

# Individual, Family, and Peer Factors Associated With the Quality of Sibling Relationships in Families of Youths With Spina Bifida

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Based on a social-ecological theoretical framework, this study sought to identify key individual (attitude toward spina bifida), family (satisfaction with family functioning), and peer (peer support) factors associated with the quality of sibling relationships in families of youths with spina bifida. A cross-sectional sample of 224 siblings of youths with spina bifida, ages 11-18 years, and parents participated. Siblings completed self-report measures of attitude toward spina bifida, satisfaction with family functioning, peer support, and warmth and conflict in their relationships with brothers and sisters with spina bifida. The parent provided information on spina bifida severity and family demographics. Hierarchical regression analyses supported the overall model in explaining variance in sibling-reported relational warmth (Adjusted  $R^2 = .29$ ) and conflict (Adjusted  $R^2 = .17$ ). Satisfaction with family functioning was the only ecological factor consistently associated with warmth and conflict in the sibling relationship. Findings have clinical implications for pathways to support positive sibling interactions in families of youths with spina bifida.

*Keywords:* sibling relationship, disability, spina bifida, social-ecological theory, family functioning

The sibling relationship is often the most complex and long-term relationship a person will experience (Seltzer, Greenberg, Orsmond, & Lounds, 2005). This special relationship influences self-concept and offers a safe haven to build, test, and shape social skills (Furman & Buhrmester, 1985; Weaver, Coleman, & Ganong, 2003). Despite its widely acknowledged impact on individual development, research on sibling interactions when one member of the dyad has a disability have historically been restricted in scope (Bat-Chava & Martin, 2002), and knowledge of how the sibling without the disability experiences this relationship is especially limited (Hodapp, Glidden, & Kaiser, 2005). The current study contributes to this literature by using a social-ecological theoretical framework to enhance understanding of factors associ-

ated with sibling relational warmth and conflict in the context of a physical disability.

Although sibling interactions are multi-faceted (Furman & Buhrmester, 1985), warmth and conflict in the sibling dyad are of particular interest given the consistent connections to developmental outcomes. Conflict in the sibling relationship has been associated with anxiety, depressed mood, and delinquent behavior (Stocker, Burwell, & Briggs, 2002), while warmth has predicted positive outcomes (Kim, McHale, Crouter, & Osgood, 2007). Research with youths who have a sibling with a disability parallels these findings, as relational conflict heightens risk for poor psychological and behavioral functioning in the unaffected siblings (Verte, Hebbrecht, & Roeyers, 2006), and warmth fosters adaptive outcomes (Fisman et al., 1996; Seltzer, Greenberg, Krauss, Gordon, & Judge, 1997).

Given the important associations between qualities of the sibling relationship and adjustment outcomes, a second, though more limited, body of research has sought to identify risk and protective correlates of relational warmth and conflict when one member of the dyad has a disability. In general, siblings who are close in age (Begun, 1989) and opposite gender (Orsmond & Seltzer, 2000) appear to be at greatest risk for compromised sibling relations. Mixed findings have been shown for an effect of birth order (Begun, 1989; Bat-Chava & Martin, 2002) and severity of disability (Orsmond & Seltzer, in press; Rivers & Stoneman, 2003), and even less is known about the impact of other individual and contextual factors. For example, although *attitude toward disability* has been identified as a correlate of sibling adjustment, with more favorable perspectives about disability impact on the unaffected sibling's life related to more

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Funded in part by the National Institutes of Health Predoctoral Fellowship for Students with Disabilities # F31HD047998-01A1, National Association of Social Workers Foundation Jane B. Aron Doctoral Fellowship, Ambulatory Pediatrics Association Region IV, and the Virginia Organization of Healthcare Social Workers. We thank Grayson Holmbeck, Kathleen Sawin, and Patrick Dattalo for their helpful reviews of this manuscript. We also acknowledge the Spina Bifida Association and families of youths with spina bifida for their support of this research.

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positive outcomes (Bellin, Bentley, & Sawin, in press; Taylor, Fuggle, & Charman, 2001), to our knowledge, it has not been tested in a model of sibling relations. However, it is possible that a negative attitude toward disability heightens risk for relational conflict with the siblings who have a disability. Further, although linkages between *family functioning* and sibling adjustment are regularly noted (Williams et al., 1999, 2002), empirical support for a relationship between family functioning and qualities of the sibling relationship is more limited.

