem Behavior
Step 1	Well being – T1	.51***	.35***	.53***	.45***
	Final R^2	.26***	.12***	.28***	.20***
	F test	F(1,309)= 109.28	F(1,309)= 42.48	F(1,309)= 121.12	F(1,309)= 77.92
Step 2	Parent-child Relationship	.08	.11*	-.01	-.07
	Child Self-regulation	.11*	.10	-.04	-.01
	Sex of child	.15**	.07	.18***	-.08
	Sex of sibling	.03	.10*	-.02	-.07
	Age disparity between siblings	-.03	-.11*	.14	-.01
	Age of child	-.04	-.04	.05	.21***
	Single parent family	-.05	-.03	.06	.07
	Family income	-.01	.01	.07	.08
	African American	.02	.15**	-.01	-.04
	Multi-ethnic	-.09	-.02	.09	.05
	Other race/ethnicity	-.04	-.03	-.01	-.04
	Final R^2	.29	.16	.32	.24
	F test	F(11,298)= 2.19	F(11,298)= 2.53	F(11,298)= 2.77	F(11,298)= 2.58
Step 3	Stress –Time 1	.01	.01	-.06	.09
	Final R^2	.29	.16	.32	.25
	F test	F(1,297)= .06	F(1,297)= .00	F(1,297)= 1.10	F(1,297)= 2.65
Step 4	Sibling Affection – Time 1	.18***	.16**	.07	-.01
	Sibling Conflict – Time 1	.05	.02	.03	.02
	Final R^2	.31**	.18*	.32	.24
	F test	F(2,295)= 5.42	F(2,295)= 3.89	F(2,295)= 1.00	F(2,295)= .09
Step 5	Affection x stress	-.05*	-.06*	.03*	-.01*
	Conflict x stress	-.09*	-.05*	.01*	-.01*
	Final R^2	.32**	.19	.33	.24
	F test	F(2,293)= 4.68	F(2,293)= 2.67	F(2,293)= 1.62	F(2,293)= .02

* p < .05   ** p < .01   *** p < .001

NOTE: As recommended by Aiken & West (1991) Beta values for main effects are standardized while Beta values for interaction effects are unstandardized.

In the final regression step, the interaction between stress and sibling affection and the interaction between stress and sibling conflict were significant for the Time 1 and the longitudinal models but not for the Time 3 model. In the Time 1 model, the interactions while significant, did not significantly improve the overall R^2 (F_{T1} (2,294) = 1.57), therefore no further analysis were conducted. The inclusion of the interaction terms did significantly improve the overall R^2 for the longitudinal model (F_{T13} (2,294) = 4.68). Significance testing of simple slopes found the slope of the line representing sibling affection for respondents with high levels of stressful events and for respondents with low levels of stressful events were not significantly different from zero ($t(1,294)= -1.22$, $p>.05$; $t(1,294)= .70$, $p>.05$). Therefore, no further analyses were conducted.

Predicting Hope. The direct effect of stress on hope was only significant during Time 1. Higher levels of stress were associated with lower levels of hope. Zero-order correlations are congruent with this find because hope and stress were not significantly correlated over time (see Table 5) or at Time 3 (see Table 4). The change in hope from Time 1 to Time 3 was investigated through paired sample *t*-tests. Hope significantly increased from Time 1 to Time 3, ($t(370) = -25.55$, $p<.001$).

The direct effects of sibling affection were significant in all models. The direct effects of sibling conflict were never significant. For each model, the inclusion of sibling affection in the overall model significantly improved the overall R^2. In the final step, the interaction between stress and sibling affection, and the interaction between sibling conflict and stress were significant for all models. The interaction terms contributed significantly to R^2 the only for the Time 3 model.

As a follow up to the regression analyses for the Time 3 model, interaction terms were assessed by plotting respondents with stressful life event scores one standard deviation above and below the mean against respondents with affection scores one standard deviation above and below the mean and significance testing were conducted. Significance testing of simple slopes found that regarding sibling affection, the slope of the line representing high stress and the slope of the line representing low stress were not significantly different than zero ($t(1,294)= -.98$, $p>.05$; $t(1,294)= -.27$, $p>.05$). A review of the original regression model shows that the regression coefficients for the interaction between stress and affection was very small ($b=.02$), which might explain why additional testing found no significant findings.

Significance testing regarding sibling conflict, found that the slope of the line representing low stress was not significantly different than zero ($t(1,294)= 1.09$, $p>.05$) but the slope of the line representing high stress was significant ($t(1,294)= 1.97$, $p<.05$). To further display the nature of this interaction, stressful life event scores and sibling conflict scores that fell one standard deviation above and below the mean where plotted (see Figure 2).
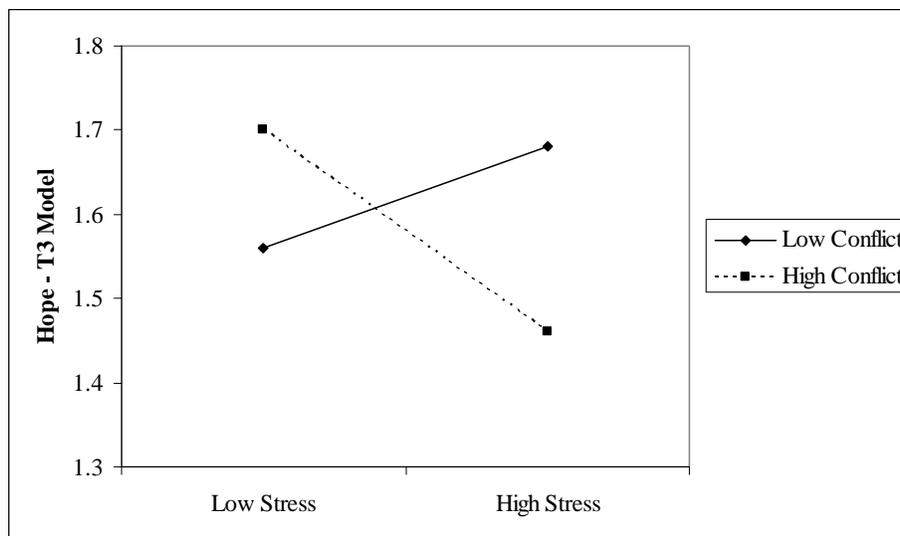
Figure 2. Mean Levels of Hope as a Function of Stressful Life

Events and Sibling Conflict – Time 3 model

For children who experienced low levels of stressful life events, levels of sibling conflict do not help predict hope; however, for children experiencing high levels of stressful life events, the level of sibling conflict does help predict hope. Children who are experiencing high levels of stress and who experience high levels of sibling conflict demonstrate significantly lower levels of hope, or in other words sibling conflict exacerbates the impact of stress on hope.

Predicting Internalized Problem Behavior. The direct effect of stress was significant for both cross-sectional models but not for the longitudinal model. The lack of significant findings in the longitudinal model may indicate that this methodology is insufficient for assessing the buffering or exacerbating effect of siblings on stress. This pattern is also shown with the direct effects sibling conflict and affection which are significant for the cross-sectional models but not for the longitudinal model. Results show that as sibling conflict goes up, internalized problem behavior also goes. As sibling affection goes up, internalized problem behavior also goes up, which is consistent with other research findings (see Gass, Jenkins & Dunn, 2007).

In the final step of the regression models, the interactions between stress and both affection and conflict, were significant for all regression models. However, these interaction terms significantly improved the overall model R^2 only for the cross-sectional models. The change in internalized problem behavior from Time 1 to Time 3 was also investigated through a paired sample t-test. Internalized problem behavior significantly decreased from Time 1 to Time 3, ($t(370) = -55.04$, $p<.001$).

As a follow up to the regression analyses, respondents with stressful life event scores one standard deviation above and below the mean were plotted against respondents with affection scores one standard deviation above and below the mean and with respondents with sibling

conflict scores one standard deviation above and below the mean for the Time 1 and the Time 3 models (see Figures 3, 4, 5 and 6). Significance testing of simple slopes found that regarding sibling affection in the Time 1 model, the slope of the line representing high stress and the slope of the line representing low stress were both significantly different than zero ($t(1,294)= 2.24$, $p<.05$; $t(1,294)= 2.26$, $p<.05$). For children experiencing high levels of stress the predicted decrease in internalized behavior was buffered or decreased when accompanied with high levels of sibling affection. Even for children experiencing low levels of stress, having an affectionate sibling relationship was still associated with lower levels of internalized behavior.

Significance testing regarding sibling conflict, found that the slope of the line representing low stress was not significantly different than zero ($t(1,294)= .58$, $p>.05$) but the slope of the line representing high stress was significant ($t(1,294)= 3.70$, $p<.05$). For children who experienced low levels of stressful life ev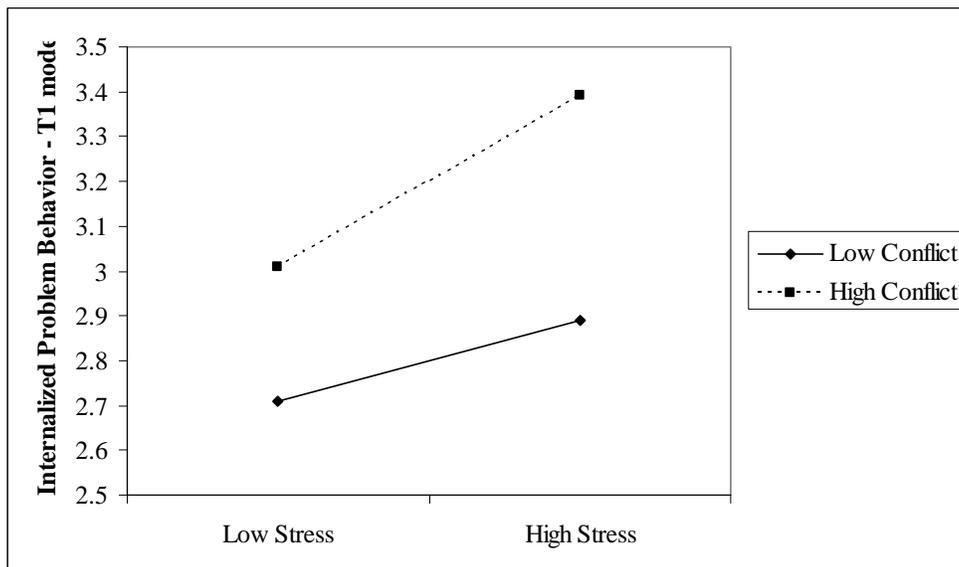ents, levels of sibling conflict do not help predict internalized behavior; however, for children experiencing high levels of stressful life events, the level of sibling conflict predicts higher levels of internalized behavior. In other words sibling conflict exacerbates the impact of stress on internalized problem behavior.
Follow-up analyses on the Time 3 model showed similar results. Respondents with stressful life event scores one standard deviation above and below the mean were plotted against respondents with affection scores one standard deviation above and below the mean (see Figure 8), and with respondents with sibling conflict scores one standard deviation above and below the mean (see Figure 9). Significance testing of simple slopes found that regarding sibling affection in the Time 3 model, the slope of the line representing high stress was significantly different than zero ($t(1,294)= 3.56$, $p<.05$) however the slope of the line representing low stress was not significantly different than zero ($t(1,294)= 1.83$, $p>.05$). For children experiencing high levels of

Internalized Behavior - T1 Model

6
5.9
5.8
5.7
5.6
5.5
5.4
5.3
5.2

Low Stress   High Stress

◆— Low Affection
■····· High Affection
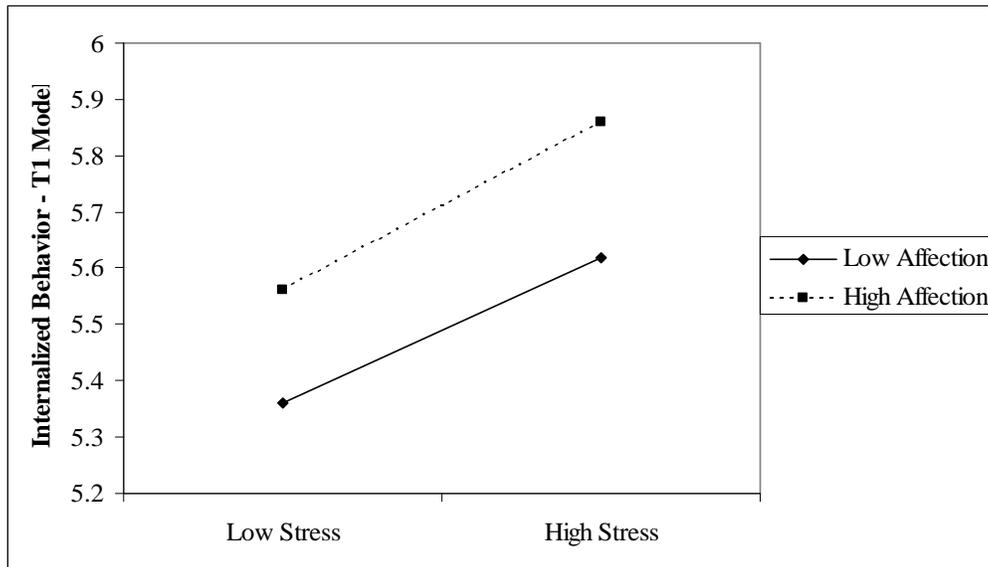
Figure 3. Mean Levels of Internalized Problem Behavior as a Function of

Stressful Life Events and Sibling Affection – Time 1 model

Internalized Problem Behavior - T1 model

3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5

Low Stress   High Stress

◆— Low Conflict
■····· High Conflict

Figure 4. Mean Levels of Internalized Problem Behavior as a Function of

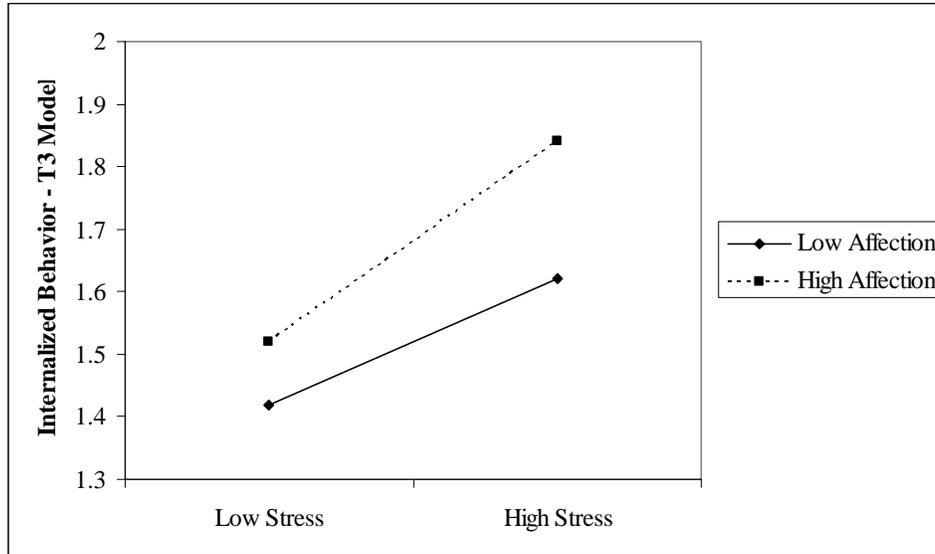Stressful Life Events and Sibling Conflict – Time 1 model

Figure 5. Mean Levels of Internalized Problem Behavior as a Function of

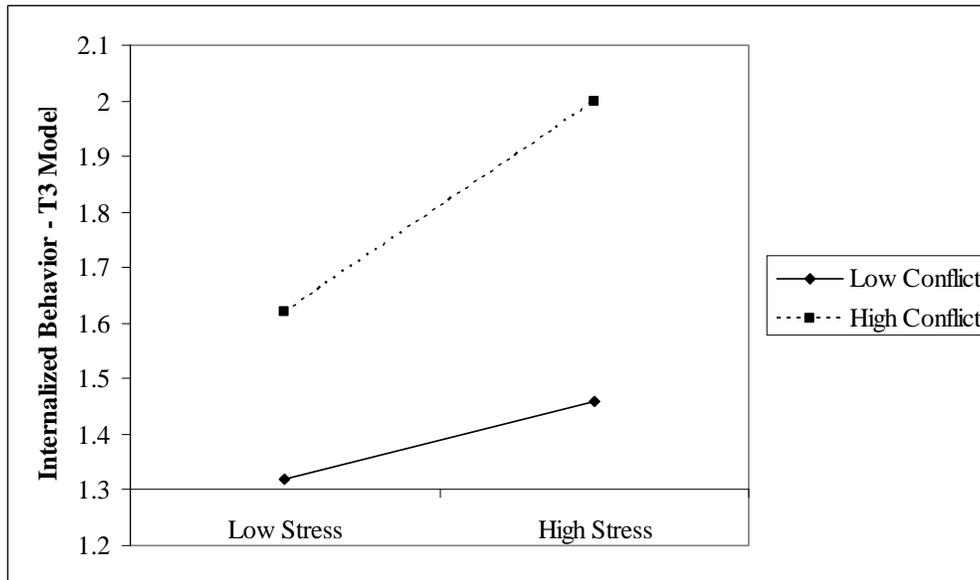Stressful Life Events and Sibling Affection – Time 3 model

Figure 6. Mean Levels of Internalized Problem Behavior as a Function of

Stressful Life Events and Sibling Conflict – Time 3 model

stress the predicted decrease in internalized behavior was buffered or decreased when accompanied with high levels of sibling affection.

