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ORIGINAL ARTICLE

Childhood Sibling Aggression and Emotional Difficulties and Aggressive Behavior in Adulthood

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Abstract Preliminary evidence indicates that childhood sibling aggression, the most common form of family violence, might be associated with aggression and emotional difficulties in adulthood. Three hundred twenty-two adult participants, recruited from various sources, completed an online survey retrospectively examining this relationship further. Levels of childhood sibling aggression perpetration and victimization were highly correlated, precluding separate analyses. Significant associations between childhood sibling aggression and adult emotional difficulties and aggression were found, even after controlling for exposure to other forms of family violence and other demographic variables. Neither gender nor reported sibling relationship moderated the childhood sibling aggression and adult difficulties effects. These findings, while mostly exploratory, suggest that greater attention should be paid to childhood sibling aggression.

Keywords Sibling aggression · Aggressive behavior · Family violence

Family violence is a major social concern and has received growing attention in both research literature and the media. Domestic violence, child abuse, elder maltreatment, and childhood exposure to domestic violence have all been the focus of public health and research efforts in recent years (Baker 2007; Carlson 1984; Evanson 2006; Hughes 1997; McDonald and Jouriles 1991; Straus 1992; US Department of Health and Human Services 1990). However, aggression between minor siblings, the most common form of family aggression/violence (Caspi 2012; Eriksen and Jensen 2009; Finkelhor and Dzuiba-Leatherman 1994; Finkelhor et al. 2005; Hoffman et al. 2005; Straus et al. 1980), has received less attention in the media and is rarely considered a psychological or social problem.

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Prevalence

Aggression is a construct that encompasses a broad range and severity of behaviors. Some level of aggression occurs in the majority of sibling relationships, and both physical (e.g., pushing, slapping, beating up, hitting with an object, threatening with knife or gun; 64 to 91 % annual incidence) and verbal (e.g., name-calling, threatening to harm; 83 to 95 %) aggression between siblings has been reported by the majority of middle school- to high school-age respondents (Goodwin and Roscoe 1990; Roscoe et al. 1987). In a study utilizing fewer aggression prompts, Finkelhor et al. (2006) found that 35 % of surveyed children had been "hit or attacked" with or without a weapon by a sibling within the past year. Retrospectively, studies with college student samples found that 40 to 83 % of participants indicated being involved in physical sibling aggression, and almost all indicated verbal sibling aggression during childhood (Hardy 2001; Hoffman et al. 2005; Mackey et al. 2010; Steinmetz 1977). Using data from the National Incident-Based Reporting System (NIBRS), Krienert and Walsh (2011) found that more than 20,000 cases of single-victim, single-abuser violent incidents between minor siblings were reported between 2000 and 2005.

From the current literature, the level of sibling aggression reciprocity is unclear. Hardy (2001) reported a reciprocity rate of 31.5 % in her sample of college students. Although few

other studies reported a rate of reciprocity, it is clear that there must be some reciprocity from examination of reports of perpetration and victimization (e.g., approximately 65 % for each, Goodwin and Roscoe 1990; 91 % for each, Roscoe et al. 1987; 97 % for each, Mackey et al. 2010).

Correlates of Sibling Aggression

There have been many calls to investigate the effects of sibling aggression, but the research in this area continues to be limited and is somewhat confounded by the co-occurrence of sibling aggression and other forms of family violence (Straus et al. 1980). Cross-sectional studies exploring the immediate, childhood correlates of sibling aggression indicate that trauma and anxiety symptoms (victimization), delinquency (both victimization and perpetration), aggression (both), and substance use (both) co-occur with sibling verbal and physical aggression (Button and Gealt 2010; Finkelhor et al. 2006; Patterson et al. 1984).

Less attention has been given to long-term, adult behaviors associated with earlier sibling aggression. Graham-Bermann et al. (1994) divided college students into groups based on their perception of having been a sibling aggression perpetrator, victim, perpetrator and victim, or neither. Results indicated that women who were victims of emotional aggression or mild physical aggression from a sibling had increased anxiety and those who had perpetrated mild physical aggression against a sibling had lower self-esteem. For men, those who had perpetrated sibling emotional aggression reported lower self-esteem (Graham-Bermann et al. 1994). Mackey et al. (2010) investigated correlations between objective (CTS2-SP) and subjective (self-identification as abuse) measures of childhood sibling aggression and found that self-identification as being the victim of emotional abuse by a sibling or perpetrator of sibling emotional or physical abuse during childhood was positively correlated with adult anxiety levels, as measured by the Zung Anxiety Scale. The authors found no relationship between objective reports of aggression on the CTS2-SP and anxiety levels (Mackey et al. 2010).