Moreover, despite the prominent role that *peer relationships* may play in the life of developing youths, surprisingly little research has explored whether peer support influences interactions in the sibling dyad when one member has a disability. Yet, research in the United Kingdom found that nearly 70% of youths were teased or bullied because they had a sibling with a disability (Atkinson & Crawford, 1995). It is possible that positive, intimate relationships with peers may influence how siblings engage their brothers and sisters with a disability. Such a position is supported by research in the general sibling population (Kramer & Kowal, 2005). In summary, notable inroads have been made with regard to our understanding of the nature of sibling interactions when one member has a disability. However, few studies have utilized a social-ecological lens to simultaneously examine the impact of individual, family, and peer factors on relationship qualities.

Spina bifida, the second most common congenital birth defect worldwide (Detrait et al., 2005), may present unique stressors and challenges to the sibling relationship. It is caused by the failure of the neural tube to close early in embryonic development (Kinsman, Levey, Ruffing, Stone, & Warren, 2000) and is associated with a wide range of spinal cord and central nervous system deficits resulting in varying levels of paralysis and limited mobility (Sawin, Brei, Buran, & Fastenau, 2002). Other common health problems include: (a) hydrocephalus requiring shunt placement; (b) neurogenic bowel and bladder; (c) changes in the musculoskeletal system often requiring foot, tendon, scoliosis, or tethered cord surgery; and, (d) neuropsychological deficits (Kinsman et al., 2000; Holmbeck, Greenley, Coakley, Greco, & Hagstrom, 2006). This complex condition impacts all aspects of child development and likewise can present a range of psychosocial stressors to the broader family system (Sawin et al., 2003; Vermaes, Janssens, Bosman, & Gerris, 2005). Although Holmbeck, Coakley, et al. (2002), Holmbeck et al. (2006), and others, have made significant contributions to the study of family functioning in this population, there is a paucity of research on sibling interactions, and in particular, limited understanding of factors associated with positive interactions in this unique relationship.

### The Current Study

This study is part of a larger investigation of the psychological and behavioral adjustment of adolescent siblings of youths with spina bifida (Bellin et al., in press). Analysis of data from that study identified warmth and conflict in the sibling relationship as important fac-

tors associated with adjustment outcomes in the siblings without spina bifida. Siblings who reported high levels of warmth in their relationships with brothers or sisters with spina bifida had more adaptive adjustment outcomes. In contrast, relational conflict emerged as a risk factor for poor behavioral functioning. Moreover, qualitative analysis of the data from the larger study indicated that having a brother or sister with a physical disability had a profound psychological impact on the siblings (Bellin, Kovacs, & Sawin, 2008). Participants' stories of their lived experience revealed great emotional complexity in their feelings for their siblings with spina bifida, including jealousy, embarrassment, guilt, protection, and affection. The present study advances the larger program of sibling research by delineating key individual, family, and peer factors associated with the quality of sibling relationships in families of youths with spina bifida.

This research is guided by a social-ecological theoretical framework that conceptualizes the sibling relationship as nested within and interdependent with larger social systems of influence (Bronfenbrenner, 1979). Sibling interactions are viewed as being shaped and molded by individual and contextual factors (Stoneman & Brody, 1993). At the individual level, the cognitive, social, and personality characteristics of members of the dyad have been proposed as key influences (Furman & Lanthier, 1996). The functioning of the broader family environment is also considered to yield a range of effects that help socialize sibling relationships (Stoneman & Brody, 1993). However, over time, the social ecologies of youths may expand to include relationships outside of the family unit, with peer influences particularly important during the adolescent period (Howe, 1993). Consequently, a comprehensive model of sibling relationships takes into account influences found in the immediate and broader social contexts. Although a social-ecological model has long been proposed for use in understanding child and family response and adaptation to disability (Kazak, 1986, 1989), research on sibling interactions has tended to focus separately on the impact of individual, family, or environmental factors.