Significance testing regarding sibling conflict, found that the slope of the line representing low stress was not significantly different than zero ($t(1,294)= 1.2$, $p>.05$) but the slope of the line representing high stress was significant ($t(1,294)= 4.51$, $p<.05$). For children who experienced low levels of stressful life events, levels of sibling conflict do not help predict internalized behavior; however, for children experiencing high levels of stressful life events, the level of sibling conflict predicts higher levels of internalized behavior. In other words sibling conflict exacerbates the impact of stress on internalized problem behavior, as demonstrated by both Time 1 and Time 3 data.

Predicting Externalized Problem Behavior. The direct effects of stress were only significant in the Time 3 model. The direct effects of the sibling relationship were only significant in the Time 1 model. The interaction between stress and the sibling relationship (affection and conflict) were significant for all models but never significantly contributed to the overall model R^2. The change in externalized problem behavior from Time 1 to Time 3 was also investigated through a paired sample *t*-test. Externalized problem behavior significantly increased from Time 1 to Time 3, ($t(370) = -81.86$, $p<.001$). Because the interaction between stress and the sibling relationship was never significant, no further analysis or discussion will be presented.

Additional Follow-up Analysis to the Longitudinal Models

Several unexpected results were found with the stress variable and the sibling relationship variables in these models. These results lead to the follow-up questions: "Does stress matter in predicting child well being?" and "Do siblings matter in predicting child well being?"

First, additional follow-up analyses were conducted to assess whether stress matters in predicting child well being. Zero-order correlations between stress and three of the outcome variables were significant; however, when additional variables were included in the analysis through regression modeling, stress was no longer significant in the longitudinal models. To test at what point the effect of stress became non-significant, several follow-up regressions were conducted. First, stress was entered into the model before the control variables to see if any of the control variables were mediating the effect of stress. For each outcome variable, the main effects of stress were not significant.

Stress was then entered into the model at Step 1 and the main effects of stress were significant for each outcome variable (except hope). This model represents the zero-order correlations and was expected (see Table 5). Time 1 well being was then added at Step 2 and the main effects of stress were no longer significant, which indicates that Time 1 well being fully mediates the effect of stress on child well being for all outcome variables.

Perhaps the effect of stress was not significant in the hierarchal modeling for this study because this model involved stress at Time 1 and outcome variables at Time 3. Given that Time 1 well being fully mediates the effect of stress on Time 3 well being, follow-up correlations were run between Time 3 stress and the Time 3 well being to test whether the effect of all stress had been accounted for through prior levels of well being. All variables were significantly associated with stress in expected ways, even hope, which was not correlated with Time 1 stress.

Correlations between Time 1 stress and Time 1 levels of the outcome variables and the same variables at Time 3 (see Table 4). Again, all variables were significantly associated with stress in expected ways. These correlations indicate that current levels of stress are more predictive of well being than prior levels of stress and that prior levels of well being are more

predictive of well being than stress at any time point. These results also indicate that cross-sectional analyses of the buffering effect of siblings on stress may be preferred.

The second follow-up question asks whether sibling relationships matter in predicting child well being. In the modeling for this study, sibling conflict was not significant in any of the models, and sibling affection was not significant for internalizing problem behavior and externalizing problem behavior.

To address the question whether siblings matter for child well being, the full model was run for each outcome variable, meaning that all variables were included in one model rather than sequentially added to the model. Stress was never significant in the model for any of the outcome variables. For externalizing problem behavior, internalizing problem behavior and hope the sibling relationship was also not significant. For the prosocial behavior model, affection was significant ($b = .32$, $p<.001$; $R^2 = .21$; $F=3.63$, p<.000). These results indicate that although the sibling relationship is concurrently related to well being, the sibling relationship seems to have little ability to predict future well being, without also assessing the future quality of the sibling relationship.

The final follow-up analysis conducted looked at whether well being predicted the sibling relationship. Given that the sibling relationship seems to have little impact on later well being, perhaps well being impacts the quality of the sibling relationship.

One full regression model was generated for sibling conflict and one for sibling affection. Time 1 well being and Time 1 sibling relationships were regressed on Time 3 sibling relationship, controlling for the same child- and family-centered variables. For sibling conflict, the only significant predictor variable was internalized problem behavior ($b=.13$, $p<.05$; $R^2 = .32$;

F=8.62, *p*<.000). For sibling affection, none of the predictor variables were significant. These

results indicate that well being has little effect on the sibling relationship.

Chapter 5:

Discussion

The goal of the present study was to examine the potentially moderating effect of sibling

relationships on child well being for those children experiencing stressful life events and to

assess whether cross-sectional or longitudinal methods are preferred in addressing this topic. In

the present study, two general hypotheses were investigated to test whether sibling relationships

can buffer or exacerbate the negative effect of stress on well being. Hypothesis 1 (the buffering

hypothesis) tests whether the negative effect of stress on well being increased as sibling affection

increases. Hypothesis 2 (the exacerbating hypothesis) tests whether the negative effect of stress

on well being increased as sibling conflict increases. Hypothesis 3 tests whether the moderating

effect of siblings should be assessed using a cross-sectional or longitudinal methodology. Based

on previous research (see Gass et al., 2007; Soli et al., 2009), I expected to find evidence that

sibling affection decreases the effect of stress on well being, this is described as the sibling

relationship buffering the effect of stress. I also expected to find that sibling conflict increases

the effect of stress on well being; this is described as the sibling relationship exacerbating the

effect of stress.

Buffering or Exacerbating Stress

The direct effect of sibling affection was significant in predicting prosocial behaviors,

hope, internalized problem behavior and externalized problem behavior. The direct effect of

sibling conflict was less well established and was not a significant predictor of well being in

most of the models. This initial finding might indicate that sibling affection is more influential

than sibling conflict, until the results from the interaction variables are assessed. The indirect

effect of the interaction term including sibling affection and stress was a significant predictor of

well being in all models and for all outcome variables. The indirect effect of the interaction term including sibling conflict and stress was also a significant predictor of well being in all models and for all outcome variables. That the interaction terms for sibling conflict were significant while the direct effects often were not indicates that a moderating relationship is at a work.

The moderating relationship that consistently demonstrated the ability to impact well being was sibling conflict and stress. With nearly all outcome variables, higher levels of conflict when paired with higher levels of stressful life events, lead to even lower levels of well being. For example, children experiencing stress who also were experiencing high levels of sibling conflict had significantly lower levels of hope. In other words, sibling conflict exacerbated the negative impact of stress on hope. At the same time, sibling affection showed no impact.

For internalized problem behavior, high levels of sibling conflict again lead to higher levels of internalized problem behavior, or sibling conflict exacerbated the negative impact of stress on internalizing problem behavior. An additionally supportive, although unexpected finding is that sibling affection is also associated with higher levels of internalized problem behavior, meaning for children experiencing stress, affectionate sibling relationships were associated with even higher levels of internalized problem behavior. This finding again provides evidence that the sibling relationship has the ability exacerbate the negative effect of stress. Perhaps one reason why sibling pairs with highly affectionate relationships who are also experiencing stress have higher levels of internalized problem behavior is because the type of interaction during stress, for siblings who are affectionate, leads to more internalized problems. For example, Tucker and Winzeler (2007) found that the extent to which siblings talked to each about extracurricular activities, media and academics was connected to the individual child's perceived competency in those areas. This may occur because siblings who are competent in

these areas seek to share their successes with each other or because siblings who can talk about these areas gain confidence and efficacy in their competence. In either scenario, the content of sibling interactions is associated with everyday activities, meaning what siblings talk about is also what they are doing and how they are spending their time Stocker (1994). By extension, siblings experiencing stress may spend a great deal of time talking about the stressful life events in their lives and may be doing this on a daily basis. These siblings might simply spend more time focused on and discussing the stress in their lives and might mutually discourage each other leading to higher levels of internalized problem behavior.

Although results from the present study do not corroborate findings from Gass et al., they do meet the goals of extending research to include sibling conflict and positive measures of well being in the current literature. This study extends the literature on sibling interaction and well being by including sibling conflict in the analysis in an attempt to determine whether conflict exacerbates the effect of stress and whether sibling conflict uniquely contributes to well being. Prior research has focused on sibling affection (East & Khoo, 2005; Howe et al., 2001) or sibling conflict (Stocker et al., 2002), but few researchers have looked at both affection and conflict simultaneously (see Soli et al., 2009 for one example).

Another goal of the present study was to increase our understanding of the potential effects of sibling relationships on positive measures of well being as potential moderators of stress. These outcome variables include hope and prosocial behavior. Results showed that main effects for stress and sibling conflict were not significant predictors of positive child well being. However, the main effect of sibling affection was significant; as sibling affection increases, positive well being increases. And this association remained even when sibling conflict and the parent-child relationship were considered.

These findings corroborate but extend research from Pike, Coldwell and Dunn (2005) who found that in the presence of sibling negativity, sibling positivity was more important when predicting prosocial behavior. Results from the present study also show that when assessing direct effects (as was done by Pike, Coldwell & Dunn) sibling affection is a better predictor of child well being. However, results from the present study also show that when considering the moderating affect of the sibling relationship, sibling conflict is a much more salient predictor of child well being.

These findings also add to the current literature on the effects of sibling conflict. In past research, the effects of sibling conflict have been associated with higher levels of antisocial behavior (Criss & Shaw, 2005), higher risky sex behavior for adolescence (East & Khoo, 2005), lower self-esteem (Sherman et al., 2006). All of these outcome measures are deficit-based measures of well being. Results from the present study show that sibling conflict is associated with higher levels of deficit-based or negative measures of well being such as internalized problem behavior. Findings also show that sibling conflict is associated with several strengths-based measures of well being such as hope and prosocial behavior. In short, sibling conflict is harmful for children in many ways and even more so when the child is experiencing stress.

Results from the present study also contribute to the literature demonstrating that the sibling relationship does have a unique effect on the child above that of the parent-child relationship (Brody & Sooyeon, 2003), as demonstrated by the significant findings for sibling conflict, even when the parent-child was included in the regression model. Specifically for the present study, this means that a positive parent-child relationship cannot compensate for the negative effect of high levels of sibling conflict.

The mechanism by which sibling conflict exacerbates the effect of stress on child well being can be explained using social learning theory (Bandura, 1977; Soli et al., 2009). According to this theory, children will behave in a manner that is consistent with the type of modeled behavior they see at home and behave in a manner that is reinforced and repeated. Siblings with higher levels of conflict experience more fighting, arguing, and teasing modeled in their sibling relationship and that behavior is reinforced over time. Bullock and Dishion (2002) refer to this as sibling deviance training. Subsequently, those children may fail to act in prosocial ways because they have not had those behaviors modeled and reinforced.

Resilience Theory Revisited

In the longitudinal models, stress was never associated with the dependent variables, and sibling affection was only associated with the positive measures of well being. After follow-up analysis to the regression modeling, results demonstrated that the most important predictor of future well being was not sibling affection, but was a child's prior level of well being. This finding can be explained using resilience theory. Specifically, this finding seems to indicate that some internal, pre-existing state of being accounts for children who do well despite negative or stressful life events, or in other words, accounts for the child's resiliency.

In the resilience literature, there are two lenses used to explain how resilience emerges, 1) resilience as an internal personality trait, and 2) resilience as the result of an external context. Often these different perspectives are used interchangeably in a way that complicates an already ambiguous construct. To address this ambiguity let me reiterate terminology outlined by Luthar, Ciccheti and Becker (2000), who clarified the term "resiliency." They observed that resiliency is an internal personality trait. Operationalized measures of this internal resiliency include self-regulation (Gardner, Dishion, & Connell, 2008) and personal hardiness (Bartone, Roland, James

& Williams, 2008). This first construct that was employed here in an effort to show how sibling relationship quality can lead to more resilience and, in turn effect eventual outcomes. In the present study, the most salient predictor of well being at Time 3 was prior levels of well being, which seems to indicate that some internal resiliency, or prior levels of doing well or doing poorly, are actually accounting for later well being.

One explanation for why prior levels of well being were better predictors of future well being might be an overall decrease in stress over time for our sample. As described above, stress was significantly correlated with well being at all time periods; however, the relationship between early stress and later well being was not significant when considering prior levels of well being using regression modeling approach. However, paired sample t-tests did reveal that overall levels of stress significantly decreased from Time 1 to Time 3 (t(370)=1.56, $p<.000$). Additionally, internalized problem behavior and prosocial behavior also significantly decreased over time but externalized problem behaviors and levels of reported hope significantly increased over the same time period. In other words, child well being seemed to be changing in ways that were not dependent on stress. Again, this points to the idea that there may be other internal resiliency constructs that are accounting for changes in well being over time and that a research methodology which can account for changes in independent and dependent variables over time is preferred, such as multiple time point cross-sectional analysis or growth curve analysis.

One explanation for why the direct effects of stress were often not significant in this study involves measurement error. As with the Gass, Jenkins and Dunn (2007) research, the present study attempted to assess Stressful Life Events as the moderating variable; however the manner in which stressful life events were measured differed substantially. In this study, stressful life events were measured using the Stressful Life Events scale which measures whether stressful

life events occurred (this year, more than a year ago, or never). In contrast, the Gass et al. study did not use the Stressful Life Events scale but rather they measured stressful life events using a semi-structured interview where researchers determined what stressful events occurred but then continued their assessment by asking respondents to rate how unpleasant the event was. Therefore, Gass et al. operationalized stress as a subjective experience, rather than the more quantitative count of stressful events as used here. This measuring technique might have allowed for more detailed, specific assessment of stressful events that actually lead to the felt-experience of stress, but there is no evidence in their research that their measure was any more or less effective than the one used here. Perhaps further measurement research about assessing stressful events in childhood should be conducted.

The importance of the subjective interpretation of stress is described using the ABC-X model of family stress (Hill, 1958; McCubbin & Patterson, 1981). In this model, "A" represents the stressor, "B" represents supports or resources, "C" represents the perception of the stressor, and "X" represents the outcome. The difference between the measurement of stressful life events in the present study compared to the Gass, Jenkins, and Dunn (2007) study lies in the "C" portion of the family stress model. Specifically, the Gass, Jenkins and Dunn research accounts for the individual's child's perception of the severity of the stressor. Whereas, the use of the Stressful Life Events scale in the present study does not allow any consideration of the subjective perception of stress, and is a limitation to this study.

And finally, conceptual issues might account for the differences between results from these two studies. Specially, the present study includes the simultaneous assessment of sibling conflict. Because sibling affection and conflict are not dichotomous (Sherman, Lansford & Volling, 2006), perhaps when both dimensions of the sibling relationship are assessed, the

overall impact of the relationship is altered. In fact, some sibling relationships are associated with high affection and high conflict; while others are associated with low affection and low conflict (McGuire et al., 1996). These different combinations of sibling relationships will elicit different types of sibling experiences. For example, would sibling affection (as measured by Gass et al.) still buffer stress for those siblings who also have high levels of conflict? It seems by not including sibling conflict in the assessment; the entire context of the sibling relationship is not addressed.

Cross-sectional versus Longitudinal Research Design

Results from this study show that when assessing the buffering or exacerbating impact of siblings, cross-sectional data produces better explanatory power than when these constructs are assessed longitudinally. This conclusion is based on both theoretical and empirical evidence. In the literature, researchers seem to demonstrate a bias toward longitudinal data even for research assessing the moderating effects of siblings. Gass, Jenkins and Dunn (2007, p. 168) state that, "the major limitation of the few previous studies assessing the protective nature of sibling relationships lies in their methodology. By using cross-sectional designs, any conclusions made about the direction of causality between the protective factors studied and child adjustment are tentative". While it is true that direct causality cannot be determined using cross-sectional data, longitudinal data that involved measuring sibling relationships at one time point and outcome measures at another point is also problematic. Sibling relationships are dynamic and can change dramatically over even short periods of time. As children age they tend to experience less conflict with their siblings (Kim et al., 2007) and greater warmth (Feinberg, Neiderhiser, Simmens, Reiss, & Hetherington, 2000). Any longitudinal research design that does not account for previous and current measures of the sibling relationship is incomplete. One solution is to run

multiple models using sequential time points (as shown in this study). While this method is preferred to a longitudinal design (also as shown in this study), it is still limited in its ability to show causality and to account for change over time. For example, the cross-sectional and longitudinal models presented in this study show different results for the direct effects of stress on the dependent variables, which indicates that while longitudinal modeling is not sufficient, a single cross-sectional model is also insufficient.