An early study of adult sequelae following childhood sibling aggression found that college students who reported perpetrating sibling aggression during childhood were more likely to report violent behavior during adulthood and to predict their own behavior to be violent in hypothetical vignettes, after controlling for exposure to parent violence (Gully et al. 1981). Mangold and Koski (1990) found a positive relationship between experiencing or perpetrating sibling aggression and later perpetration of non-family violence for males in general and for females with male siblings (no assessment of other family violence).

Two groups of researchers have investigated the link between sibling aggression and later dating violence (Noland et al. 2004; Simonelli et al. 2002). Simonelli and colleagues found a positive correlation between childhood sibling aggression and both victimization and perpetration of dating violence in adulthood for males, but no association was found for females. These authors assessed other childhood family violence exposure but did not control for it in the analysis. Similarly, Noland et al. found that childhood sibling aggression predicted perpetration of dating violence over and above other family violence.

The level and potential effects of reciprocal aggression in the sibling relationship is unclear at this time. As described above, few researchers have systematically reported the rate of aggression reciprocity, much less the effects. In the only study found to have reported on the effects of reciprocity, Graham-Bermann et al. (1994) noted that adults who believed they had been in high-conflict sibling relationships and reported "fighting back" with their sibling during childhood exhibited less emotional difficulty than those who did not report fighting back.

In general, intimate partner and non-familial violence reciprocity has been found to increase negative outcomes, mainly because violence escalates over time as a result of increasing levels of retaliation (Anderson and Carnagey 2004; Whitaker et al. 2007). Previous research on the sibling relationship (e.g., possibly milder forms of aggression), however, suggests that some level of conflict between siblings can be developmentally helpful via learning of adaptive conflict resolution skills (Dunn and Munn 1986). It is unclear whether reciprocal aggression in the sibling relationship leads to increased levels over time in the same way that is found in intimate partner or non-familial violence situations. Previous research suggests that sibling aggression decreases as children move into adolescence, regardless of prior level (Finkelhor et al. 2006; Stocker et al. 1989; Straus et al. 1980), although this needs to be studied more systematically. The present study will examine the level of sibling aggression reciprocity and, if possible, will examine sequelae among participants that fall in perpetrator only, victim only, and reciprocal aggression groups. Within the reciprocal aggression group, due to multicollinearity, sequelae from total sibling aggression will be examined.

Adult sequalae of sibling aggression can take on many forms and be caused by multiple factors. Developmental psychopathology and social learning theories are two viewpoints that provide possible explanations for the adult sequelae being examined in the current study. From a developmental psychopathology perspective, similar to other forms of child maltreatment, sibling aggression victimization might lead to recurrent trauma-like emotional symptoms (i.e., depression, anxiety; Toth et al. 2011). Also, sibling aggression perpetration could be expected to serve as learned behavior and manifest in adult aggression (Bandura 1979). These processes can occur together and siblings both model and reinforce behavior between each other, including prosocial behavior (Kim et al. 2007). Furthermore, sibling aggression occurs in the context of family dynamics, which can contribute to its meaning and outcomes

(Caspi 2012). Although such contextual factors are beyond the scope of the present study, levels of family violence, and adult emotional and behavioral sequalae are examined.

That said, many other childhood factors affect adult functioning, adult and child emotional and behavioral disorders are commonly comorbid, and some amount of sibling aggression is reciprocal. As such, the disentanglement of sibling aggression experiences and their sequelae is complex and multifaceted.

Effects of Family Violence

A complicating factor in investigating potential effects of sibling aggression is the high rate of overlap with other forms of family violence (Straus et al. 1980), which has consistently been found to be related to maladaptive adult functioning. For example, witnessing interparental violence in childhood has been linked to behavioral difficulties, including aggression, conduct problems, reduced social competencies, and violence (Edleson 1999; Hughes and Barad 1982; Jouriles et al. 2001; Margolin 1998; Wolfe et al. 1986) and emotional difficulties, such as anxiety, depression, sleep disturbances, guilt, low self-esteem, Post-Traumatic Stress Disorder (PTSD) or trauma-related symptoms, intense fears, intense rage, and somatic complaints (Edleson 1999; Grych et al. 2000; Hughes and Barad 1982; Margolin 1998; Sudermann and Jaffe 1999). In a community sample, researchers found that adults who reported childhood physical abuse reported higher rates of anxiety, antisocial behavior, and drug and alcohol use (MacMillan et al. 2001), and women with childhood abuse histories also reported greater levels of depression.