The model tested in this study examines the combined effects of individual (attitude toward spina bifida), family (satisfaction with family functioning), and peer factors (peer support) on sibling-reported warmth and conflict in their interactions with brothers and sisters with spina bifida. Specifically, it was hypothesized that the overall model inclusive of the individual, family, and peer factors would explain variability in sibling relational warmth and conflict. Moreover, consistent with social ecology theory, it was hypothesized that the individual, family, and peer components of the model would each significantly contribute to the explanation of sibling-reported warmth and conflict in their relationships with the brothers and sisters with spina bifida. Finally, based on the work of Stoneman (2005) and Friedman and colleagues (Friedman, Holmbeck, Jandasek, Zuckerman, & Abad, 2004), a strength-of-association model was tested. Ecological factors more proximal to the sibling relationship (i.e., individual, family) were expected to be

more strongly associated with relational warmth and conflict than distal environmental factors (i.e., peer).

### Method

A convenience sampling strategy was used to recruit a cross-sectional sample of 254 families from the Spina Bifida Association (SBA) and three SB clinic sites.<sup>1</sup> Sibling participant eligibility criteria included the following: (a) between the ages of 11-18 years; (b) English-speaking; (c) had no current major health condition; and, (d) resided in the same household as the brother or sister with SB who was at least 6 months old. Families who failed to meet inclusion criteria ( $N = 7$ ) or were missing the parent ( $N = 8$ ) or adolescent survey ( $N = 15$ ) were excluded. The final sample was comprised of 224 sibling-parent dyads. A power analysis suggested that a minimal sample size of  $N = 103$  was required based on the following parameters: (a) the model contains seven predictors; (b)  $\alpha = .05$ ; (c)  $\beta = .80$ ; and, (d) a medium effect size of  $f$ -square = .15 (Faul, Erdfelder, Lang, & Buchner, 2007).

Sibling participants were primarily Caucasian ( $n = 195$ , 87.1%) and older than the child with spina bifida ( $n = 160$ , 71.4%). A slight majority was female ( $n = 122$ , 54.5%). Sibling participants reported a mean age of 13.81 years ( $SD = 2.30$ ), range 11 - 18 years, and had lived with their brother or sister with spina bifida for an average of 9.79 years ( $SD = 4.17$ ). The participating parent was most often married/partnered ( $n = 197$ , 87.9%) and the biological/adoptive mother of the adolescent ( $n = 188$ , 83.9%). In terms of the child with spina bifida (mean age = 10.93,  $SD = 5.61$ ), the vast majority had a shunt ( $n = 193$ , 86.2%), with an average of 2.20 revisions ( $SD = 5.50$ ) to the shunt. A lumbar level of lesion (LOL) was most frequently reported ( $n = 89$ , 39.7%), followed by a lumbosacral LOL ( $n = 64$ , 28.6%), and thoracic LOL ( $n = 42$ , 18.8%). A slight majority of the parent participants agreed that the sibling with spina bifida had learning difficulties ( $n = 117$ , 52.2%) and nearly half considered their child's spina bifida to be severe in nature ( $n = 109$ , 48.7%).

### Procedure

The study was reviewed and approved by the university Institutional Review Board, the Professional Advisory Board of SBA, and the human subjects protections committees of the participating clinic sites. Interested families responded to flyers or newsletter advertisements circulated through the SBA and clinic sites. Study packets containing two sets of surveys were mailed to the parent of the eligible study participant. Sibling participants completed a 140-question survey that included the standardized instruments described below. The parent completed a one-page survey that included questions about family demographics and spina bifida clinical data. The parent and sibling surveys were assigned a matching, arbitrary number to link the demographic and spina bifida clinical information to the sibling data. The anonymous surveys were returned sepa-

rately to the first author in self-addressed, stamped envelopes. Also included in the study packet was a return postcard that requested the name and mailing address of the parent and participating sibling for the purpose of entering each parent and sibling participant into raffles for a \$100 gift card. Sibling participants also received a \$15 gift card as recognition of her/his time. The postcards were destroyed at the conclusion of the raffle.