Additional empirical evidence from the present study that supports the use of cross-sectional rather than longitudinal methodology includes the changes in the significance of direct effects between siblings, stress and well being. As shown, several direct effects are not significant longitudinally, but show evidence of a relationship in cross-sectional analyses. Additionally, the difference in significance levels for interaction terms, or the indirect effects of stress and the sibling relationship are more consistent when using cross-sectional data. Another example can be found in the significance of the direct effect of sibling affection on all dependent variables in all models. Sibling affection is significantly associated with all outcome variables at Time 1, but is only associated with two of those variables at Time 3. Here we see that something has changed in the association between siblings and well being over time. Additionally, sibling affection is only associated with two dependent variables in the longitudinal model. These results lead me to conclude that cross-sectional, especially repeat cross-sectional design is preferred to longitudinal study and further, to suggest that future research use more inclusive techniques such as growth curve analysis. Perhaps methods using growth curve and multilevel modeling are better suited for this type of research. Some examples of researchers using these methods to answer similar questions about siblings see East & Khoo (2005) for latent growth curve modeling, or Pomery and colleagues (2005) for structural equation modeling.

Implications for Practice and Intervention

Findings from this study support utilizing the sibling relationship as a context for intervention among children who are at risk of negative outcomes because of the presence of stressful life events. For children who are experiencing stressful life events and sibling conflict, interventions can be targeted at increasing sibling affection. Sibling relationships can change dynamically which can alter the long-term effects of the relationship on the child. For example, Richmond, Stocker & Rienks (2005) found that as sibling relationships improve, the predicted long-term effects of those relationships are also likely to change. The authors reported a decrease in depressive symptoms for participants whose sibling relationships improved (across three time points, spanning 6 years). Findings from the present study support identifying the sibling relationship as key context for intervention, specifically interventions which seek to decrease sibling conflict and increase sibling affection.

Masten (2000) describes two methods of intervening among children who are at risk of negative outcomes. The first she calls "risk-focused strategies." These interventions are targeted at identifying and decreasing the level of risk factors in a child's life. The second method Masten calls "asset-focused strategies." These interventions are focused on increasing the prevalence or potency of available protective factors. Findings from the present study suggest that practical interventions can use a risk-focused strategy by targeting and working to decrease the overall level of sibling conflict in a sibling relationship because evidence is shown here that sibling conflict is a risk factor for child well being. Practitioners could also utilize an asset-focused strategy by targeting and working to increase levels of affection in the sibling relationship as supported by findings that affection is associated with higher levels of prosocial behavior and hope. This is especially the case for children who are experiencing high levels of stress.

Limitations

The primary limitations of this study center on methodological concerns. First, this study is limited by the variables used in analysis of the sibling relationship and stressful life events. The sibling relationship inventory (SRI) was used to assess the sibling relationship primarily due to its prevalence in the sibling literature; however, the nature of the questions in the SRI might not fit well with the conceptual use of the SRI as predictive of the protective nature of siblings. For example, the SRI measures affection by how often siblings share secrets, teach each other, or show physical affection. These items may be good measures of affection, but this type of affection does not conceptually speak to the process or mechanism by which a sibling might actually be protective. Questions that might better assess whether a sibling relationship has the type of affection that is conceptually associated with being protective might include, "*when I am stressed, I talk to my sibling*" or *"When I am in trouble, my sibling helps me."*

The Stressful Life Event scale is limited because it does not include a subjective measure of stress. Rather, this scale simply catalogues the occurrence of stressful life events without addressing whether that event actually led to the subjective experience of stress. For example, the scale asks respondents to report whether a parent has been gone a lot, but for some children, having a parent gone may not actually cause them stress. It may be so common, as with a parent who travels for business, that it does not cause additional stress. Or it may even decrease stress if the presence of that parent is a hardship. Questions that might better access the child's level of stress could ask follow-up questions that rate the level of stress or anxiety this event caused.

Another limitation to the present study is a threat to external validity because the sample used in this study was highly educated and relatively wealthy. Perhaps among this group, sibling affection is more or less important or the processes of sibling interaction are altered. In the

present analysis, family income was controlled and was never significant in analysis, but perhaps a non-tangible family process exists for these highly educated and wealthy families.

Future Research

Future research on the risk and protective nature of sibling relationships should continue to utilize a resilience framework to explain the ability of siblings to protect or exacerbate a child's response to negative life events. Specifically, this means that research should always include the simultaneous assessment of sibling affection and sibling conflict. Research should also include stressful life event measures that include subjective reports of felt-stress in addition to objective counts of the occurrence of stressful life events.

Research should also expand the assessment of sibling affection to include questions that conceptually are related to the process and mechanism by which siblings might protect each other. Researchers should also explore other dimensions of the sibling relationship that might be predictive such as relational aggression (see Crick, Nelson, Morales, Cullertonsen, Casas & Hickman, 2001) and sibling rivalry. Both of these dimensions would lead to the assessment of siblings as risk factors or perhaps that siblings with low levels of these aggressive traits can be protective.

Research should also continue to expand the range of well being outcome variables utilized to include measures of positive well being such as prosocial behavior. Research should also include assessment of both siblings simultaneously, rather than the report of only one sibling. This research could then assess whether effects are congruent for both siblings.

Sibling researchers should continue to analyze the types of stressors that might be moderated by siblings. Research indicates that siblings can moderate the effect of marital discord (Jenkins & Smith, 1990), and peer relations (Pomery, Gibbons, Gerrard, Cleveland, Brody &

Willis, 2005). From the present study we see that siblings can exacerbate the already negative effect of stress. Future research should address the ability of siblings to buffer or exacerbate the effect of academic achievement, body image issues, obesity, learning disability, emotional struggles, having a parent with a mental health condition, poverty, and abuse. Given the early findings that siblings can be protective, researchers have empirical evidence and also theoretical support to investigate these additional factors.

And finally, research on the buffering or exacerbating effect of siblings must include methodologies which can account for current measures of the sibling relationship while including multiple time points of data collection to address the issue of causality. This leads to researchers using a multiple time point, cross-sectional study, as was done here, or more preferred growth curve analysis.

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APPENDIX A: EXPANDED LITERATURE REVIEW

Sibling Research: Method, Scope and Outcomes for Children

by

Alisa Cox Van Langeveld

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Sibling Research: Method, Scope and Outcomes for Children

Sibling relationships are the most enduring of all human relationships. Sometimes referred to as the 'womb to the tomb' relationship, siblings are present in each other's lives for longer than any other relationship. Most children grow up with at least one sibling (Hernandez, 1997). In fact, 80% of families in the United States include children with at least one brother or sister (Sanders, 2004). For most, the sibling relationship begins at or very close to birth and that relationship endures while peers come and go, before marital partners are selected, and after parents have passed away. Most people have a living sibling until the end or very near the end of their lives (Cicirelli, 1982).

Children spend more of their free time with their siblings than they do in any other relationship. Outside of school hours, children spend more time with siblings than they do with parents or even with peers (Larson & Richards, 1994; McHale & Crouter, 1996).

The ever-present nature of the sibling context justifies focused research attention on the nature of this relationship. However, in addition to the mere perpetual presence of siblings, these relationships can make the daily lives of individuals better or worse (Karos, Howe & Aquan-Asee, 2007), can teach us how to enact successful relationships (Abramovitch, Pepler & Corter, 1982) and can direct us on trajectories of future success (Stocker, Burwell & Briggs, 2002) or can direct us toward future hardship (Criss & Shaw, 2005).

The pervasive presence of siblings and the powerful influence they can have in both positive and negative ways, on both daily well being and long-term adjustment, make sibling research a salient, compelling, and crucial feature on the broader social research agenda.

A common perception among social science researchers is that very little research exists about siblings. Research on siblings has not follow a structured, orderly progression over the past several decades as can be seen in other areas of study, but the research is available, even if it is underutilized or unknown. Recently, there has been an increased interest in the clinical, psychoanalytic and popular psychology implications of sibling relationships. Two recently published books, both titled *Sibling Relationships* (Coles, 2006; Sanders, 2004), provide chapters of clinical advice and practical application largely based on theories and assumptions. Books like these demonstrate an interest in the application of sibling clinical work without a corresponding focused concentration on the empirical support regarding sibling relationships. Although much research exists, it is too often unknown or disregarded.

The purpose of this paper is to review current sibling research in an effort to alter the perception that there is a dearth of sibling research. I include a review of key variables, theories, and methodologies and focus this review in answering the following three questions:

1) *What is the scope and range of current sibling research?* Contrary to popular belief, sibling researchers can draw from a long history of research and a broad spectrum of variables. The current scope of sibling research demonstrates the importance of the sibling relationship on well being by assessing several different independent variables including family structure and family processes.

2) *What theories and methods are currently being used in sibling research?* Several grand theories and many mid-range theories are referenced in sibling research literature. Research methodology in sibling research reflects methods used in the larger social science field including data collection methods, sampling, and analysis techniques.

3) *What topics are of particular interest in future research on siblings?* Although sibling research is broad and varied, it is highly underutilized, which gives the common perception that very little research exists. Areas of future research will help to focus the field in unique and progressive ways particularly as researchers use interdisciplinary methods and theories.

SECTION I: SCOPE AND RANGE OF SIBLING RESEARCH

Despite its history, the prevailing perception among many social science researchers is that sibling research is lacking. On the contrary, sibling research has been around for decades, draws on a solid history of research, is current and contemporary, and uses a broad range or explanatory variables. Rather than experiencing a dearth of sibling research, it seems that sibling research is simply not widely known or utilized, regardless of the compelling nature of the sibling relationship.

1.1 Historical Shifts in Sibling Research

Sibling relationships have been studied, researched and theorized for decades (Cicerelli, 1995; Cumming & Schneider, 1961; Frank, 2008; Neisser, 1951; Lamb & Sutton-Smith, 1982; Sutton-Smith & Rosenberg, 1970), and for decades researchers have claimed that siblings are understudied. Although research on siblings may be unseen, there is a rich history of sibling research available.

As with many research topics, early work in the field began with proposed associations and suggested hypotheses that were explained through theory and not through research. The field of sibling research follows this same pattern, with early work largely suggestive and hypothetical in nature and more contemporary work testing, supporting, and rejecting those early hypotheses with empirical evidence.

For example, over 50 years ago, Neisser (1951) suggested that parental time is a competitive resource among siblings that leads to conflict and nearly 45 years later, Bryant and Zick (1996) reported empirical findings which demonstrated how the amount of time a parent spends with each individual child decreases as the number of children increases, and even more recently Price (2008) reported that oldest children receive more time from their parents than younger children even after subsequent children are added to the family. Neisser (1951) also suggested that parental comparisons between siblings were painful and he claimed that it was important parents to be fair and balanced among their children. Decades later, researchers now refer to this dynamic as "differential treatment" and find that differential treatment leads to a variety of emotional and behavioral problems (Reiss, Neiderhiser, Hetherington, & Plomin, 2000). Neisser (1951) also suggested that individual children grow as they imitate their sibling's feelings. This is an explanation of social learning theory that Anderson (1999) used to explain his findings that over a 3-year longitudinal study, younger siblings took on the characteristics of older siblings. This early history of sibling research hypotheses is presented to demonstrate the decade's long history of theorizing and studying that underscores contemporary research on siblings. Meanwhile, current researchers continue to remark that siblings are an understudied population.

Over 30 years ago, Lamb and Sutton-Smith (1982) called for sibling researchers to make three distinct shifts in future research on siblings, and just as Neiss's (1951) early theorizing has been supported empirically, so has Lamb and Sutton-Smith's call for research change been supported empirically. The three shifts are: 1) away from the use of static sibling status variables to more complex use of relationship variables, 2) a broadening of the scope of study to include

sibling relationships across the lifespan, and 3) an increase in the amount of diversity in published sibling research.

Shift One: From Status Variables to Relationship Variables

Status variables are a simple description of the child's position (or status) in the family such as birth order, total number of children in the family, and gender. Among these, birth order garnered the most interest in early research largely because findings indicated that birth order was associated with overall intelligence (Sutten-Smith, & Rosenberg, 1970). Although birth order is still a feature of current study (Karos et al., 2007; Pollet & Nettle, 2007; Price, 2008), its overall impact has been weakly demonstrated (Retherford & Sewell, 1991).

Moving away from these status variables, current research more often addresses the relationship quality of siblings; such as the nature of the sibling affective relationship (McHale, Whiteman, Ji-Yeon, & Crouter, 2007; Sherman, Lansford & Volling, 2006), perceived differential treatment by parents, (Reiss et al., 2000), social learning (Shananhan, Kim, McHale, & Crouter, 2007) and teaching that occurs between siblings (Brody, 2007/08; Cicirelli, 1995).

Shift Two: Using a Lifespan Perspective

Early sibling research focused almost exclusively on children (Neisser, 1951), but after Lamb and Sutton-Smith (1982) called researchers to broaden of the scope of sibling study to include the entire lifespan in 1982, research on siblings has covered the entire human lifespan including: early adolescence (de Leeus, Snoek, van Leeuwe, van Strien & Engels, 2007; Van Der Vorst, Engels, Meeus, Dekovic, & van Leeuwe, 2007), later stages of adolescence (Whiteman, McHale & Crouter, 2007), emerging adults (Myers & Bryant, 2008a; Rauer & Volling, 2007; Sherman et al., 2006), adults (Frank 2008; Sptize & Trent, 2006; Voorpostel & Blieszner, 2008) and mid- to later life adults (Pau-Ching, 2007). Even with this broadening of the field of study,

researchers have not ignored sibling relationships in childhood (Karos et al., 2007; Lamarche, Brendgen, Vitaro, Perusse, & Dionne, 2006) which is still the most prevalent developmental timeframe of study.

Shift Three: Increased Focus on Diversity

Current research on siblings represents a broad range of racial/ethnic, as well as socioeconomic diversity. Specific samples have been studied from Taiwan (Pau-Ching, 2007), the United Kingdom (Gass, Jenkins, & Dunn, 2007), Israel (Elbedour, Bouchard & Yoon-Mi, 1997), Africa (Elbedour et al., 1997), and the Netherlands (Pollet & Nettle, 2007; Voorpostel & Van Der Lippe, 2007). Within the United States, researchers have used targeted samples of Mexican-Americans (East & Khoo, 2005; Hurtado-Ortiz & Gauvain, 2007), African Americans (Brody & Sooyeon, 2003; McHale et al., 2007; Pomery, Gibbons, Gerrard, Cleveland, Brody, & Willis., 2005), and low-income families (Criss & Shaw, 2005; Modry-Mandall, Gamble & Taylor, 2007).

In summary, sibling research has followed the pattern of other social science fields where early theorists presented suggested hypotheses that have subsequently been tested and refined. In the past few decades, the focus of sibling research has shifted to include more relational variables (, a lifespan perspective and more diverse, under studied populations. These shifts address those originally called for by Lamb and Sutton-Smith (1982), but many areas of study still remain, such as shifting to include the larger sibling context (from dyads to triads and beyond) and the impact on siblings of family processes such as violence.

1.2 Importance of Sibling Research: Why Study Siblings?

Why should researchers spend time looking at the sibling relationship? Siblings are involved with and connected to each other in ways that are different from any other relationship.

The nature of that connection varies throughout the life course, with childhood presenting the most impactful timeframe for siblings. Co-residence during childhood accounts for part of that involvement and connection but the *quality* of the sibling relationship remains important throughout the lifespan (Bedford, 1989; Jenkins, 1992; Mikkelson, 2006; Scharf, Shulman, & Avigad-Spitz, 2005).

The familial context of the sibling relationship situates the individual within a presumably stable family network where siblings hold reasonably equivalent roles in the family (as children). This allows for greater freedom to test relational behaviors in the sibling relationships than in many other relationships. A strong hierarchy does exist between older and younger siblings (Bryant, 1982), but that hierarchy is not as rigid as the one experienced between parents and children. This simultaneously egalitarian and hierarchal relationship allows for more direct confrontation and camaraderie (Dunn, 1985).

The sibling relationship is also largely involuntary, meaning siblings cannot "opt out" of the relationships. This allows siblings to behave in more relationally-risky ways without the fear of the relationship ending, as in peer relationships. If an individual is unkind or aggressive toward a peer, that peer can voluntarily chose to end the relationship, but when that same behavior occurs among siblings, the sibling relationship does not end. In fact, siblings are more likely to be able to resume the relationship without reference to the conflict (Katz, Kramer, & Gottman, 1992).

This egalitarian and involuntary nature of the sibling relationship allows it to be uniquely meaningful with regards to both learning and testing interpersonal relationship strategies.