Moderators

Several potential moderators of the relationship between sibling aggression and adult functioning have been suggested. For the purposes of this study, we have focused on two of those suggested, gender and overall relationship quality. Some authors have found that more sibling aggression occurs when at least one member of the sibling dyad is male (Aguilar et al. 2001; Noland et al. 2004; Straus et al. 1980), although others have found less pronounced sex differences (Goodwin and Roscoe 1990; Roscoe et al. 1987). Other studies suggest that differences may be related to the gender combinations within the dyad instead of just the gender of one sibling. Mangold and Koski (1990) found higher rates of sibling aggression in male-male dyads than any other pair, while Felson and Russo (1988) found higher rates in same-sex dyads, either male or female, than opposite-sex dyads.

For the most part, these findings suggest an increase in sibling aggression with a male sibling, but there are discrepancies. Participant gender has been found to moderate the effect of sibling aggression in some studies (Graham-Bermann et al. 1994; Mangold and Koski 1990; Simonelli et al. 2002), but was not explored (or reported) in others (Gully et al. 1981; Noland et al. 2004). From these few studies, it appears that males who have been involved in sibling aggression are more likely to be involved in later non-family violence than comparable females (Simonelli et al. 2002), while Graham-Bermann et al.'s results suggest that females who experience sibling aggression may be more likely to experience emotional difficulties than males.

Regarding overall relationship quality, prior studies have indicated that sibling warmth may directly contribute to adjustment (Linares 2005) and/or moderate (lessen) any effects of conflict in sibling relationships on concurrent childhood functioning (Dunn et al. 1994; Slomkowski et al. 2001). Dunn et al. (1994) divided participants into three groups based on the levels of received conflict and warmth (conflictual, involved, and supportive) and found that those children in "involved" (equal warmth and conflict) sibling relationships scored more positively on several measures of adjustment than those in either of the other groups. In their study of same-sex siblings, Slomkowski et al. (2001) found that sibling warmth/support moderated the effect of high levels of sibling hostility-coercion on delinquent behavior in children with delinquent older siblings. High hostility-coercion combined with low warmth/support predicted younger sister delinquency, while high hostility-coercion and high warmth-support predicted younger brother delinquency. These findings suggest that boys and girls respond differently to the interaction of positive and negative aspects of sibling relationships. Further study may be helpful in elucidating the mechanisms of action here, but these studies suggest that sibling warmth/support may act as a protective factor. Marganski (2010) found an inverse relationship between childhood sibling aggression and adult sibling attachment, and interestingly, found that individuals who experienced a high level of sibling violence victimization and low adult attachment to a sibling had lower odds of perpetrating adult physical violence than those with high adult attachment to a sibling. There are some qualitative reports of positive sibling relationships during childhood ameliorating the relationship between sibling aggression and adult emotional difficulties (Wiehe 1990). However, no quantitative studies were found that have systematically examined the effect of warmth and closeness of the childhood sibling relationship on the association between childhood sibling aggression and *adult* behavioral and emotional status.

The Current Study

The current study attempts to address gaps in the current literature by assessing the extent of childhood sibling aggression in a large sample and examining the relationship between

reported childhood sibling aggression and adult emotional and behavioral functioning. First, we examine the retrospectively reported rates of perpetration and victimization, and examine the reciprocity of sibling aggression in this community, convenience sample. Second, we examine the relationship between childhood sibling aggression (either perpetration and victimization separately, or combined) and adult emotional and behavioral difficulties. Third, we will examine whether positive sibling relationship qualities (e.g., warmth) diminish (moderate) any relationships between sibling aggression and adult status given prior studies of moderation between sibling aggression and concurrent behavior during childhood (Dunn et al. 1994; Slomkowski et al. 2001). If sibling aggression reciprocity is low, we expect a) childhood perpetration to lead to higher levels of adult aggression and b) childhood victimization to lead to higher levels of adult emotional difficulties. If sibling aggression reciprocity is high, we expect total sibling aggression (a composite of both types of exposure) to predict higher levels of both adult aggression and emotional difficulties, above and beyond that explained by earlier exposure to other types of family violence.