### Sibling Self-Report Measures

*Attitude toward spina bifida.* The Child Attitude Toward Illness Scale (CATIS) was developed by Austin and Huberty (1993) to capture feelings about the condition from the perspective of the affected child. The CATIS has solid psychometric properties and has been used with diverse populations (Heimlich, Westbrook, Austin, Cramer, & Devinsky, 2000). Under the guidance of the instrument developer (Austin), the CATIS was revised for use by siblings of youths with spina bifida (13 items; e.g., "How often do you feel that having a brother or sister with spina bifida keeps you from doing things you like to do"). The internal consistency of the CATIS-Sibling ( $\alpha = .86$ ), is comparable to that reported for the original instrument (Austin & Huberty, 1993). Higher scores reflect a more favorable attitude toward spina bifida.

*Satisfaction with family functioning.* The five-item Family APGAR (Austin & Huberty, 1989) provided an assessment of how satisfied the sibling participants were with the nature of family interactions in five domains of family functioning: adaptation, partnership, growth, affection, and resolve (Austin & Huberty, 1989). Higher scores reflect higher levels of satisfaction with family functioning. The measure has established reliability and validity for use with adolescents who have spina bifida (Sawin, Buran, Brei, & Fastenau, 2003). Cronbach's alpha in this sample was .86.

*Peer support.* As an index of peer social support, the sibling participants completed two components of Harter's (1985) Social Support Scale for Children, the six-item Classmate scale and the six-item Close Friend scale. Developed to overcome "the tendency for two-choice questionnaire formats to pull for socially desirable responding," (Harter, 1985, p. 2), respondents must first decide which of two proposed descriptions is most like them (e.g., Some kids have a close friend who they can tell problems to; other kids don't have a close friend who they can tell problems to) and then rate whether the reference is "sort of true for me" or "really true for me." Each item is scored on a scale from 1 to 4, with higher scores reflecting greater perceived support from peers. Internal consistency reliabilities for the Classmate ( $\alpha = .79$ ) and Close Friend ( $\alpha = .89$ ) subscales for the current sample of siblings of youths with spina bifida are slightly higher than those reported by Harter. The reliability of this instrument has also been established in re-

<sup>1</sup> Data were combined due to low participation rate ( $N = 12$ , 5.4%) from clinic sites.

search with siblings of youths with diverse health conditions (Williams et al., 2002).

*Warmth and conflict in the sibling relationship.* The Sibling Relationship Questionnaire-Brief Version (SRQ; Furman & Buhrmester, 1985) was used to assess qualities of the sibling relationship from the perspective of the sibling without spina bifida. Due to reportedly high correlations among the conflict, rivalry, and power factors of the SRQ (Fisman, Wolf, Ellison, & Freeman, 2000), only the warmth and conflict scales were used in this research. The Warmth factor is derived from six two-item subscales (intimacy, companionship, similarity, admiration by sibling, admiration of sibling, and affection) and one three-item subscale (prosocial behavior). Three two-item subscales (quarreling, antagonism, and competition) form the Conflict factor. Youths rate the characteristics of their sibling relationship across a 5-point Likert-type scale (1 = Hardly at all to 5 = Extremely much), with higher scores reflecting higher levels of the concept being measured. Psychometric analyses have revealed adequate internal consistency (coefficients exceed .70) and test-retest reliability ( $r = .71$ ) for the composite scales (Furman & Buhrmester, 1985). The validity of the SRQ has also been supported in research with siblings of individuals with an intellectual disability (Begun, 1989). Strong internal consistency was found for the warmth ( $\alpha = .91$ ) and conflict ( $\alpha = .81$ ) factors in this sample. Consistent with the work of Furman and Buhrmester who proposed that relational warmth and conflict are not simply bipolar constructs, only a moderate association was observed between the warmth and conflict factors in these siblings of youths with spina bifida ( $r = -.31$ ,  $p < .01$ ).

### Parent Measure

*Spina bifida severity.* Spina bifida severity was based on parent-report of lesion level. Although there is some variability reported in the literature for the assessment of severity (Vermaes et al., 2005), lesion level is an accepted proxy given its association with child functioning (Pit-ten Cate, Kennedy, & Stevenson, 2002). Following the work of Hommeyer, Holmbeck, Wills, and Coers (1999), lesion level was coded as follows: sacral = 1, lumbar = 2, thoracic = 3, with lower lesion levels indicating less severity.