Sibling Relationships across the Lifespan

The nature and quality of the sibling relationships varies across the lifespan. Each sibling dyad experiences unique patterns of closeness and distance, but a few general trends have emerged from the research. The nature of the sibling relationship varies at different stages of development (Orsmond & Seltzer, 2007).

Early sibling relationships are often characterized by volatility between conflict and kindness throughout adolescence until the changes of emerging adulthood shift individuals away from their siblings and toward peers and romantic partners. This distancing continues throughout adulthood as the responsibilities of family become a priority and finally, in later life siblings often experience a positive shift to greater closeness. Each of these developmental timeframes is discussed in more detail below.

Sibling Relationships during Childhood

The sibling relationship is an important part of most children's developmental contexts (Dunn & Slomkowski, 1992) and is a source for play and friendship (Furman & Buhrmester 1985) as well as a context for conflict and a testing ground for interpersonal and communication skills (Herrera & Dunn, 1997). Sibling conflict in childhood is uniquely intense in nature (Katz et al., 1992; Volling, Youngblade & Belskey, 1997). Other relationships would likely end before that level of intensity was reached, but positive interactions are more common than negative ones (Newman, 1994). When siblings treat each other with more equal respect, rather than a strict hierarchy of older and younger status, children tend to be happier (Karos et al., 2007).

Sibling Relationships during Adolescence

Like sibling relationships in childhood, adolescent sibling relationships are also characterized by intense positive *and* negative interactions (McHale & Crouter, 1996). During

adolescence, siblings may become somewhat less involved with their siblings as time with peers increases. The time spend with peers does not completely distance adolescent siblings from each other, rather adolescent siblings are often very similar (Reiss et al., 2000) in positive (Hurtado-Ortiz & Gauvain, 2007) or negative ways (Bullock & Dishion, 2002). During this time, older siblings set a powerful example for younger siblings (de Leeus et al., 2007; Slomkowski, Rende, Novak, Lloyd-Richardson, & Niaura, 2005).

Sibling Relationships during Emerging Adulthood

Siblings continue to be impactful as children move into emerging adulthood (between 18 and 25 years old) (Arnett, 2000). During this time, emerging adults typically move out of their parents home and no longer co-reside with other siblings so the physical presence of siblings decreases (Arnett, Ramos & Jensen, 2001). Emerging adults shift their focus toward peers and romantic relationships (Pulakos, 1989), and typically the emotional presence of siblings decreases (Arnett et al., 2001). Even given these physical and psychological shifts away from siblings, emerging adults do still consider their sibling relationships important (Scharf et al., 2005), even if the nature and quality of the relationships changes. For example, emerging adults use the most verbally aggressive communication (Myers & Goodboy, 2006) and report high levels of violence, even while simultaneously not categorizing their relationships as violent (Kettrey & Emery, 2006).

Sibling Relationships during Adulthood

In general, adult sibling relationships are agreeable (Connidis & Campbell, 1995; Gold, 1990) with some conflict centered around the care of aging parents, the death of a parent, and the settling of a parent's estate (Bedford, 1998; Suitor & Pillemer, 1993). Even in adulthood, siblings

are central in each others lives, often involving frequent contact and positive feelings (Sptize &

Trent, 2006).

Sibling Relationships in Later Life

A positive shift in the quality of sibling relationships and attachment occurs in late life

(Connidis and Campbell, 1995; White, 2001). Although in early life so much of the childhood

sibling relationship is influenced by the physical presence of a sibling, in later life the influence

of the sibling relationship is highly symbolic and emotional in nature, rather than an involved,

face-to-face relationship (Bedford, 1998). Siblings in later life often provide expressive,

emotional support and are seen as a potential reserve for instrumental support (Connidis &

Campbell, 1995), illustrating that siblings remain important to individuals throughout the life

course.

<div align="center">

Concurrent Effects of Sibling Relationships during Childhood

</div>

The impact of sibling relationships includes both daily effects and long-term outcomes.

During childhood, the sibling relationship impacts a child's current sense of well being in both

positive and negative ways. For example, Stocker (1994) found that the sibling relationship

impacts several internal psychological measures both positive (such as self-esteem and

behavioral conduct) and negative (such as loneliness and depressive mood). In other words,

children experiencing low quality sibling relationships are more likely to be lonely and depressed

on a daily basis. Conversely, children who enjoy high quality sibling relationships are more

likely to experience high self-esteem on a daily basis. In this manner, the quality of the sibling

relationship can make the daily lives of children better or worse.

What siblings *do* when they are together also impacts their daily well being. Tucker and

Winzeler (2007) found that the extent to which siblings talked to each about extracurricular

activities, media, and academics was connected to the individual child's perceived competency in those areas. This may occur because siblings who are competent in these areas seek to share their successes with each other or because siblings who can talk about these areas gain confidence and efficacy in their competence. In either scenario, the content of sibling interactions is associated with everyday activities, meaning what siblings talk about is also what they are doing and how they are spending their time.

The sibling relationship can also buffer a child to difficulties present in his or her environment. Affectionate and positive sibling relationships have demonstrated the ability to diminish the negative effects of stress (Gass et al., 2007) and marital conflict (Jenkins & Smith, 1990).

<center>Long-term Effects of Childhood Sibling Relationships</center>

The childhood sibling relationship is also predictive of future outcomes in both positive and negative ways. One way siblings can impact children in a positive way is through the shared experiences of interaction, such as helping behaviors like teaching, caretaking and protecting (Cicirelli, 1995) or by providing experiences with social interaction and problem solving (Aronen, 1999), which can lead to higher levels of social responsibility in the future (Anderson, 1999).

An example of the long-term negative impact of siblings was reported by Stocker, Burwell and Briggs (2002), who found that sibling relationships in middle childhood can predict a child's adjustment in adolescence including a child's anxiety, depressed mood, and delinquent behavior. The long-term negative impact of siblings can also be demonstrated in behavioral outcomes. For example, Pomery and colleagues (2005) found that an older sibling's level of willingness to use substances (alcohol, tobacco, and marijuana) at Time 1 predicted whether his

or her younger sibling would be using any of those substances at Time 2, and the effect of the sibling was stronger than the impact of peers (whether peers were using these substances).

The potential negative effect of the sibling relationships is not merely the case of setting an early trajectory (positive or negative) and following it through development but rather, the sibling relationship can change dynamically, which will alter the long-term effects of the relationship on the child. For example, Richmond, Stocker and Rienks (2005) found that as sibling relationships improve, the predicted long-term effects of those relationships will also change. The authors reported a decrease in depressive symptoms for participants whose sibling relationships improved (across three time points, spanning 6 years). These findings support the dynamic nature of the sibling relationship, wherein as the dyadic relationship changes, the individual well being also changes.

The effects of childhood sibling relationships have also been associated with adult behaviors such as parenting practices (Kramer & Baron, 1995) and personal accomplishments (Bedford, 2000).

The Unique Effect of Siblings on Child Well being

Much research has demonstrated that the parent-child relationship is influential to child adjustment (Amato, 1994; Kochanska, Aksan, Prisco & Adams, 2008) and predictive of later child outcomes (Morrison, Rimm-Kauffman, & Pianta, 2003). This research often utilizes a family systems and ecological framework, whereby children studied in the context of their families, with the context of the parent-child relationship situated within those families. However, given that most families include siblings (Sanders, 2004), the child's context is incomplete if the sibling relationships are not also addressed as a salient feature of the familial context. According to family systems and ecological theory, all dyadic relationships within a

family are enacted in the presence of, and therefore influenced by, other family members (Addison, 1992; Bronfenbrenner, 1990; Segrin, & Flora, 2005). In other words, the parent-child relationship is influenced by the sibling relationship and vice versa. Given the convincing evidence that parents matter, it then becomes important to understand what relationships (like siblings) impact the parent-child relationship and whether each relationship uniquely contributes to child well being.

Because the parent-child relationship and the sibling relationship are both embedded within the family context, it may be difficult to parcel out which feature of that mutually influential context is really associated with positive or negative outcomes. Do siblings really matter or is the relationship just another way to measure the parent-child or family variable? Empirical research has demonstrated a unique effect of the sibling relationship, above and beyond that of the parents (Stocker et al., 2002). For example, Brody and Sooyeon (2003) found that the prediction of an individual child's competence was more accurate when sibling relationships AND parent relationship were assessed. Moser and Jacob (2002) found that sibling behavior is a significant predictor of deviant behavior (even when parenting effects were statistically controlled) and further, that parenting had a separate effect on positive behavior.

In summary, the sibling relationship is pervasive and important to individuals across the lifespan. During childhood, the quality of the sibling relationship can impact the child in both positive and negative ways, both in the present and in the future. However, the sibling relationship is dynamic and as the nature of the relationship changes, so can the nature of the impact of that relationship. The sibling relationship contributes uniquely to child well being above and beyond other features of the family context.

1.3 Key Variables in Research on Siblings in Childhood

Several key variables independent and dependent variables have been used in sibling research. Dependent variables focus primarily on the developmental outcomes of children and include the study of siblings as a moderating variable, buffering the effects of stress on the child. Independent variables include a wide range of family structure and family process variables.

Dependent Variables

Developmental outcomes

Research has consistently shown that sibling relationships can have a marked impact (both positive and negative) on a child's well being in all domains of development. Whiteman, McHale and Crouter (2007) present three processes that explain HOW that influence among siblings occurs. Those processes are 1) modeling (one sibling tries to mimic the behavior of the other), 2) deidentification (siblings deliberately try to be different from each other), and 3) non-reference (personality development without references to the sibling).

In the *physical domain of development,* there is evidence that siblings have moderately similar eating behaviors and that siblings do have an influence on each other's eating behaviors (de Leeuw et al., 2007). Siblings with high levels of warmth are more likely to be similar in smoking behavior patterns (both are smokers or neither are smokers) (Slomkowski et al., 2005). Additionally, one siblings' willingness to use substances (like alcohol or marijuana) shifts over time to match the other's willingness to use substances, even if the siblings willingness does not match earlier in life. For example, if the older sibling drinks, the younger sibling is more likely to drink later on (Van Der Vorst et al., 2007). What this research indicates is that siblings tend to move toward similarity in prevalence of substance use, with siblings both using substances or neither using substances.

In the *cognitive domain of development*, there is evidence that siblings experience benefits in language development because of the natural teaching that occurs between siblings. This benefit is observed in both the older and younger sibling (Brody, 2007/2008). Academic achievement seems to be influenced by siblings, as shown by Hurtado-Ortiz and Gauvain (2007), who find that having an older sibling in college is a good predictor of college attendance for younger siblings. Aggressive older siblings are associated with poor academic performance in younger siblings and greater conduct problems (Bank, Patterson, & Reid, 1996). Research indicates that excessive caregiving demands placed on siblings leads to decreased academic performance and decreased involvement in school activities (Marshall, Garcia-Coli, Marx, McCartney, Keefe, & Ruh, 1997).

In the *social and emotional domain of development*, again there is evidence of both positive and negative outcomes based on the sibling relationships. For example, siblings with more positive relationships have higher self-esteem and decreased loneliness (Sherman et al., 2006) as well as decreased externalizing problem behavior, higher social responsibility, greater cognitive agency, higher self-worth, higher autonomy and higher sociability (Anderson, 1999). Sibling conflict, on the other hand, is associated with increased depression in children, while sibling intimacy is associated with increased peer competence and (for girls) and decreased depression (for both sexes) (Kim, McHale, Crouter, & Osgood, 2007).

Siblings provide unique learning opportunities for each other as caregivers and teachers. Older siblings who are caregivers to their younger siblings demonstrate increased empathy and the ability balance their own self-concerns with the concerns of others (Zukow-Goldring, 1995). Siblings who act as teachers to their younger sibling show an increased ability to explain

concepts, provide feedback, and allow learners control over the task at hand (Azmitia & Hesser, 1993).

Additional evidence that the sibling relationships are not always beneficial comes from research on children in foster care. It is a common child protection policy to place children in foster homes with their siblings. However, recent research has demonstrated that siblings with high behavior problems who were placed with their siblings and then removed from those siblings showed a *decrease* in behavior problems. Conversely children with low behavior problems who were then removed from their siblings showed an increase in behavior problems (Linares, Mimin, Shrout, Brody & Pettit, 2007). These findings indicate that living with a sibling who has behavior problems tends to lead to increased behavior problems in the sibling, but if the problematic sibling is removed, the child then shows a decrease in problems.

Notably missing from the research outcomes is the use of *positive indicators of success.* In general, the research utilizes a deficit model to explain child development with an absence of outcomes indicative of well being. A recent text by Kristen Moore and Laura Lippman (2005) provides a timely review of potential measures of child well being that use a strengths-based perspective, opting to measure success based on the presence of positive behaviors rather than simply the absence of negative ones. Moore and Lippman refer to this strengths-based strategy as the study of flourishing, which includes measures such as hope (Snyder, 2005), prosocial behavior (Scales & Benson, 2005), and school engagement (Fredericks, Blumenfield, Friedel, & Paris, 2005).

Siblings as a Moderating Variable

In addition to the direct influence of the sibling relationship on outcomes, much research shows evidence of the ability of siblings to moderate or buffer the effect of risk in their lives.

Positive sibling relationships have been found to buffer the experience of stressful life events on the child (Gass et al., 2007). They also can buffer the risk of peer victimization (Larmache et al., 2006); can mediate the effects of risks such as living in a single-parent household, sibling teen pregnancy, and being of low-income status (Shanahan, McHale, Crouter, & Osgood, 2008); can buffer the effects of parental or peer smoking (Slomkowski et al., 2005) and can protect children in homes where marital conflict is high (Jenkins & Smith, 1990). Voorpostel and Blieszner (2008) found that the ability of siblings to buffer poor parent-child relationships is also true with adult siblings, and that sibling emotional support is actually higher for those with poor parent-child relationships in adulthood.

In summary, sibling research has demonstrated compelling evidence for both positive and negative effects on children. The nature of those effects is determined by the quality of the relationship, with positive sibling relationships leading to greater child well being both with regards to all domains of developmental outcomes and as a buffer to the negative experiences of risk.

Independent Variables

To fully understand the context in which sibling relationships begin, develop, and adapt, attention should be paid to both family structural factors and the quality of the sibling relational experience (Bryant, 1982). The range of independent variables used in sibling research includes both family structure variables and family process variables. In this section, I will review the current literature with regards to:

1) *Family structure variables* such as half-, step- or full-sibling status, age and age disparity, gender, family size, birth order, only children, and the peer network; and

2) *Family process variables* such as sibling relationship quality, parental differential

treatment, and unique family adaptations to sibling dynamics.

Family Structure and the Sibling Structure Variables

1. Structure of the Sibling Relationship. The structure of the sibling relationship includes

categorical, demographic variables that remain stable throughout the lifespan for the sibling

dyad. The sibling structure refers to the familial relationship of the siblings as either half-, step-

or full-siblings, the gender composition of the sibling dyad, and age differences between siblings.

Half-, step-, or full-sibling status. The quality of the parent-child relationship in

stepfamilies or blended families has been well-researched, but very few researchers have

assessed the quality of the sibling relationship in stepfamilies (Anderson, 1999). Stepfamilies

include three types of sibling relationships: 1) *step-siblings* who are already part of the family

when parents marry, 2) *half-siblings,* where one sibling is already part of the family and only

sibling is born after the parents marry, and 3) *full-siblings* who are both born after the parents

marry and are full, biological siblings. The interesting research questions regarding sibling

structure assess whether the *quality* of the relationship is different among step-, half- and full-

siblings and whether the *outcomes* for children in these different structures are different.

Research on how the quality of the sibling relationship varies among these types. The

common belief may be that half- or step-sibling relationships experience higher levels of

conflict, but the research does not support this belief and actually shows some evidence of the

opposite being true. Some researchers have found that full siblings experience *more conflict* and

negativity when compared to half-siblings (Deater-Deckard, Dunn, & Lussier, 2002) and step-

siblings (Anderson, 1999). Other researchers have found no difference between half- and full-

siblings regarding levels of both positivity and negativity, but that step-siblings exhibit less negativity, less rivalry, and less aggression (Anderson, 1999; Deater-Deckard at al., 2002).

Step- and half-siblings may actually be at an advantage based on the quality of the sibling relationship, but this pattern is not true when assessing outcomes for these children. Step- and half-siblings experience decreased child achievement (Gennitain, 2005) and more school-related behavior problems (Tillman, 2008) even after controlling for demographic and family backgrounds, although the effects are modest.

The disconnect between the positive quality of the sibling relationship and the likely negative outcomes for children who are step or half-siblings cannot be explained by simple demographic variables, which shift the focus to family processes and interactions. One explanation for these findings may be the differential parenting that occurs more dramatically among step-siblings than among full-siblings (O'Conner, Dunn, Jenkins & Rasbash, 2005).