Although this is inconsistent with the findings of one study mentioned above (Graham-Bermann et al. 1994), there is greater evidence in the literature of the negative impact of reciprocal aggression at this time. Further, we predict that more positive sibling relationships (relationship quality) will moderate any relationships between sibling aggression and adult sequalae. Gender will be examined as both an independent predictor and a moderator. The potential influence of the interaction between gender and total sibling aggression on adult aggression and emotional difficulties will be examined. It is expected that the relationship between sibling aggression and adult aggressive behavior will be stronger for men than for women and that the relationship between sibling aggression and adult emotional difficulties will be greater for women than for men. Finally, demographic variables and level of exposure to other forms of family aggression on adult functioning will be examined and, where significant, will be entered into any prediction model of adult sequelae.

Method

Participants

Three hundred and thirty-two participants were recruited from undergraduate psychology courses (60.6 %), online sources ("Psychological Research on the Net http://psych.hanover.edu/research/exponnet.html" and other sites that list psychology experiments, 18.6 %), social networking, and word-of-mouth advertising (20.8 %). Participants were recruited from a wide variety of sources in order to maximize sample size and variability of participants in this exploratory study. Due to the use of an online survey, there was no way to assess refusal to participate; however, 45 participants started the survey but did not complete it. It is likely, but difficult to determine, that some of these participants experienced connectivity difficulties and later restarted and completed the survey. Participants enrolling through psychology courses could earn extra credit in class for their participation. Ten participants with substantial missing data were removed from analysis. Within the full sample, 58 participants were missing up to 13 items across the five predictor and outcome measures. Mean or median imputation was utilized as appropriate for each scale. After data imputation, analyses conducted with both imputed data and utilizing listwise deletion exhibited comparable results; results are presented from the full sample (N=322) with imputed data.

The final sample included 322 participants with a mean age of 22.83 (SD=6.47; range 18–56). The majority of participants were female (71.4 %) and reported Hawaii as their home state (73.9 %). More than half (60.6 %) of the participants were referred to the survey from undergraduate classes at a large public university. There was considerable diversity in the racial makeup of the sample with 38.2 % of participants reporting that they were of mixed race, 31.4 % Caucasian, 26.4 % Asian/Multiasian, 2.2 % Black/African American, and 1.8 % of other racial backgrounds, including Hispanic and Hawaiian/Pacific Islander. Participants were asked to mark all relevant ethnic backgrounds. If they indicated more than one census race category, they were considered Multiracial. If they reported one or more than one Asian race (i.e., Korean, Chinese, Japanese, etc.) and no other categories, they were considered Asian/Multiasian.

Procedure

Data were collected anonymously with the use of the web-based survey provider SurveyMonkey.com. Participants completed an informed consent page approved by the university's Institutional Review Board, a demographic information form, and other measures described below. Pilot study participants indicated that the survey took between 20 and 40 minutes to complete. Participants were instructed to report on childhood events occurring when they were between the ages of ten and fourteen (hereafter referred to as the reference period). This reference period was selected due to research findings indicating that the rate of conflict and aggression between siblings appears to initially rise with age, peak when the oldest sibling is 10 to 14 years old, and then decrease as children get older (Finkelhor et al. 2006; Stocker et al. 1989: Straus et al. 1980). In addition, this reference period increased the likelihood that older siblings were still present in the household during the reference period.

Measures

Childhood Sibling Aggression The Psychological Aggression and Physical Assault scales of the Revised Conflict Tactics Scales Sibling Version (CTS2-SP; Straus et al. 1996) were used to assess sibling aggression victimization and perpetration. The CTS2-SP has been shown to have good construct and discriminant validity (Straus et al. 1996). Consistent with prior research on sibling aggression (Graham-Bermann et al. 1994) and recommendations from one of the measure's authors (Straus 1999), participants were asked to complete this measure based on the sibling with whom they had the most conflict during the reference period. As such, and consistent with much of the literature on sibling aggression, this study focuses on what might arguably be the most contentious sibling relationship and does not focus on overall sibling relationships. The CTS2-SP consists of 38 items asking about the frequency of nineteen verbally and physically aggressive acts perpetrated by the participant and their sibling against each other (i.e., a scale of 0 to 6 is used, with 0 = 0 times per year and 6 = 20 or more times per year). Within the current sample, internal consistency of the CTS2-SP scales was excellent, with α=0.96 for total sibling aggression.