### Data Analysis

Scores on the close friend subscale were missing for 15 participants (6.7% of sample). To ascertain whether these data were missing in a nonrandom fashion, a dummy variable (0 = nonmissing, 1 = missing) was constructed and a test of mean differences on sibling warmth and conflict was performed (Tabachnick & Fidell, 2001). As no significant differences on the outcome variables emerged between the groups, regression imputation was used to impute close friend scores for the missing cases, and these cases were retained in the analyses.

Hierarchical regression analyses were performed using SPSS 15.0 to evaluate the contribution of the ecological

factors in explaining sibling relational warmth and conflict. To control for the effects of the clinical (spina bifida severity) and demographic factors (age spacing and dyad gender status), these variables were entered on step one of each model. Next, following a proximal to distal approach to order of entry for the ecological factors forming the model (Friedman et al., 2004; Stoneman, 2005), the individual level factor (attitude toward spina bifida) was entered on step two, the family factor (satisfaction with family functioning) on step three, and the peer factors (classmate support and close friend support) on step four. For each model, the total variance accounted for by the factors (Adjusted  $R^2$ ) and the change in explained variance associated with each step of the model ( $R^2$  change) were evaluated. Finally, confidence intervals around  $R^2$  were constructed to provide additional perspective on the utility of the models (Dattalo, 2008; Smithson, 2003).

## Results

### Descriptive Analyses of Sibling Warmth and Conflict

The sibling participants generally described positive interactions with their brothers and sisters with spina bifida. Mean scores on the warmth factor ranged from 1.53 – 5.0 ( $M = 3.45$ ,  $SD = 0.67$ ), out of a possible range of 1 – 5. The highest scores on sub-scales of the warmth were found for affection ( $M = 4.38$ ,  $SD = 0.74$ ), admiration of sibling with spina bifida ( $M = 3.88$ ,  $SD = 0.91$ ), and admiration by sibling with spina bifida ( $M = 3.71$ ,  $SD = 1.02$ ) (Table 1). However, participants reported less similarity ( $M = 3.00$ ,  $SD = 0.91$ ) and intimacy ( $M = 2.35$ ,  $SD = 1.02$ ) in their relationships with siblings with spina bifida. Low levels of relational conflict in the sibling dyad were also noted (Conflict Factor  $M = 2.41$ ,  $SD = 0.85$ ). Overall, these data suggest that the sibling relationships are fairly positive in nature but have restricted emotional intimacy.

Consistent with prior research, significant bivariate relationships were observed among demographic and clinical factors and sibling relationship qualities. Sibling relational warmth was associated with same gender in the dyad ( $r =$

Table 1  
*Descriptive Statistics of Sibling Relationship Questionnaire Subscales (N = 224)*

	<i>M</i>	<i>SD</i>	$\alpha$
Warmth subscales			
Affection	4.38	0.74	0.77
Admiration of sibling with SB	3.88	0.91	0.81
Admiration by sibling with SB	3.71	1.02	0.86
Companionship	3.54	0.90	0.66
Prosocial behavior	3.33	0.80	0.78
Similarity	3.00	0.88	0.81
Intimacy	2.35	1.10	0.85
Conflict subscales			
Quarreling	2.65	1.07	0.84
Antagonism	2.55	1.08	0.57
Competition	2.02	1.00	0.77

*Note.* Scores on the warmth and conflict factors and sub-scales range from 1 = *Hardly at All* to 5 = *Extremely Much*.

.21,  $p < .05$ ) and less condition severity ( $r = -.14$ ,  $p < .05$ ). Sibling-reported conflict in interactions with brothers and sisters with spina bifida was highest in pairs who were close in age ( $r = -.36$ ,  $p < .05$ ). Consequently, dyad gender status, age-spacing, and spina bifida severity were controlled for in the analyses.