In summary, extant research has demonstrated that half-, step- and full-siblings do experience different patterns in their relationships, with step-siblings appearing more different; particularly by being less engaged (lower conflict and lower warmth). Both step- and half-siblings tend to perform lower academically than full-siblings, which may be accounted for by the effects of differential parenting experienced by those groups.

Age and age disparity. Sibling age issues have been researched using three main variables: 1) the absolute age of the siblings, 2) the age disparity between siblings, and 3) older or younger sibling status.

The absolute age of each member of the sibling dyad will, of course, change over time. Research indicates that as children age, their sibling relationships become more egalitarian and become less intense (Buhrmester & Furman, 1990), warmth increases (Feinberg, McHale,

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Crouter, & Cumsilled, 2003), sibling rivalry decreases (Cicirelli, 1982), and conflict declines (Kim et al., 2006). These changes have been demonstrated as siblings age through the childhood years (Buhrmester & Furman, 1990) as well as aging that occurs in adulthood into later life (Pau-Ching, 2007).

Age disparity between siblings represents the number of years between two siblings, which appears to have little impact on outcomes such as social interaction (Abramovitch, Pepler, & Corter, 1982); however, siblings who are closely spaced have been shown to have higher conflict (Bryant, 1982).

Older and younger sibling status does seem to have an impact on sibling relationships with older siblings seen as having more power (Bryant, 1982). Younger siblings seem to especially benefit (by showing greater socio-emotional problem solving) when they are in sibling relationships characterized by egalitarianism. Although there may be some differential effects for being the older or younger sibling, there is no difference in reports of the quality of the relationship when asking the older or the younger sibling. Whiteman, McHale and Crouter (2007) find no difference between reports of sibling quality and sibling negativity when collecting data from older or younger siblings, both reporting on the same relationship. Therefore, the age of siblings does impact the sibling relationship. As children grow, their sibling relationship becomes less conflictual. Siblings close in age tend to experience more conflict and older siblings seem especially impactful on younger siblings.

Gender composition of the sibling dyad. Research on the effects of gender composition in the sibling dyad is mixed. Some research indicates a modest difference in the quality of the sibling relationship among same gender pairs (Whiteman & Loken, 2006) whereas other research shows no gender difference in the quality of the relationship (de Leeuw et al., 2007; Shanahan et al.,

2008). Research regarding whether gender composition impacts the overall outcome for the individual child indicates no gender effects.

Research on sister-pairs has convincingly demonstrated that sisters typically enjoy more warmth and affection than any other gender composition of siblings, although those differences are often modest (Cicirelli, 1982; Cumming & Schneider, 1961; Kim et al., 2007; Whiteman & Loken, 2006). Even in adulthood, sister pairs experience more frequent contact and exchanges of advice than with other dyads (Spitze & Trent, 2006)

Research on brother-dyads is less convincing. Brothers tend to engage in more conflictual relationships (Whiteman & Loken, 2006) and to demonstrate more sibling rivalry (Karos et al., 2007), although these differences are often modest. Contrary to what the research on childhood indicates, Pau-Ching (2007) recently found that adult dyads of brothers in Taiwan offer more support than sister dyads. This finding likely demonstrates cultural differences in familial obligations into adulthood.

Research on sister-dyads indicates more warmth and research on brother-dyads indicates more conflict; however, mixed-gender dyads are not remarkably different from each other. For example, Kettrey and Emery (2006) asked respondents to select the sibling with whom they experience the most conflict and found that the selection of siblings was fairly even based on gender (meaning similar numbers of males selected brothers or sisters and vice versa). This finding indicates that although some evidence of increased warmth or increased conflict may be evident in group data, sibling relationships of all gender compositions are similarly likely to experience conflict. In fact, much other research has found no gender effects for the quality of the sibling relationship or the perceived experience in the family. Shanahan and colleagues (2008) found no meaningful patterns among the various gender compositions based on the

quality of the relationship. Feinberg, Neiderhiser, Simmens, Reiss, and Hetherington (2000) found that gender does not moderate perceived differential treatment of parents, meaning that having a sister or brother made no difference in how an individual child perceived whether that sibling was treated differently than him- or herself.

There seems to be *some* difference in the quality of the sibling relationship among same-gender pairs; however, no significant differences seem to arise when considering the overall impact of the sibling relationship on the individual. Abramovitch, Pepler, and Corter (1982) found no gender effects on social interaction of the child. Shananhan and colleagues (2008) found no gender effects for depressive symptoms exhibited by the child, even though the quality of the sibling relationship did demonstrate a main effect for depressive symptoms. Van Der Vorst and colleagues (2007) found no differences in the gender of one's sibling and adolescent drinking behavior.

In review, research indicates that sibling gender composition impacts the quality of the sibling relationship only when the dyad includes a matched pair, such as two sisters or two brothers, and mixed-gender pairs are not dramatically different from same-gender pairs with regards to warmth or conflict. Having a brother or sister also does not seem to impact whether one perceives that one's sibling is treated differently by parents. Finally, gender composition of the sibling dyad does not seem to impact the overall outcomes for the individual, even when the sibling relationship does impact those outcomes.

Family size. Family size (which represents the absolute number of sibling relationships experienced by a child) may have an overall impact on the sibling relationship as the total number of siblings changes and the availability of resources changes. The "dilution of resources" theory explains that families have a finite amount of resources available (such as time and

money), and when the total number of individuals who must draw on those resources increases, individual access to those resources decreases. This dilution is true for financial resources, time, physical, and psychological resources (Blake, 1989).

Accordingly, research has demonstrated that individuals in larger families do experience negative effects in many domains of development. Large family size has a negative effect on a child's educational attainment (Blake, 1989; Polit, 1982; Trong, Knodel, Lam & Friedman, 1998) and is associated with lower academic performance in reading, math, and general knowledge (Cox, 2004). Bryant and Zick (1996) found that the amount of time parents spend with each individual child decreases as the number of children increases.

The effects of being from a large family on availability of resources and educational attainment seem to be linear. Sameroff, Seifer, Barocas, Zax, and Greenspan (1987) argue that the effects of being in a large family are experienced only after a certain threshold is achieved. These authors found positive (or no negative effects) for small families and negative effects for large families. Trong and colleagues (1998) also found that negative effects of resource dilution are mostly seen in large families. Scant evidence sets that threshold limit at families with four or more children (Cox, 2004). In contrast to the poor individual outcomes experienced by children from large families, coming from a large family seems to have a positive effect on the sibling relationship. Riggio (2006) found that individuals from larger families recalled more positive interactions with their siblings than did individuals with only one sibling.

Birth order. Birth order was one of the first, most popular variables used in sibling research. First presented in 1931, Alder claimed that a child's ordinal position in the family greatly influences his or her overall development. For decades, researchers focused carefully on birth order as a predictor of child outcomes (to the exclusion of other relational and contextual

variables). This early research demonstrated compelling evidence that being first-born is particularly advantageous to intellectual development (Cumming & Schneider, 1961; Neisser, 1951; Sutton-Smith and Rosenberg, 1970). Later research called into question this association.

For example, Retherford and Sewell (1991) found only a weak association between being first-born and academic performance when controlling for other family variables. It appears that much of the advantage of being first born is moderated by other contextual variables, such as time with parents.

For a time, first-born children have their parents all to themselves, and even after siblings come along, first-borns continue to enjoy more individualized attention from parents (Bryant & Zick, 1996). Price (2008) recently demonstrated that first-born children receive 20-30 more minutes of quality time with parents each day, than second-born children of the same age in different families. First-borns also have more contact with later-born children (Pollet & Nettle, 2007), which may indicate that first-borns benefit from increased social investment from both ends of their family system (parents and younger siblings). Ordinal birth order does not appear to have an impact on the quality of the sibling relationship as reported by Whiteman, McHale and Crouter (2007) who found that first- and second-born children report similar levels of sibling relationship quality and sibling negativity.

Only children. Although sibling relationships appear to be beneficial for development, they are not essential. Children who grow up without siblings demonstrate no negative impact on adult levels of life satisfaction or happiness (Polit, Nuttall & Nuttall, 1980) or on later marriages (Falbo, 1982). Comparatively few children grow up as only children but that proportion is increasing (Newman, 2001). Using data from the Current Population Study, Hernandez (1997) reported that 23% of all children are only children.

Stereotypes for only children often attribute negative characteristics such as selfishness, egotism and unsociability; however, research on only children has failed to support such stereotypes (Mancillas, 2006; Polit et al., 1980). In fact, research does indicate that only children tend to perform better academically (Falbo, 1982; 1990) and attain higher levels of education (Falbo, 1992; Falbo & Polit, 1986). This finding may occur because only children tend to have closer relationships with their parents who apply more pressure toward accomplishment (Falbo & Posten, 1993).

If only children do so well, do siblings matter at all? As demonstrated in this review, we often see the benefits of siblings in social and emotional relationships. Only children may be at a disadvantage for early development of social skills. For example, Kitzmann, Cohen and Lockwood (2002) found that only children tend to be less liked by their elementary school classmates and that they are more likely to be victimized and to be aggressive with their peers. Perhaps conflict management at this young age is underdeveloped among only children compared to children who must practice conflict management with siblings (Mancillas, 2006)

The peer network. The peer context is an important developmental context for children; however, research indicates that the sibling relationship is still more influential on the individual child. In their study of substance use, Pomery and colleagues (2005) found that the siblings' behavioral willingness to use substances was more influential on the individuals' actual use than the peer context. In other words, the sibling relationship could compensate for the peer relationship. Lamarche and colleagues (2006) also found evidence of the superiority of the sibling relationship. They found that siblings can buffer a child to peer victimization more effectively than peers can buffer a child to peer victimization, when the siblings exhibit prosocial behavior with each other. Just as siblings can buffer the negative effect of peers, the reverse is

also true. In low-involved sibling relationships (which are difficult on children) harmonious peer relationships have also been shown to compensate for low-involved siblings (Sherman et al., 2006).

Another reciprocal relationship is found in how children learn to socialize with others. Just as children learn from their siblings how to interact positively with peers (Anderson, 1999), the reverse can also be true, wherein positive peer relationships can teach children how to interact with their siblings. Kramer and Kowal (2005) found positive interactions with peers at age 4 or 5 predicted better interaction with subsequent siblings born after that time. Having low-involved siblings has been shown to be difficult on children; however, harmonious peer relationships have also been shown to compensate for low-involved siblings (Sherman et al., 2006)

Family Process Variables

Family processes are the behavioral manifestations of the family system (Day, Gavazzi, & Acock, 2001). Processes include the interactions, rituals and everyday behaviors of family members and siblings. The family process variables that have received attention in the sibling research include sibling affection, sibling conflict, parental differential treatment, and a few variables that arise due to unique family situations such as disability or violence.

Sibling Relationship Quality. Research on the quality of the sibling relationship centers along two dimensions of affect: levels of warmth/affection and conflict/hostility (Gass et al., 2007; Modry-Mandell, Gamble & Taylor, 2007).

Affection and warmth. The presence of sibling warmth and affection is associated with many benefits for children. Jenkins and Smith (1990) found that even after controlling for child temperament and family processes, sibling warmth and affection made a significant and unique

contribution to child adjustment. The impact of affection on child adjustment is consistently positive across the literature. Positive outcomes include greater emotional understanding and self-disclosure (Howe, Aquan-Assee, Bukowski, Lehoux, & Rinaldi, 2001), less risky sexual behavior, and lower substance use (East & Khoo, 2005) and even a decrease in the negative impact of marital discord (Jenkins & Smith, 1990). A precursor to warmth and affection in sibling relationships may be egalitarianism. Karos, Howe, and Aquan-Asee (2007) found that sibling relationship characterized by equality were associated with increased levels of warmth, affection, mutual esteem, and more frequent daily exchanges with siblings.

Conflict and hostility. Exposure to conflict leads to many negative outcomes in children; this has been demonstrated convincingly in marital conflict research (O'Brien, Bahadur, Gee, Balto, & Erber, 1997). Exposure to conflict between siblings is also associated with negative outcomes; however, in the concurrent presence of warmth, these effects can be moderated (Brody, 2007/2008).

Sibling conflict can begin as early as 18 months (Dunn & Munn, 1986) and center around a variety of topics such as insufficient parental attention, the emotional climate of the family, parental response to conflict, differential treatment by parents, and the characteristics of the siblings (Cicirelli ,1995). From an economist's viewpoint these areas of conflict center around the strain for finite resources of time, money, and attention (Blake, 1998).

Whatever the cause, conflict between siblings is associated with greater antisocial behavior (Criss & Shaw, 2005), higher risky sex behavior for adolescence (East & Khoo, 2005), lower self-esteem, and greater loneliness (Sherman et al., 2006). A precursor to sibling conflict may be found in the larger family context. Criss and Shaw (2005) found that poor mother-child relationships are associated with higher levels of sibling conflict. Stocker and Youngblade

(1999) found that parental hostility mediates the relationship between marital conflict and sibling

relationships, meaning that families experiencing marital conflict are also likely to contain

siblings who experience more hostile relationships, which is exacerbated even more when the

parents are hostile toward the children. Stocker, Ahmed and Stall (1997) found that both

mother's negative emotional expressiveness and marital dissatisfaction are associated with

hostile sibling relationships.

Some research has identified some positive outcomes of sibling conflict in that it

increases social and emotional competence (Bedford & Avioli, 2001). Perhaps a moderate

amount of aggression can define the hierarchy of the sibling subsystem (Bank & Kahn, 1982),

which can prevent future conflicts over power. Early research seems to show that siblings can

benefit from some aggression as long as warmth is also present (Stormshak, Bellanti, &

Bierman, 1996).

A sibling relationship typology. Researchers have developed a few methods of

categorizing siblings based on their relationships. Stewart, Verbrugge, & Beilfuss (1998)

identified four relationship types (i.e., caretaker, buddy, casual, and loyal) when analyzing one

sibling's (a mix of older and younger siblings) perspective of the nature and quality of their

sibling relationship in late adolescence and adulthood. Furman and Buhrmester (1985) identified

four variables by which the sibling relationship could be measured: warmth, conflict, rivalry and

relative power.

More common are relationship groups based on the affective quality of the relationship

(the presence of affection or hostility). Affection and hostility are not dichotomous. While there

seems to be a correlation between the two (as one goes up, the other goes down) (Sherman et al.,

2006), they are not mutually exclusive categories. In fact, some sibling relationships are

associated with high affection and high conflict, whereas while others are associated with low affection and low conflict. By using median splits of reports of warmth and hostility, McGuire, McHale, and Updegraff (1996) identified four sibling relationship types as shown in Table 1. This same grouping has been used by other researchers (Sherman et al., 2006). McHale and colleagues (2007) used an analytical technique to group siblings and found only three groups (positive, negative, and distant). This analysis seems to ignore the "affect-intense" category and may not be preferred. Research on these groupings indicates that siblings in harmonious relationships (high affection and low hostility) enjoy the highest levels of well being (Sherman et al., 2006).

TABLE 1: Sibling groups based on affection and hostility

		Hostility	
		High	Low
Affection	High	Harmonious	Affect-intensive
	Low	Hostile	Disengaged, low-involved, or distant

Parental Differential Treatment and Siblings. Sibling relationships are embedded within a family context and each child's experience in that context is unique. The experience is unique for structural reasons such as the children being of different ages, genders or birth orders, and family process reasons such as different interactions between children and parents. Bryant (1982) found evidence that parents do, in fact, treat children differently from each other; however, current research on different treatment of siblings by parents focuses on the *perception* of difference and not the actual difference in treatment.

Parental differential treatment can be explained using a social constructivist theory which claims that individuals construct or build an understanding of the world around them based on their social interactions (Bengston, Acock, Allen, Dilworth-Anderson, & Klein, 2005). In this manner, the perceived difference between parental treatment becomes the child's understanding of the world, regardless of the actual nature of the differential treatment.

The trend in research on differential parental treatment shows a clear negative effect with a few exceptions. When parental warmth is perceived as different between siblings, children experience negative outcomes such as poor emotional and behavioral functioning (Reiss et al., 2000) and increased depressive symptoms (Shanahan et al., 2008). Maternal behaviors and differences in mother-child interactions among siblings seem to be particularly impactful (Stocker, Dunn & Plomin, 1989).

Children who perceived differential parental control experienced more negative internalizing behavior (girls) and externalizing behavior (older siblings) (Tamrourti-Makkink, Dubas, Gerris, & van Aken, 2004). Some research even indicates that in the presence of differential treatment, siblings might adapt to *protect* each other. Shanahan and colleagues (2008) found that youth who experienced decreases in parental warmth (relative to their sibling) also experienced an increase in sibling warmth. Some differential treatment may be accounted for in blended families. Biologically related parent-child dyads seem to experience both more conflict and more positivity (Henderson & Taylor, 1999) which may explain why half-siblings perceive differential treatment.