Childhood Sibling Relationship Qualities Positive aspects of the sibling relationship were assessed with the childhood subscales (24 items) of the 48-item Lifespan Sibling Relationship Scale (LSRS; Riggio 2000). The LSRS consists of six subscales based on affect, behaviors, and cognitions regarding the sibling relationship in childhood and adulthood. Items are scored on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) with higher scores reflecting more positive attitudes towards the sibling relationship. The LSRS has been found to have good discriminant validity (Riggio 2000). Excellent internal consistency (α=0.94) was found in the current sample.

Childhood Exposure to Other Family Violence Other family violence was assessed with a modified version of the original Conflict Tactics Scales (CTS; Straus 1979) used in previous research (Mathis et al. 2010). Using this measure, participants answered five items about observed verbal and physical violence exhibited by each person (i.e., parents, siblings, other relatives, non-relatives) that they reported was living in their home when the participant was 10 to 14 years old. Participants rated the frequency of observing these acts by each person in the home on the same scale as that described for the CTS2-SP above, resulting in reports of observed violence in all dyads (e.g., parent-parent, parent-child, child-parent, sibling-sibling). The CTS has been found to have good test-retest reliability (0.80; Amato 1991) and adequate validity through interfamily agreement (Jouriles and Norwood 1995; Richters and Martinez 1993) and nonzero prevalence rates (Straus and Gelles 1990). The data in the current study are consistent with the findings in Mathis et al. regarding the general pattern of aggression experienced (i.e., severe physical aggression was reported less often than less severe physical aggression, which was reported less often than verbal aggression) and exhibited excellent internal consistency (α=0.83).

Adult Emotional Difficulties The Depression and Anxiety subscales of the short-form version of the Depression Anxiety Stress Scales (DASS21; Lovibond and Lovibond 1995) were used to assess participants' experience of depressed mood and anxiety in the month prior to the survey. The DASS21 consists of three seven-item subscales measuring depression, anxiety, and stress on a 4-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). The DASS-21 has been shown to have excellent convergent validity and factor structure (Antony et al. 1998). In the current sample, the DASS21 exhibited excellent internal consistency with α=0.82 for the Anxiety subscale and α=0.90 for the Depression subscale. For the purposes of analysis, the Depression and Anxiety subscales, which were strongly correlated (r=0.69), were combined into one scale reflecting overall Emotional Difficulties (α=0.94).

Adult Aggressive Behavior Aggressive behavior was assessed with a modified version of the 13-item Physical Assault subscale of the CTS2 (Straus et al. 1996). Participants were instructed to indicate the number of times they had engaged in each act in the last year toward any individual, including friends, family, significant others, strangers, etc. The scoring and psychometric properties of the CTS2 have been described previously. In the current sample, the Aggressive Behavior subscale was found to have excellent internal consistency (α=0.93).

Results

Family and Sibling Data

Participants reported an average of 2.29 (SD=1.66) siblings and 3.89 (SD=1.73) total family members living in the home during the questionnaire reference period. Approximately one half (49.4 %) of participants indicated that the sibling with whom they had the most conflict was female. Of all siblings listed, 50.1 % were female. Selected siblings were predominantly "full" siblings (87.9 %), as opposed to "half," "step," or adopted. The average age difference between participants and their most conflictual sibling was ± 3.98 years (SD=3.00) and ranged from 0 (same-age) to 20 years.

Recruitment Group Differences

A series of Mann-Whitney U tests and tests of proportions compared participants referred from university undergraduate courses (n=195) and those referred from other sources (n=127) on all demographic, independent, and outcome variables. The groups were found to differ by age (undergraduate group younger; U=7312.50, Z=6.28, p<.05), absolute value of age difference between participant and selected sibling (greater difference in undergraduate group; U=12211.00, Z=2.82, p<.05), age of sibling with most conflict (undergraduate group younger; U=7561.50, Z=5.91, p<.05), and aggressive behavior in the past year (undergraduate group greater; U=10733.50, Z=2.14, p<.05). The two groups were found to vary on level of reported adult aggressive behavior but not on adult emotional problems. As such, recruitment group was entered as an additional variable in any analyses regarding adult aggressive behavior prediction in order to control for effects of recruitment.