### Sibling Warmth Model

As reported in Table 2, the overall model inclusive of individual, family, and peer factors explained a significant amount of variance in sibling warmth, Adjusted  $R^2 = .29$ , 95% CI = 0.16 to 0.36,  $F(7, 203) = 12.55$ ,  $p < .001$ . Cohen's (1988) benchmarks for  $f^2$ , the effect size measure appropriate to multiple regression, place the warmth model ( $f^2 = .41$ ) in the range of a large effect size (where  $f^2$  of 0.02 = small, 0.15 = medium, and 0.35 = large). The hypothesized relationships between the individual, family, and peer factors and sibling-reported relational warmth were partially supported in this model. As predicted, the addition of the individual level factor on step 2,  $R^2\Delta = .020$ ,  $F(1, 199) = 4.36$ ,  $p = .04$ , and family factor on step 3,  $R^2\Delta = .21$ ,  $F(1, 198) = 61.32$ ,  $p < .001$ , explained a significant amount of variance in sibling warmth. However, the peer factors were nonsignificant,  $R^2\Delta = .00$ ,  $F(2, 196) = .11$ ,  $p = .90$ . To confirm a lack of effect for the peer factors, post-hoc analyses were conducted with the covariates entered on step 1 of the regression model, the peer factors on step 2, and the family factor on step 3. A small effect was observed for the peer factors,  $R^2\Delta = .05$ ,  $F(2, 198) = 5.49$ ,  $p = .01$ . However, findings were consistent with the predicted direction of the strength-of-association model insofar as satisfaction with family functioning (proximal factor) had a stronger association with warmth in the sibling relationship than peer support (distal factor).

In the final model, a main effect was observed for satisfaction with family functioning ( $\beta = .48$ ,  $p < .001$ ), with

higher levels of satisfaction associated with greater sibling warmth. The only demographic factor significant in the final model was dyad gender status, with more warmth reported in dyads comprised of members of the same gender ( $\beta = .22$ ,  $p < .001$ ).

### Sibling Conflict Model

The combined effects of the individual, family, and peer factors (Table 3) accounted for a significant amount of variance in sibling-reported relational conflict with their brothers and sisters with spina bifida, Adjusted  $R^2 = .17$ , 95% CI = .08 to 0.26,  $F(7, 203) = 6.78$ ,  $p < .001$ . A medium effect size was observed for the conflict model ( $f^2 = .20$ ). Paralleling findings from the warmth model, the addition of the individual factor on step 2,  $R^2\Delta = .02$ ,  $F(1, 199) = 4.07$ ,  $p = .045$ , and the family factor on step 3,  $R^2\Delta = .03$ ,  $F(1, 198) = 6.72$ ,  $p = .01$ , were supported but the change in explained variance associated with the addition of the peer factors to the model was non-significant,  $R^2\Delta = .01$ ,  $F(2, 196) = 0.71$ ,  $p = .49$ . The lack of effect for the peer factors was supported in post-hoc analyses such that even when the peer factors were entered on step 2 of the regression model, the change in explained variance associated with the peer factors was non-significant,  $R^2\Delta = .01$ ,  $F(2, 198) = 1.36$ ,  $p = .26$ . These findings again provided evidence for the strength-of-association hypothesis since factors more proximal to the sibling relationship (attitude toward spina bifida and satisfaction with family functioning) were more strongly related to relational conflict than the distal factor (peer support). In the final model, a main effect was again observed for satisfaction with family functioning ( $\beta = -.18$ ,  $p = .02$ ), with less satisfaction associated with greater sibling conflict. Spina bifida severity ( $\beta = -.17$ ,  $p = .01$ ) and age-spacing ( $\beta = -.33$ ,  $p < .001$ ) were also significant, with more conflict reported in less severe cases of SB and in dyads comprised of members closer in age.

Table 2  
Sibling Warmth Model ( $N = 204$ )

	Step 1	Step 2	Step 3	Step 4
Spina bifida severity	-.14*	-.13*	-.08	-.08
Dyad gender status	.21*	.22*	.21*	.21*
Age spacing	.05	.02	.07	.07
Attitude toward spina bifida		.14*	-.05	-.05
Satisfaction with family functioning			.51**	.50**
Classmate support				.03
Close friend support				.01
$R^2$ Change	.08	.02	.23	.00
<i>Df</i>	3, 200	1, 199	1, 198	2, 196
<i>F</i>	4.08*	3.55*	63.74**	0.16
Total $R^2$	.08	.09	.32	.32
Total $R^2$ (Adjusted)	.06	.07	.30	.29
<i>Df</i>	3, 203	4, 203	5, 203	7, 203
<i>F</i>	4.08*	4.02*	15.06**	11.24**

Note. Individual factor = attitude toward spina bifida; family factor = satisfaction with family functioning; peer factors = classmate support, close friend support; coding for dyad: 0 = mixed gender, 1 = same gender; standardized regression coefficients reported in upper half of table.  
\*  $p < .05$ . \*\*  $p < .001$ .