Exceptions to the findings of negative effects of differential treatment have been reported by Brody (2007/08) who found that differential treatment is negative only when the parent-child relationship is poor, and Fienberg and Hetheringon (2001) who reported that when the child is

still treated well, even when the other sibling receives more warmth and affection, the association with negative outcomes is weak.

Parental differential treatment is a family process variable that may seem largely uni-directional, originating in the parents behavior and trickling down to the child. Some family process variables take the opposite trajectory, originating in the sibling dyad. Sibling collusion is an example of a family process that originates with siblings and extends out into the larger family context. Sibling collusion is a process by which siblings form coalitions with each other that promote deviance and undermine parenting (Bullock & Dishion, 2007). This type of family process will have an impact on many family relationships such as the sibling relationship, and the parent-child relationship between the parent and both children separately and may lead to some level of parental differential treatment.

Unique family adaptations. Some families confront unique situations that impact family processes and sibling relationships. At least two of these unique adaptations have received attention in the sibling literature: 1) siblings with disabilities or illness and 2) sibling violence.

Siblings with disabilities or illness. The presence of a sibling with a disability is one are in sibling research that is particularly well researched. Research is mixed with some studies indicating there is no impact on the non-disabled sibling and others indicating both positive and negative impacts on the non-disabled sibling. For example, Hastings (2007) found that over a 2 year time period, behavioral problems in the non-disabled sibling were not associated with having a sibling with a disability.

Some researchers have found an overall negative effect of having a sibling with a disability. For example, Sambuco, Brookes and Lah (2008) found that having a sibling with a traumatic brain injury led to residual behavior difficulties and increased risk of poor

psychological outcomes for the non-injured child. More commonly researchers have found evidence of both positive and negative effects of having a sibling with a disability (Mulroy, Robertson, Aiberti, Leonard & Bower, 2008). In the case of having a sibling with a speech impairment, Barr, McLeod and Daniel (2008) found that siblings often become protectors who buffer the disadvantaged sibling. However, these siblings often experienced resentment and decreased parental attention. Loos & Kelly (2006) found that having a sibling with diabetes led to relationship strain, with some siblings and brought the siblings closer together in others. Explanations for these findings tend to focus on the non-disabled child being benefited by increased emotional closeness with the sibling or satisfaction in caretaking, whereas explanations for the negative effects tend to revolve around lack of parental and others' attention.

Autism is a unique example, where the negative effects of having an autistic sibling are not necessarily associated with decreased parental attention but rather with the actual sibling interaction. Orsmond and Seltzer (2007) found that children with an autistic sibling are at heightened risk of social and behavioral adjustment problems, perhaps because of the patterns of interaction learned from their autistic sibling. The authors also found a lack of closeness among adult sibling pairs when one member is autistic.

Most of the research on siblings and disabilities has centered on the effects on the non-disabled child, some research has focused on the effects on the disadvantaged child. For example, in cases of anorexia, the non-anorexic sibling can have an overall positive or negative effect on the child's treatment program and the subsequent efficacy of that treatment, based on the non-anorexic child's attitude toward and involvement with the sibling during this time (Honey, Clarke, Halse, Kohn & Madden, 2006).

To summarize the effects of having a sibling with a disability, we find evidence that having a sibling with a disability has both positive and negative effects on the non-disabled child. Positive effects include increased quality of the sibling relationship wheras negative effects revolve around lack of parental time and attention given to the non-disabled child. Autism is one example that seems to directly and negatively impact the non-effected siblings' adjustment. And some early research indicates that siblings can influence the effectiveness of treatment for siblings with a disability (such as anorexia).

Sibling violence. Violence in sibling relationships is surprisingly prevalent and includes both physical violence (Straus, Gelles & Steinmetz, 1980) and non-physical, verbal aggression (Myers & Bryant, 2008b) and sibling aggression can be observed in children as young as 18 months (Dunn & Munn, 1986). Early research on sibling violence reported that 75.5% of American children between the ages of 3 and 17 who had a sibling at home carried out at least one violent act toward a sibling in the year leading up to the study (Straus, Gelles & Steinmetz, 1980). A more recent study found that 30% of middle school children have experienced frequent bullying by their siblings (Duncan, 1999) and 48% of college students (Hardy, 2001) and over 60% of high school students had been victims of physical aggression by a sibling (Goodwin & Roscoe, 1990). Kettrey and Emery (2006) found that in their study only 17% of respondents were in nonviolent sibling relationships, 25% experienced mild violence, and a surprising 71% experienced severe violence, according to the commonly used Conflict Tactics Scale. The authors also found that violence is most often mutually perpetrated. This research indicates that most sibling violence is not the situation of one sibling bullying another, but rather most sibling violence involves both siblings. Another interesting finding by Kettrey and Emery (2006) is that even given the prevalence of violence, most individual did not categorize their sibling

relationships as violent. This research highlights one of the least studied areas in sibling research. Siblings seem to be one of the last relationships where it is still socially legitimate to perpetuate violence. Additional research is desperately needed in this area.

SECTION II: THEORY AND METHODS IN SIBLING RESEARCH

2.1 Theory in Sibling Research

Theoretical references in sibling research span the fields of sociology, psychology, biology, and human development. Some researchers feel that theorizing in family research has declined, in favor of less-connected, individual, empirical studies (Bengston et al., 2005). The field of sibling research seems to follow this trend. Many are studies published without direct references to a theoretical framework opting instead to use empirical references to support their claims and hypotheses. However, many sibling researchers do make a focused effort to explain how theory guided their work and how their results corroborate or refute stated theory.

Most theoretical referencing in the sibling literature revolves around explanations for *how* siblings impact each other's development and *why* sibling relationships are so close.

To explain *how* siblings impact one another, s*ocial learning theories* are most common. These theories claim that siblings learn from observing each other and then mimicking those observations (Shananhan et al, 2007; Whitman, McHale & Crouter, 2007). *Social comparative theory* is used to explain how children assess their own abilities based on comparisons with their siblings (Feinberg et al., 2000; Shanahan et al., 2008). An extension of social comparative theory explains how children compare their relative value based on differential treatment by parents (Shanahan et al., 2008).

Comparisons between siblings provide the substance for siblings to make changes based on those observations as explained by *Differentiation Theory*, which states that the comparison between similar siblings can lead to conflict and tension. This comparison usually is made by parents but can also include peers, teachers and other adults in the chilren's lives. To avoid this comparison some children seek to differentiate themselves from their siblings, meaning that siblings purposefully seek to be different from one another (Feinberg et al., 2003; Shananhan et al., 2007). This is know as *Sibling Deidentification Theory,* which explains that children develop specific patterns of behavior that allow them to be unique from (or deidentify with) their siblings (Whiteman, McHale, & Crouter, 2007). A *Lifespan Development Perspective* is simply used to explain how the sibling relationship has an impact on the individual across the lifespan, although that influence varies at different stages of development (Orsmond, & Seltzer, 2007).

To explain why sibling relationships are close or not, researchers most commonly use *Attachment Theory,* which describes the pervasive impact of the sibling relationship in terms of the creation of an attachment bond between siblings that has current effects on the individual and also provides a prototype for future relationships (Gass et al., 2007). Cicirelli (1982) used attachment theory explain the enduring nature of sibling relationships. Various *Evolutionary Theories* have been used to explain biological kin attachments as the reason why sibling relationships are close. For example, Pollet and Nettle (2007) used the *Evolutionary Theory of Kin Selection* to explain how older siblings will invest in younger sibs but not vice versa and empirically, in their research they found that older siblings are more likely to initiate contact with younger siblings throughout the lifespan.

Finally, *Social Constructivism* has been used to explain how siblings create an understanding of their sibling relationship in context of their social environment. For example,

Kettrey and Emery (2006) used social constructivism to explain why individuals tend not to label violent acts as violent when they occur in the context of the sibling relationship.

In summary, while much sibling research does not include direct references to theory, many sibling researchers are using systematic and deliberate theory justification and theory testing their research work.

2.2 Research Methods in Sibling Research

Sibling relationships have been studied extensively using a wide variety of research methods, including qualitative and quantitative methods, small and large samples, and using cross-sectional and longitudinal data. To understand the unique nuances and dynamics of sibling relationships, qualitative research that can be generalized to non-studied sibling dyads is needed. To understand patterns of sibling behavior, quantitative research is needed. The field of sibling research includes both of these methods, with a heavy emphasis on quantitative methodology. Additional methodologies include data collection, instrumentation, participant sampling, and analysis techniques.

Data Collection Methods Used in Sibling Research

The most common data collection method in sibling research is quantitative in nature and involves using self-administered, paper-and-pencil questionnaires (Kettrey & Emery, 2006; Pollet & Nettle, 2007; Shananhan et al., 2007). Other data collection techniques include interviews with siblings and parents (Honey et al., 2006; Loos, & Kelly, 2006), daily diaries (Tucker & Winzeler, 2007), or home interviews (Modry-Mandall et al., 2007) A small group of researchers use videotaped discussion tasks to observe relational behavior (Criss & Shaw, 2005; Richmond & Stocker, 2006).

In the field of sibling research, very few researchers have used multi-method approaches that combine both quantitative and qualitative data in the same research report. One exception is Karos, Howe and Aquan-Asee (2007) who report on data collected from interviews, self-report questionnaires, daily diary checklists, and a narrative task. This type of comprehensive data collection is time-intensive and expensive, both of which necessitate a much smaller sample size (*n*=40) than when using other methods. Qualitative data are most often collected from personal interviews, typed transcripts of interviews, or videotapes of interviews and consist almost exclusively of content analysis of the interview dialogue (see Barr, McLeod, & Daniel, 2008; Honey et al., 2006; Myers & Bryant, 2008a).

<center>*Instrumentation in Sibling Research*</center>

The use of questionnaires in sibling research has elicited a small handful of common sibling research instruments. The two most prominent sibling relationship scales found in the extant literature are: 1) the *Sibling Relationship Questionnaire (SRQ)* and 2) the *Sibling Relationship Inventory (SRI)*. A third measure, the *Sibling Inventory of Behavior,* has received much less attention. To measure perceived differential treatment by parents, only one scale occurs with real frequency in the literature: the *Sibling Inventory of Differential Experience (SIDE).* Other researchers have either used less common scales, scales not specifically developed for sibling study, or ad hoc study-specific measures.

The Sibling Relationships Questionnaire (SRQ) was originally developed by Furman & Buhrmester (1985) over 20 years ago and for use with children. The SRQ is a 48-item, self-administered questionnaire which assesses the relationship with the sibling closest in age to the target child along four relationship dimensions: (1) warmth/closeness (e.g, 'How much do you

<center>120</center>

and your sister go places and do things together?'), (2) conflict (e.g, 'How much are you and your sister mean to each other?'), (3) rivalry (e.g, 'How much do you and your sister compete with each other?'), and (4) relative power. In 2002, Moser and Jacob published psychometric analysis on the SRQ and indicated adequate test-rest and internal consistency, reliability and construct validity.

The SRQ has been used widely (see Buhrmester & Furman, 1990; Criss & Shaw, 2005; East & Khoo, 2005; Karos, et al., 2007; Moser & Jacob, 2002; Richmond et al., 2005). An adult version of the questionnaire – *The Adult Sibling Relationships Questionnaire (ASRQ)* was presented by Stocker, Furman, and Lanthier in 1997, and found that adult relationships are characterized by only three of the original SRQ factors: 1) warmth, 2) conflict and 3) rivalry. The last factor, relative power, was not a salient measure. To date, the ASRQ has received little use.

The Sibling Relationship Inventory (SRI) was developed by Stocker and McHale (1992). The SRI is a 20-item scale measuring three factors: 1) affection, 2) hostility, and 3) rivalry by asking how often certain behaviors occur between siblings. The SRI is used with both children and adults and has been used in full and adapted form [see Gass et al., 2007 (only the affection scale), Kim et al., 2007; Verte, Hebbrecht & Roeyers, 2006; Whiteman, McHale & Crouter, 2007 (adapted 5-item negativity scale) and Shanahan et al., 2008 (to assess conflict)].

The Sibling Inventory of Behavior developed by Schaefer and Edgerton (1981) measures behavior and interaction across six domains, 1) rivalry, 2) aggression, 3) embarrassment/ avoidance, 4) teaching/directiveness, 5) empathy, and 6) companionship. This measure has only been modestly used (see Anderson & Rice, 1992; Anderson, 1992), with an increased interest recently (Volling & Blandon, 2005).

The Sibling Inventory of Differential Experience (SIDE) was first developed by Daniels and Plomin (1985) for use with children and is meant to assess whether and how parents treat two siblings differently from each other along two dimensions: 1) control and 2) affection. Other researchers have measured differentiation along of four dimensions: 1) punishment, 2) blame, 3) discipline, and 4) disfavoring (Richmond, Stocker & Rienks, 2005). The *SIDE* has been used widely to understand perceptions of differential treatment by parents (see Fienberg et al., 2000; Pike, Manke, Reiss & Plomin, 2000; Wichers, van Os, Dackaerts, Van Gestel, Derom & Vlietinck, 2001).

Other researchers have typically used less common scales, non-sibling specific scales or study-specific measures. For example, Riggio (2000) presented the *Lifespan Sibling Relationship Scale* which she has continued to use in her own research (Riggio, 2006) but that has received little other use. Whiteman, McHale, and Crouter (2007) use a revised version of an 8-item sibling relationship scale adapted from Blyth, Hill and Thiel (1982) that includes questions such as: 'How much do you go to your brother/sister for advice/support?' This scale has also received little other use.

Some researchers have used scales developed for use with relationships other than siblings, but have applied those instruments to the sibling relationship. For example, Kettrey and Emery (2006) used the *Conflict Tactics Scale (CTS)* among college aged respondents to assess sibling violence. The CTS was developed by Straus (1979; 1990) to measure intrafamily conflict and violence but has almost exclusively been used to assess violence between romantic partners (Straus, 2004) and parents and children (Clement & Chamberland, 2007).

Finally, many researchers have used ad hoc, self-developed lists of measures that are created, administered, and analyzed in their own studies and assessments. Often these self-

development instruments are used because the affective quality of the sibling relationship is not the focus of study, whereas it is the focus of most of the available instruments. For example, Pomery and colleagues (2005) measured behavioral willingness toward substance use and compares sibling reports. In this research, no direct measure of the quality of the sibling relationship was required, so a self-developed measure was a good option. Extant sibling research that does not use a standardized sibling relationship measure often is in this position where the quality of the sibling relationship is not measured but comparisons between siblings are studied.

Sampling in Sibling Research

Studies of siblings have incorporated both large and small samples, using national data sets and longitudinal studies. Sample sizes in sibling research vary dramatically from fewer than 10 (Barr, McLeod & Daniel, 2008) to greater than 8,000 (Pollet & Nettle, 2007, Voorpostel, & Blieszner, 2008). Most samples seem to cluster in the range between 100 – 250 respondents (see Criss & Shaw, 2005; East & Khoo, 2005; Frank, 2008; Kim et al., 2007; Rauer, & Volling, 2007; Richmond, Stocker & Rienks, 2005; Whiteman, McHale, & Crouter, 2007). Several largely qualitative studies involve samples of 40 or fewer (Barr, McLeod, & Daniel, 2008; Karos et al., 2007), whereas several others studies involve very large samples sizes over 1,000 (Pudrovska, 2008; Spitze, & Trent, 2006; Voorpostel, & Blieszner, 2008). As with most social science research, sampling reflects the research question (qualitative or quantitative in nature) and the available resources for data collection.

Longitudinal Datasets Used in Sibling Research

Much research on siblings is still cross-sectional in nature even though a strong preference for longitudinal research has been demonstrated in the literature. Some sibling studies

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come from large national data sets, but most research comes from regional data collection projects, and a small portion of research comes from local, independent studies.

Given the accessibility of national data sets, surprisingly little sibling research is generated from these sources. A few exceptions include research using the National Survey of Families & Households (Spitze & Trent, 2006; White, 2001); the National Survey of Youth (NSY) (Powers, 2001); the National Longitudinal Study of Youth (NLSY-79); (Deary, Paul, & Bates, 2007); and the National Longitudinal Study of Adolescent Health (AddHealth) (Slomkowski et al., 2005; Tillman, 2008).

Most longitudinal research on siblings is generated from regional, longitudinal projects such as the Non-shared Environment in Adolescent Development project (NEAD) with a samples size of N=709 (Feinberg et al., 2000), the Wisconsin Longitudinal Study with a sample size of 4,744 (Pudrovska, 2008), the Avon Brothers and Sisters Study (ABSS) with a sample size of 192 (Gass et al., 2007), the Netherlands Kinship Panel Study with a sample size of 8,161 (Pollet & Nettle, 2007, Voorpostel, & Blieszner, 2008), the Family and Personality Study of 288 families in the Netherlands (Tamrouti-Makkink et al., 2004), the Pittsburg Mother & Child Project (PMCP) with a sample of 421 families (Criss & Shaw, 2005), and the Family & Community Health Study (FACHS) with a sample of 897 (Pomery et al., 2005)

Other longitudinal research on siblings is generated from local, independent data collection efforts such as the work of East & Khoo (2005) whose research includes 3 waves of data over 5 years or de Leeuw and colleagues (2007) whose research includes 2 waves of data colleted in a 1 year time frame.

Extant sibling research has demonstrated a marked preference for longitudinal research on siblings, which comes largely from regional data collection projects, and less often from

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national data sets and independent local studies. Future researchers can benefit from the low-hanging fruit found in large national data sets that remain a largely untapped resource for data on siblings.

Analysis Techniques Used in Sibling Research

Sibling researchers have used a wide range of statistical analysis procedures. As statistical techniques have advanced, so have the analysis and results derived from sibling research. The analysis techniques discussed here are used across social science topics and are not unique to sibling research, but the application of these techniques and prevalence of certain techniques is of interest.

Early sibling research was mostly correlational in nature and could not speak to predictive relationships (Lamb, & Sutton-Smith 1982). More contemporary researchers have used techniques such as multiple analysis of variance models (MANOVA's) to assess the impact of categorical variables on multiple outcome variables in a more predictive manner [see Kettrey & Emery (2006) who assessed gender and level of sibling violence; and Riggio (2006) who assessed effects of sex composition, age difference, current co-residence, birth order and family size on attitudes toward adult siblings]. While this research demonstrates some compelling associations, they findings are still not causal.

To assess associative and causal relationships several different regression methods have been used including: OLS regression (Spitze & Trent, 2006), multiple regression (Criss & Shaw, 2005), multinominal logistic regression (Shananhan et al., 2007; Pollet, & Nettle, 2007), hierarchal regression (Gass et al., 2007; Karos et al., 2007; Richmond et al., 2005), DeFries-Fulker regression (Slomkowski et al., 2005); and independent, forward-selection stepwise regression (Hurtado-Ortiz & Gauvain, 2007).

Structural equation modeling (SEM), a version of regression analysis which allows for the simultaneous assessment of several independent and dependent variables, has also been used [see de Leeuw et al., (2007); East and Khoo, (2005) (latent growth curve modeling); Feinberg et al., (2000); Pomery et al., (2005); and Van Der Vorst et al., (2007)].

Data sets that include responses from multiple family members often use multi-level modeling (MLM), which extends multiple regression to account for responses that are non-independent because of within-family membership. The following researchers have used MLM with research including responses from two siblings and at least one parent: Larmache et al., (2006) in research on twins; O'Conner et al., (2006); Richmond & Stocker, (2006); Shananhan et al., (2008); and Whiteman & Loken, (2006).

Cluster analysis has been used to assess the natural occurrence of sibling typologies (such as sibling relationships identified as harmonious or conflictual). Whiteman and Loken (2006) provide a helpful review of how typologies of sibling dyads are created methodologically. The authors explain three types of sibling grouping:

1) a priori (a predetermined structure set by the researcher) because groups are defined a priori, the typology should be theoretically meaningful and relevant,

2) cluster analysis, which is exploratory in nature, and

3) a mixed model (using maximum likelihood or Bayesian procedures).

In their research, when tested empirically, methods 2 and 3 produced only two groups (harmonious and conflictual) compared to four groups which were theoretically justified and created a priori. A four-class mixed model solution did match near to the a priori options but is preferred only when responses from both siblings are available (Whiteman & Loken, 2006).

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Several researchers have used both the a priori (Sherman, Lansford & Volling, 2006) and cluster analysis method (see (McHale et al., 2007; Shananhan et al., 2007; Whiteman, McHale, & Crouter, 2007). Both methods have demonstrated meaningful and methodologically rigorous results.

SECTION 3: FUTURE RESEARCH

The future direction of sibling research should first seek to expand and explore the existing scope and range of study. This corroborative effort can help shift the common perception that little sibling research exists. This type of repeated exposure can help other researcher recognize the vast scope of sibling research.

Additional areas of future research fall into three main categories: 1) expanded dependent variables, 2) expanded independent and family process variables, and 3) more advanced analysis techniques.

Expanded Dependent Variables

Future research will benefit from a *wider range of dependent variables* utilized in sibling research. Most sibling research looks at the individual's outcome as the dependent variable. A few researchers have shifted the dependent variable to the sibling dyad and asking what factors are associated with high or low quality sibling relationships (Stocker, Ahmad & Stall, 1997). Assessing the precursors or concurrent factors associated with quality sibling relationships can help researchers better understand the internal family processes at work.

Additional focus on positive indicators of success as dependent variables is both timely and informative. Measures of positive development are becoming more common in the literature (Moore & Lippman, 2005) so by including those measures in sibling research, the field stays abreast of new theory and methods in the larger social science field. A more targeted use of

resilience theory and a discussion of how siblings can be a protective factor in the face of risk

will help strengthen the literature on the buffering effects of siblings.

<center>Expanded Independent and Family Process Variables</center>

Future research will also benefit from a *wider range of independent variables*, especially

as they relate to unique family situations. For example, while much research has examined the

effects of domestic violence on children's relationships with mother, with father, the extended

family and peers, almost no research has not looked at the impact on siblings (McGee, 2000;

Sanders, 2004).

Research on the negative effects of being in a large family with many siblings (based on

finite resource theory) can be expanded by acknowledging and assessing how in large families,

sibling resources increase as parental resources decrease. Perhaps the decrease in available time

and attention from parents can be offset by the increased availability of social interaction from

siblings.

Family process variables that are mutually influential are also of particular future

research interest. These variables will acknowledge that the sibling relationship impacts other

family relationships (such as parents) and that parents in turn influence the sibling dyad. Current

research does analyze these two relationships separately. For example, sibling collusion

impacting parents (Bullock & Dishion, 2001), parental differential treatment impacting children

individually (Reiss et al., 2000) and parental differential treatment impacting the sibling dyad

(Shanahan et al., 2008). To date, very little research simultaneously assesses how these family

processes impact each other in bi-directional ways.

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More Advanced Methodology and Analysis Techniques

To better understand the processes at play in the sibling dyad, the unit of analysis ought to shift from the individual to the sub-system, in this case the sibling dyad (Day, Gavazzi, & Acock, 2001). To analyze this sub-system unit of analysis requires multi-informant research, meaning that data ought to be analyzed from both siblings at a minimum. Most sibling research including multi-informant data involves responses from one child and one parent. Some research includes responses from both parents or from both siblings, but no research to date includes data from *more than two* siblings. Many sibling researchers have acknowledged that they sibling dyad does not exist in a vacuum and therefore, these researchers include family-level variables and perhaps parent-reports. Conceptually, sibling researchers have not yet addressed the notion that the sibling dyad does not exist independent of other sibling dyads and considering the compelling evidence that siblings make a difference, future research ought to assess how different siblings can have a different type of impact on each other. This research would include at least three sibling respondents and can provide rich data from which to assess the family processes in a more compete and contextual way. To accommodate this type of multi-informant data collection, statistical analysis techniques such as multi-level modeling must be used and expanded.

CONCLUSION

Current research on siblings is neither sparse nor underdeveloped; however, sibling research is highly underutilized. One reason this might be the case is because of the interdisciplinary nature of the field, including psychologists, developmentalists, economists, family scholars, educators, and clinicians. Because of the interdisciplinary nature of the field of

sibling research, the scope of variables is broad, including dependent variables measuring individual outcomes, moderating variables assessing how siblings help buffer each other to risk and many independent variables which help describe and predict the sibling relationship. Current use of theory and methodology in the field of sibling research parallels work done in other fields through the use of grand, social theories and applicable, broad methodological techniques. Future research on siblings will benefit from a wider range of dependent variables to include the sibling relationship as the dependent variable, a wider range of family process variables such as mutually influential family sub-systems and more advanced methodology techniques which will allow assessment of a larger sibling sub-system and will accommodate multiple data informants. The field of sibling research is well-development but also has many areas for future exploration and represents a prime agenda for research that is underutilized but compelling and meaningful.

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APPENDIX B:

PSYCHOMETRIC TESTING OF STUDY VARIABLES

Additional Psychometric Testing of the Prosocial Behavior Variables

Prosocial behavior is a positive and external measure of child well being, because it measures the presence of an indicator of well being and because prosocial behavior can be observed behaviorally. Prosocial behavior was measured using a modified version of the Inventory of Strengths: Kindness/Generosity and Prosocial Behaviors (Peterson & Seligman, 2004). Respondents rated how much they agreed with nine statements describing themselves using a scale from 1 (*not like me at all*) to 5 (*very much like me*). Higher scores represent more prosocial behavior.

Handling Missing Data – Prosocial Behavior

Descriptive statistics for all nine items in the prosocial behavior scale are presented in Table B1. As shown, missing data represent less than 1% of the total sample size. Typically, replacing 15% or fewer of the subjects' responses with the item-mean will have little, if any, effect on the outcome of the analysis; therefore, missing data were replaced with the mean for that scale item as recommended by Mertler and Vannatta (2005). When missing items were replaced with the mean for that item, there was almost no change to the descriptive statistics for the scale (M=27.70, $M_{(missing\ replaced)}$ = 27.75). To avoid losing respondents from analyses due to pairwise deletion of respondents with missing data and because there is little impact on the scale, missing data were replaced with item-mean and the summed scale used in all further analysis reflects this method.

Justifying the Creation of a Composite, Scale Measure – Prosocial Behavior

Cronbach's alpha reliability statistic was computed for the prosocial scale eliciting an alpha of .84, which was not improved if any individual item were deleted. The dimensionality of the nine-item prosocial behavior scale was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the prosocial scale is unidimensional, meaning there was visual evidence of only one factor. Additionally, only one component had an eigenvalue greater than 1 (eigenvalue for Factor 1 = 4.02) which accounted for 47% of the total variance. Based on the factor analysis, and Cronbach's reliability statistics the prosocial behaviors scale was analyzed as a summed, one-dimensional, composite measure.

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Table B1

Descriptive Statistics for the Prosocial Behavior Scale – Time 2

	Mean	*SD*	*Missing (N)**
1. I help other people I don't know, even if it is not easy for me.	3.10	.94	0
2. I really enjoy doing small favors for people I do not know.	2.85	1.06	1
3. I try to cheer up people who seem sad, even if I do not know them.	2.98	1.15	0
4. I voluntarily help my neighbors.	2.83	1.15	1
5. I help other kids at school (with things like homework, sports or other activities)	3.70	1.06	1
6. I volunteer in programs to help others in need (like food drives or service groups).	2.88	1.22	0
7. I am involved in service at my school (such as student council)	2.09	1.32	4
8. I enjoy being kind to others, even if I do not know them.	3.90	1.03	0
9. I watch out for kids at school, even if I do not know them.	3.42	1.14	0
Prosocial Behavior Measure – summed scale, missing data replaced	27.75	6.65	0

* The number of respondents who did not answer this question.

Additional Psychometric Testing of the Children's Hope Scale (CHS)

Hope is a positive, internal measure of child well being, because it measures the presence of an indicator of well being and reflects an internal psychological state. Hope was measured using the Children's Hope Scale (Snyder, 2005). Respondents rated how often certain statements described them using a scale from 1 (*none of the time*) to 4 (*all of the time*).

Handling Missing Data - Hope

Descriptive statistics for all nine items in the hope scale are presented in Table B2. As shown, there are no missing data for these items.

Justifying the Creation of a Composite, Scale Measure - Hope

Cronbach's alpha reliability statistic was computed for the hope scale eliciting an alpha of .84, which was not improved if any individual item was deleted. The dimensionality of the 9-item hope scale was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the hope scale is not unidimensional and showed evidence of two different factors. Eigenvalues also showed evidence of two components (eigenvalue$_{Factor1}$ =4.15, eigenvalue$_{Factor2}$ = 1.41), which accounted for 56% of the total variance. Based on this initial finding, a second factor analysis was conducted again, using a Varimax rotation procedure and extracting 2 factors. The rotated solution, as shown in Table B3, shows two interpretable factors.

Evidence of these two factors corroborates with the original psyhchometric properties reported by Snyder (2005) who found evidence for two factors which she refers to as "pathways" and "agency." Snyder argues that the construct of hope consists of two sub-components: pathways (desired goals and resources) and agency (motivation and self-regulation). Snyder goes on to explain that both components must be measured and assessed simultaneously in order to fully evaluate the presence or absence of hope. At this recommendation, hope is analyzed as a summed scale, regardless of the presence of the two identifiable factors. Based on the Cronbach's reliability statistics and the theoretical justification scale was analyzed as a summed, one-dimensional, composite measure.

Table B2

Descriptive Statistics for the Children's Hope Scale – Time 2

	Mean	SD	Missing (N)*
1. I always look on the bright side.	3.67	.88	0
2. I can always find the positive in what seems negative to others.	3.54	.94	0
3. Despite challenges, I always remain hopeful about the future.	3.76	.86	0
4. I have a clear picture in my mind about what I want to happen in the future.	3.85	1.13	0
5. If I get a bad grade or evaluation, I focus on the next opportunity, and plan to do better.	3.91	1.00	0
6. I have a plan for what I want to be doing five years from now.	3.51	1.29	0
7. I know that I will succeed with the goals set for myself.	3.88	.90	0
8. I am confident that my way of doing things will work out for the best.	3.82	.91	0
9. If I feel down, I always think about what is good in my life.	3.46	.99	0
10. I expect the best.	3.70	1.03	0
Hope scale – summed, no missing data	37.11	6.34	0

* The number of respondents who did not answer this question.

Table B3

Correlations between the Hope scale items and the Hope factors

	Factors	
Pathways Items	Pathways	Agency
1. I always look on the bright side.	**.71**	.42
2. I can always find the positive in what seems negative to others.	**.62**	.46
4. I have a clear picture in my mind about what I want to happen in the future.	**.65**	-.44
6. I have a plan for what I want to be doing five years from now.	**.58**	-.55
Agency Item		
3. Despite challenges, I always remain hopeful about the future.	.62	**.20**
5. If I get a bad grade or evaluation, I focus on the next opportunity, and plan to do better.	.48	**.01**
7. I know that I will succeed with the goals set for myself.	.69	**-.21**
8. I am confident that my way of doing things will work out for the best.	.59	**-.07**
9. If I feel down, I always think about what is good in my life.	.53	**.20**
10. I expect the best.	.50	**.02**

Additional Psychometric Testing of the Externalized Problem Behavior Variable

Externalized problem behavior is a negative and external measure of child well being: "negative" because delinquency measures the absence of an indicator of well being rather than its presence, and "external" because externalized problem behavior can be observed behaviorally, external to the respondent. Delinquency was measured using the Child Behavior Checklist (CBCL-YSR, Achenbach, Edelbrock & Howell, 1987; Achenbach, 1991). Respondents rated how true statements were in describing themselves from 0 (*not true*) to 2 (*very true or often true*). Higher scores represent more externalized problem behavior.

Handling Missing Data – Externalized Problem Behavior

Descriptive statistics for all nine items in the Child Behavior Checklist are presented in Table B4. As shown, missing data represent less than 1% of the total sample size. Only two items have any missing data. Typically, replacing 15% or fewer of the subjects' responses with the item-mean will have little, if any, effect on the outcome of the analysis; therefore, missing data were replaced with the mean for that scale item as recommended by Mertler and Vannatta (2005). When missing items were replaced with the mean for that item, there was almost no change to the descriptive statistics for the scale (M=10.70, $M_{\text{(missing replaced)}}$ = 10.71). To avoid losing respondents from analyses due to pairwise deletion of respondents with missing data and because there is little impact on the scale, missing data were replaced with item-mean and the summed scale used in all further analysis reflects this method.

Justifying the Creation of a Composite, Scale Measure – Externalized Problem Behavior

Cronbach's alpha reliability statistic was also computed for the delinquency scale eliciting an alpha of .75, which was not improved if any individual item were deleted. The dimensionality of the nine-item delinquency scale was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the delinquency scale is unidimensional meaning there was visual evidence of only one factor. Additionally, only one component had an eigenvalues greater than 1 (eigenvalue for Factor 1 = 3.52) which accounted for 39% of the total variance. Based on the factor analysis, and Cronbach's reliability statistics the delinquency behaviors scale was analyzed as a summed, one-dimensional, composite measure.

Table B4

Descriptive Statistics for the Externalized Problem Behavior Scale – Time 2

	Mean	*SD*	*Missing (N)**
1. I destroy things belonging to others.	.09	.69	0
2. I disobey at school.	.18	.65	1
3. I hang around with kids who get in trouble.	.27	.60	0
4. I use alcohol or drugs.	.02	.31	0
5. I lie or cheat.	.23	.43	1
6. I steal things from places other than home.	.03	.53	0
7. I swear or use dirty language.	.31	.18	0
8. I cut class or skip school.	.04	.44	1
9. I smoke cigarettes or chew tobacco.	.01	.19	0
Delinquency - summed scale, missing data replaced	10.71	2.26	0

* The number of respondents who did not answer this question.