Table 3  
*Sibling Conflict Model (N = 204)*

	Step 1	Step 2	Step 3	Step 4
Spina bifida severity	-.14*	-.14*	-.16*	-.17*
Dyad gender status	.01	-.01	-.01	-.01
Age spacing	-.35**	-.32**	-.34**	-.33**
Attitude toward spina bifida		-.14*	-.08	-.08
Satisfaction with family functioning			-.18*	-.18*
Classmate support				-.07
Close friend support				.09
R <sup>2</sup> Change	.14	.02	.03	.01
Df	3, 200	1, 199	1, 198	2, 196
F	11.25**	4.07*	6.72*	0.71
Total R <sup>2</sup>	.14	.16	.19	.20
Total R <sup>2</sup> (Adjusted)	.13	.15	.17	.17
Df	3, 203	4, 203	5, 203	7, 203
F	11.25**	9.58**	9.23**	6.78**

Note. Individual factor = attitude toward spina bifida; family factor = satisfaction with family functioning; peer factors = classmate support, close friend support; coding for dyad: 0 = mixed gender, 1 = same gender; standardized regression coefficients reported in upper half of table.  
 \*  $p < .05$ . \*\*  $p < .001$ .

## Discussion

With greater numbers of individuals with profound disabilities surviving into middle and late adulthood, and many outliving parents, the sibling relationship is often the longest lasting family tie (Hodapp et al., 2005). Consequently, it is critical that this special relationship is supported and nurtured across the life course. This research advances family science by simultaneously exploring the influences of individual, family, and peer factors on sibling-reported warmth and conflict in their relationships with brothers and sisters with spina bifida. Analyses were conducted to test the hypothesis that the overall model inclusive of these select ecological factors would explain variation in warmth and conflict. Moreover, it was predicted that the ecological factors would each uniquely contribute to the explanation of relational warmth and conflict, with factors more proximal to the sibling relationship (i.e., individual, family) having stronger relationships with warmth and conflict than more distal environmental factors (i.e., peer).

Strong support was found for the combined effects of the individual, family, and peer factors on sibling-reported warmth and conflict in relationships with brothers and sisters with spina bifida. The warmth model yielded a large effect size; the conflict model yielded a medium effect size. However, evidence for the predicted relationships between the individual, family, and peer factors and sibling relational warmth and conflict varied across factors. Attitude toward spina bifida (an individual factor) explained variance in sibling warmth and conflict beyond the clinical and demographic factors, but when the family factor (satisfaction with family functioning) entered the models, the effect of the individual factor was reduced to non-significance. Further, although a small effect of the peer factors on sibling warmth was supported when entered before the family factor, a significant relationship between the peer factors and relational warmth was not maintained in the final model. Moreover, no evidence was found for an association between the

peer factors and relational conflict. Instead, only the family factor (satisfaction with family functioning) had a consistently strong association with sibling relationship qualities. This finding supports the strength of association component of the model insofar as the family context (a proximal factor) was more influential than peer relations (a distal factor) on interactions in the sibling dyad.

Indeed, robust linkages between the functioning of the surrounding family system and warmth and conflict in the sibling dyad were observed in this sample. The adolescent siblings were more likely to report positivity in their relationships with brothers and sisters with spina bifida if they were satisfied with how the family responded to their own personal growth and encouraged shared decision-making and open communication, dimensions of family functioning measured by the Family AGPAR (Austin & Huberty, 1989). In contrast, siblings who held a more negative perception of the family environment reported the greatest conflict in the sibling dyad. Since perceived differences in parental attention and expectations have been identified as sources of poor sibling functioning (Wolf, Fisman, Ellison, & Freeman, 1998), it is not surprising that siblings who experience support for their own growth, have opportunities to freely express themselves, and feel included and valued in the family system are more inclined to engage their brothers and sisters with spina bifida with positivity and affection. Findings of an association between the qualities of sibling interactions and those found in the broader family environment are consistent with positions articulated by researchers investigating these relationships in the general sibling population (Furman & Buhrmester, 1985) and in populations with disabilities (Stoneman, 2001). The effects of the demographic and clinical factors on interactions in the sibling dyad are also noteworthy. Observed associations between (a) dyad gender status and relational warmth and (b) age-spacing and relational conflict corroborate findings from research with dyads comprised of typically developing sib-