Additional Psychometric Testing of the Internalized Problem Behavior Variable

Internalizing problem behavior is a negative and internal measure of child well being: "negative" because internalizing problems measures the absence of an indicator of well being rather than its presence, and "internal" because internalized problems reflect an internal psychological state. Internalizing problem behaviors was measured at Time 3 using the Child Behavior Checklist (CBCL-YSR, Achenbach, Edelbrock & Howell, 1987; Achenbach, 1991). Respondents rated how often 13 statements were true in describing themselves using a scale from 0 (*not true*) to 2 (*very true or often true*). Higher scores represent more internalized problem behavior.

Handling Missing Data – Internalized Problem Behavior

Descriptive statistics for all 12 items in the Child Behavior Checklist are presented in Table B5. As shown, missing data represent less than 1% of the total sample size; only two items have any missing data. Typically, replacing 15% or fewer of the subjects' responses with the item-mean will have little, if any effect on the outcome of the analysis; therefore, missing data were replaced with the mean for that scale item as recommended by Mertler and Vannatta (2005). When missing items were replaced with the mean for that item, there was almost no change to the descriptive statistics for the scale (M=17.48, $M_{\text{(missing replaced)}}$ = 17.49). To avoid losing respondents from analyses due to pairwise deletion of respondents with missing data and because there is little impact on the scale, missing data were replaced with item-mean and the summed scale used in all further analysis reflects this method.

Justifying the Creation of a Composite, Scale Measure – Internalized Problem Behavior

Cronbach's alpha reliability statistic was computed for the internalized problems scale eliciting an alpha of .85, which was not improved if any individual item were deleted. The dimensionality of the 12-item delinquency scale was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the internalized problem scale was not unidimensional, meaning there was visual evidence of more than one factor. Eigenvalues also showed evidence of three different factors (eigenvalue$_{\text{Factor1}}$ = 4.98, eigenvalue$_{\text{Factor2}}$ = 1.31), which accounted for 48% of the total variance. Based on this initial finding, a second factor analysis was conducted again, using a Varimax rotation procedure and extracting two factors. The rotated solution, as shown in Table B6, shows two interpretable factors.

Factor 1 is identified as items that seem to characterize depression. Factor 2 is identified as items that seem to characterize anxiety. The internalized problem scale does not meet the test criteria for a unidimensioanal scale based on items 1, 2 and 3 above, which would typically lead to the assessment of internalized problem as several subscales. However, the fourth test criteria listed above (the interpretability of the factor solution) is particularly relevant in this situation. Both depression and anxiety are internalized problem behaviors and because the overall goal of incorporating internalized problem behaviors is to analyze an internal, negative measure of well

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being, it is less important to partial out the two factors. In other words, both factors are relevant indicators of internalized problem behavior; therefore, the measure will still be assessed using a summed, composite variable.

Table B5

Descriptive Statistics for the Internalized Problem Behavior Scale – Time 1

	Mean	SD	Missing (N)*
1. I cry a lot.	.58	.63	0
2. I feel lonely.	.43	.63	0
3. I am afraid I might think or do something bad.	.60	.68	0
4. I feel that I have to be perfect.	.53	.69	0
5. I feel that no one loves me.	.16	.43	0
6. I feel that others are out to get me.	.28	.55	0
7. I feel worthless or bad about myself.	.25	.52	0
8. I am nervous or tense.	.58	.60	0
9. I am fearful or anxious.	.48	.61	1
10. I feel guilty.	.47	.63	0
11. I am self-conscious or easily embarrassed.	.68	.69	1
12. I am suspicious.	.50	.65	0
13. I am unhappy, sad, or depressed.	.34	.60	0
Internalized Problem Behavior – Time 1	5.28	4.60	
Internalized Problem Behavior – Time 3	17.54	4.38	

* The number of respondents who did not answer this question.

Table B6

Correlations Between the Internalized Problems items (T3) and the Internalized Factors

	Factors	
	Depression	Anxiety
1. I cry a lot.	**.42**	.35
2. I feel lonely.	**.66**	.28
3. I feel that no one loves me.	**.72**	.13
4. I feel worthless or bad about myself.	**.72**	.22
5. I am unhappy, sad, or depressed.	**.62**	.34
6. I feel that others are out to get me.	**.51**	.27
7. I am afraid I might think or do something bad.	**.49**	.32
8. I feel that I have to be perfect.	**.28**	.18
9. I am nervous or tense.	.20	**.71**
10. I am fearful or anxious.	.23	**.77**
11. I feel guilty.	.32	**.44**
12. I am self-conscious or easily embarrassed.	.26	**.40**
13. I am suspicious.	.19	**.43**

Additional Psychometric Testing of the Stressful Life Events Variable

To better assess the total impact of stress on the child, the stress variable used in this study includes indicators of both chronic and episodic stress and combines them to generate an overall stress level. Stress was measured using the Stressful Life Events Scale (Cohen, Kamarck & Mermelstein, 1983). Stress is measured at Time 2 to prevent confounding that may occur if the sibling relationship is measured at the same time as the sibling relationship (at Time 1). It is important to establish a baseline sibling relationship before the assessment of stress to see if the sibling relationship does alter the effect of the stress. Stress is not measured at Time 3 because doing so would not allow for interpretation of a buffering effect of the sibling relationship, only a coexisting positive or negative relationship. Respondents reported how recently seven stressful life events had occurred using a scale from 1 (*happened this year*) 2 (*has happened but more than a year ago*), or 3 (*happened this year*) (*has never happened*). All items were reverse coded so higher scores indicate higher levels of stress. Descriptive statistics for all seven items in the Stressful Life Events scale are shown in Table B7. Correlations between levels of stress at Times 1, 2 and 3 are also presented in Table B7.

Handling Missing Data – Stressful Life Events

As shown, missing data represent less than 1% of the total sample size. Typically, replacing 15% or fewer of the subjects' responses with the item-mean will have little, if any, effect on the outcome of the analysis; therefore, missing data were replaced with the mean for that scale item as recommended by Mertler and Vannatta (2005). To avoid losing respondents from analyses due to pairwise deletion of respondents with missing data and because there is little impact on the scale, missing data were replaced with item-mean and the summed scale used in all further analysis reflects this method.

Justifying the Creation of a Composite, Scale Measure – Internalized Problem Behavior

Cronbach's alpha reliability statistic was computed for the Stressful Life Events scale eliciting an alpha of .59, which was not improved if any individual item were deleted. The dimensionality of the seven-item stress scale was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the internalized problem scale was not unidimensional, meaning there was visual evidence of more than one factor. Eigenvalues also showed evidence of three different factors (eigenvalue$_{Factor1}$ = 2.64, eigenvalue$_{Factor2}$ = 1.61), which accounted for 47% of the total variance. Based on this initial finding, a second factor analysis was conducted again, using a Varimax rotation procedure and extracting two factors. The rotated solution, as shown in Table B9, shows two interpretable factors.

Factor 1 is identified as items that seem to characterize family stress. Factor 2 is identified as items that refer to legal trouble. The Stressful Life Events scale does not meet the test criteria for a unidimensioanal scale based on items 1, 2 and 3 above, which would typically

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lead to the assessment of stress as two subscales. However, the fourth test criterion listed above (the interpretability of the factor solution) is particularly relevant in this situation. Because the goal of this study is not whether which *types* of stress can be buffered, but rather *can* stress be buffered. In other words, it is more important to simply identify which respondents are experiencing stress rather than the particular type of stress; therefore, the measure will still be assessed using a summed, composite variable.

Table B7
Descriptive Statistics for the Stressful Life Events Scale Items – Time 1

	Mean	SD	Missing (N)[a]	Stress Type[b]
1. Frequent arguments between parents.	1.81	.85	2	Chronic
2. A parent is gone a lot.	2.14	.89	1	Chronic
3. Brother or sister leaving home.	2.57	.76	0	Episodic
4. Parent getting into trouble with law.	2.81	.49	0	Episodic
5. Parent going to jail.	2.92	.34	0	Episodic
6. Brother or sister getting into trouble.	2.14	.91	1	Episodic
7. Frequent arguments between you and your parents.	1.94	.87	0	Chronic

a. The number of respondents who did not answer this question.
b. Chronic stress refers to events that are ongoing. Episodic stress refers to events that occur at a point in time.

Correlations between Stress at Times 1, 2 & 3	Stress Time 1	Stress Time 2	Stress Time 3
1. Stress – Time 1	1.00		
2. Stress – Time 2	.52***	1.00	
3. Stress – Time 3	.52***	..62***	1.00

*** p<.000   ** p<.01   * p<.01

Table B8
Correlations between the Stress items and the Stress Factors

	Factors	
	Family Stress	Legal Stress
1. Frequent arguments between parents.	**.68**	.02
2. A parent is gone a lot.	**.38**	.16
3. Brother or sister leaving home.	**.24**	.14
4. Brother or sister getting into trouble.	**.30**	.13
5. Frequent arguments between you and your parents.	**.61**	-.01
6. Parent getting into trouble with law.	.18	**.67**
7. Parent going to jail.	.06	**.82**

Additional Psychometric Testing of the Sibling Relationship Inventory (SRI)

The sibling relationship was measured at Time 1 using the Sibling Relationship Inventory (SRI) originally created by Stocker and McHale (1992). Several researchers have also used this measure to assess the quality of sibling relationships (Gass, Jenkins, & Dunn, 2007; Verte, Hebbrecht & Roeyers, 2006; Kim, McHale, Osgood, & Crouter, 2006). Respondents rated how often 10 behaviors occur between siblings using a scale from 1 (*never*) to 5 (*always*). Based on results from factor analysis, two subscales were identified – sibling affection and sibling conflict. As needed, items were reverse coded so higher values indicate more conflict or more affection.

Handling Missing Data – Sibling Relationship Inventory

Descriptive statistics for all 11 items in the Sibling Relationships Inventory are presented in Table B9. As shown, missing data represent less than 1% of the total sample size. Typically, replacing 15% or fewer of the subjects' responses with the item-mean will have little, if any, effect on the outcome of the analysis; therefore, missing data were replaced with the mean for that scale item as recommended by Mertler and Vannatta (2005). To avoid losing respondents from analyses due to pairwise deletion of respondents with missing data and because there is little impact on the scale, missing data were replaced with item-mean and the summed scale used in all further analysis reflects this method.

The dimensionality of the 11-item Sibling Relationship Inventory was analyzed using Maximum Likelihood factor analysis. Four criteria were used to determine the number of factors to rotate and to test the dimensionality: (1) the a priori hypothesis that the measure was unidimensional, (2) the scree test, (3) the eigenvalues and (4) the interpretability of the factor solution (Green & Salkind, 2005).

The scree plot demonstrated that the SRI scale is not unidimensional, meaning there was visual evidence of more than one factor. Eigenvalues also showed evidence of three different factors (eigenvalue$_{Factor1}$ = 4.26, eigenvalue$_{Factor2}$ = 2.43), which accounted for 61% of the total variance. Based on this initial finding, a second factor analysis was conducted again, using a Varimax rotation procedure and extracting two factors. The rotated solution, as shown in Table B10, shows two interpretable factors.

Evidence of these two factors corroborates with the original psyhchometric properties reported by Stocker and McHale (1992) who found two factors: affection and conflict. These factors were comprised of the same specific items in our study, as were found in the Stocker and McHale study, which lends support and validation for the use of a revised, simplified version of the original Sibling Relationship Inventory (SRI).

Two separate scales were created by summing the items found for each factor identified during factor analysis. Cronbach's alpha reliability statistics were also computed for both scales. The alpha coefficient was .85 for both the sibling conflict scale and the sibling affection scale.

Table B9

Descriptive Statistics for the Sibling Relationship Scale – Time 1

	Mean	*SD*	*Missing (N)**
Sibling Affection Items			
1. Share secrets with one another.	2.54	1.15	1
2. Help each other or do favors for one another.	3.27	1.01	0
3. Teach each other or help one another figure things out.	3.18	1.17	0
4. Show physical affection – like hugging.	2.65	1.29	0
5. Share toys and other things.	3.21	1.19	0
6. Help one another feel better when one of you is hurt or upset	3.46	1.17	0
Sibling Conflict Items			
7. Start fights or cause trouble for each other.	3.06	1.06	0
8. Feel mad or angry with each other.	3.01	1.00	0
9. Push, hit or hurt each other.	2.40	1.02	1
10. Tease each other or call each other names.	2.68	1.10	1
11. Go into each other's rooms or take things without permission.	2.04	1.16	2
Correlations between Sibling Affection at Times 1, 2 & 3	1	2	3
1. Affection, Time 1	1.00		
2. Affection, Time 2	.63***	1.00	
3. Affection, Time 3	.49***	.64***	1.00
Correlations between Sibling Conflict at Times 1, 2 & 3	1	2	3
1. Conflict, Time 1	1.00		
2. Conflict, Time 2	.63***	1.00	
3. Conflict, Time 3	.54***	.68***	1.00

* The number of respondents who did not answer this question.

Table B10

Correlations between the Sibling items and the Sibling Factors

	Factors	
	Affection	Conflict
1. Share secrets with one another	**.59**	.07
2. Help each other or do favors for one another	**.78**	-.20
3. Teach each other or help one another figure things out	**.82**	-.10
4. Show physical affection to each other – like hugging	**.72**	-.13
5. Share toys and other things with each other	**.77**	-.12
6. Help one another feel better when one of you is hurt or upset	**.78**	-.16
7. Start fights or cause trouble for each other	-.12	**.84**
8. Feel mad or angry with each other	-07	**.80**
9. Push, hit or hurt each other	-.16	**.82**
10. Tease each other or call each other names	-.10	**.83**

Additional Psychometric Testing of the Sibling Age Disparity

Age disparity between siblings was calculated by subtracting the age of the sibling from the age of the respondent; therefore, negative values indicate that the respondent is the younger sibling and positive values indicate that the respondent is the older sibling. The reported impact of age disparity between siblings on a child is mixed in the literature. Some researchers have found little or no impact on outcomes such as siblings' social interaction (Abramovitch, Pepler, & Corter, 1982), whereas others report a slightly however; siblings who are closely spaced do seem to experience higher levels of conflict (Bryant, 1982). Table 11 shows a frequency distribution of the age disparity between siblings.

Table B11

Categorical Age Groups of Sibling Age Disparity

Respondent is younger than sibling	
5 or more years younger	10% (n=40)
3-4 years younger	18% (n=71)
2 years younger	18% (n=68)
1 year or less younger	5% (n=21)
Respondent is older than sibling	
0 years	6% (n=23)
1 year or less older	12% (n=50)
2 years older	12% (n=48)
3-4 years older	21% (n=80)
5 or more years older	9% (n=34)

Additional Psychometric Testing of the Sibling Dyad Gender Composition

In this sample, 22% of the respondents were sister-pairs, 22% were brother-pairs, and 56% were mixed gender pairs. Research on the effects of gender composition in the sibling dyad is mixed. Some research indicates a modest difference in the quality of the sibling relationship among same gender pairs (Whiteman & Loken, 2006) while other research shows no gender difference in the quality of the relationship (de Leeuw et al., 2007; Shanahan et al., 2008).

Research on sister-pairs has convincingly demonstrated that sisters typically enjoy more warmth and affection than any other gender composition of siblings, although those differences are often modest (Cicirelli, 1982; Cumming & Schneider, 1961; Kim et al., 2006; Whiteman & Loken, 2006).

Research on brother-dyads is less convincingly. Brothers tend to engage in more conflictual relationships (Whiteman & Loken, 2006) and to demonstrate more sibling rivalry (Karos, Howe, & Aquan-Asee, 2007), although these differences are often modest.

Research on sister-dyads indicates more warmth and research on brother-dyads indicates more conflict; however, research on mixed-gender dyads are not remarkably different from each other. For example, Kettrey and Emery (2006) asked respondents to select the sibling with whom they experience the most conflict and found that the selection of siblings was fairly even based on gender (meaning similar numbers of males selected brothers or sisters and vice versa). This finding indicates that while, some evidence of increased warmth or increased conflict may be evident in group data, sibling relationships of all gender compositions are similar in their likelihood of experiencing conflict. Other research has found no gender effects for the quality of the sibling relationship or the perceived experience in the family. Shanahan and colleagues (2008) found no meaningful patterns among the various gender compositions based on the quality of the relationship.

There seems to be *some* difference in the quality of the sibling relationship among same-gender pairs, however, no significant differences seem to arise when considering the *effect* of the sibling relationship on the individual outcomes including social interactiveness (Abramovitch, Pepler, & Corter, 1982), depressive symptoms (Shananhan et al., 2008), and delinquency (Scholte et al., 2007).