lings. The pioneer work of Furman and Buhrmester (1985), for example, likewise found sibling warmth to be highest in dyads comprised of members of the same gender. Siblings who are similar in gender may be more inclined to share interests and activities, which, they surmised, promote intimacy and closeness in the sibling relationship. In contrast, the greatest risk for conflict in this sample was observed in dyads comprised of members who are close in age. This observation again parallels research with typically developing sibling pairs in which greater antagonism and stress were more common in siblings closely spaced in age who may be competing for parental attention and family resources (Furman & Buhrmester, 1985).

The influence of spina bifida severity on sibling interactions offers a particularly intriguing observation. In these data, an inverse relationship between spina bifida severity and sibling conflict was found. As previously articulated by Begun (1989), a functional-based interpretation of sibling relationships involving a disability appears indicated. In more severe cases of spina bifida, often characterized by profound learning disabilities or limited physical mobility, there may be less capacity for sibling engagement, and consequently, less competition and quarreling. Conversely, when the functional impairment is limited, siblings are perhaps more likely to engage in the full range of normative interactions, including competitive or antagonistic exchanges.

#### *Methodological Considerations and Future Directions*

As each child may experience the sibling relationship in a different manner (Furman, 1993), the lack of information on how the sibling with spina bifida perceives this relationship is a notable limitation of this study. To better understand pathways to support positive sibling relations in the context of spina bifida, future research would benefit from including both members of the sibling dyad. Also, given the significant but modest amount of variability in sibling warmth and conflict accounted for by the model, it would also be important to consider alternative facets of sibling life that could impact sibling relations, including other family characteristics such as parenting style (Stoneman & Brody, 1993), maternal mood (Williams et al., 2002), and condition knowledge (McHale, Sloan, & Simeonsson, 1986).

Several methodological limitations are also noteworthy. The sample of convenience limits the generalizability of study findings to the broader study population. Sibling participants were primarily from families associated with the SBA ([www.sbaa.org](http://www.sbaa.org)). While it is possible that these families differ in key characteristics from those who are not involved in SBA, participants' demographics are consistent with previous research with this population (Holmbeck, Coakley, et al., 2002; Sawin et al., 2003). Another methodological concern pertains to reliance on sibling self-report measures which were used for both the independent and dependent variables. Consequently, it is possible that common source and method variance underlie the significant

findings (Holmbeck, Li, Shurman, Friedman, & Millstein, 2002).

Additionally, the cross-sectional nature of the data limit statements about the directionality of relationships observed among the ecological factors and sibling warmth and conflict (Holmbeck et al., 2006). It is reasonable to speculate that some observed relationships are bidirectional in nature. For example, a protective influence of satisfaction with family functioning was found on the quality of sibling interactions, but it is also possible that the patterns of sibling engagement may likewise have an effect on how the sibling perceives the family context. Stoneman (2001), in particular, emphasized how relationships within the family mutually influence each other. Ultimately, longitudinal research is needed to both unpack the nature of interrelationships among these factors and to address gaps in understanding about age-related changes in this relationship (Hodapp et al., 2005; Seltzer et al., 2005).

Despite these acknowledged limitations, the present study advances family science by simultaneously exploring the impact of individual, family, and peer factors on sibling interactions in families of youths with spina bifida. The association between overall functioning of the family system and the quality of interactions in the sibling dyad was especially pronounced, a finding that underscores the value of providing family-centered clinical services whereby a holistic assessment of youths with spina bifida includes an evaluation of family dynamics from multiple perspectives. These data suggest that inclusion of the sibling perspective on family functioning is essential to support positive interactions in the sibling dyad. However, continued exploration of risk and protective influences on the sibling relationship from the perspective of both members of the dyad is needed to enhance our understanding of pathways to support resilience in this unique relationship.

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Received February 12, 2008

Revision received October 2, 2008

Accepted October 3, 2008 ■

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