Extent of Sibling Aggression Perpetration and Victimization with High Conflict Sibling

Almost all participants (95.3 %) reported perpetrating at least one act of aggression against their index sibling per year (M=63.32 acts, SD=63.41, Mdn=46.50), and 95.3 % (overlapping but not identical participant composition than perpetration) indicated that they had been the victim of at least one act of sibling aggression per year (M=68.67 acts, SD=68.19, Mdn=49.00). The most commonly reported acts of aggression were shouting/yelling (victim (V): M=11.48, SD=8.18, Mdn=8.00; perpetrator (P): M=11.40, SD=8.26, Mdn=8.00), then insulting/swearing at (V: M=9.19, SD=8.58, Mdn=8.00; P: M=9.92, SD=8.78, Mdn=8.00), and stomping out of the room (V: M=6.14, SD=7.15, Mdn=4.00; P: M=6.11, SD=7.29, Mdn=4.00). Although verbal acts were most common, participants reported pushing/shoving (V: M=4.22, SD=6.05, Mdn=2.00; P: M=4.30, SD=6.03, Mdn=2.00) and grabbing (V: M=3.35, SD=5.40, Mdn=1.00; P: M=3.61, SD=5.78, Mdn=1.00) occurring several times a year. Levels of aggression perpetration and victimization were highly correlated (r=0.87), indicating a high level of aggression reciprocity in this sample.

Extent of Adult Difficulties

On average, participants scored 4.52 (SD=6.32, Mdn=*2.00*) on the Emotional Difficulties scale over the last month and reported 8.45 (SD=24.76, Mdn=1.00) acts of aggressive behavior in the past year. The measures of emotional difficulties and aggressive behavior were both found to be highly positively skewed, which violates the assumption of normality that must be met in order to use typical parametric statistical methods. Log and square root transformation showed some correction but the data was still unacceptably skewed for parametric methods, so these variables were dichotomized and logistic regression was applied. Emotional Difficulties scores were dichotomized into "non-clinical" and "clinical" based on norms for the DASS21. As expected, this resulted in unequal categories with the majority of participants falling in the non-clinical group (0–8; N=263) and less than 20 % in the clinical group (>8; N=59). Because any physically aggressive behavior in an adult is considered non-normative, aggressive behavior was split into *no violence* (N=152) and *any violence* (N=170), resulting in groups of fairly equal size. Means, standard deviations, and medians, which are generally consistent with other studies, are provided in Appendix Table 3 for sibling aggression variables, quality of sibling relationship (LSRS), and exposure to other family violence, as well as the number of participants reporting a clinical level of emotional difficulties in the past month and aggressive behavior in the past year.

Prediction of Adult Emotional and Aggression Status

Associations were calculated between all demographic variables, predictor variables, transformed continuous outcome variables, and the dichotomous predictor variables. The majority of the associations are presented in Appendix Table 3. Pearson's correlation was used for associations between two continuous variables, Phi coefficients were used for associations between two dichotomous variables, and point-biserial correlations were used for associations between one continuous and one dichotomous variable. Variables that were found to be significantly associated with each of the dichotomous criterion variables were included in separate logistic regression analyses. Due to the high correlation between sibling aggression perpetration and victimization and preliminary regression analyses suggesting multicollinearity, sibling perpetration and victimization were combined into a single total sibling aggression variable (TSA) for the remaining analyses.

The Emotional Difficulties logistic regression showed a significant improvement over the model including only the constant (χ^2 [4, N=322] = 22.30, p<.01; Nagelkerke R^2= 0.109) and demonstrated acceptable fit (Hosmer-Lemenshow χ^2 [8, N=322] = 11.04, p=.20). Parameter estimates, Wald χ^2, odds ratios, and confidence intervals are presented in Table 1. Identifying a female sibling as the most conflictual sibling relationship (Wald χ^2 [1] = 6.86; p<.01) and total sibling aggression (Wald χ^2 [1] = 7.54; p<.01) were significant predictors of emotional difficulties. The odds ratios indicated that an increase of one sibling aggressive act per year (perpetrated or victimized; on average, more than 100 total acts reported) increased the log odds of clinical level emotional difficulties by a factor of 1.003. Selecting a female as the index sibling increased the log odds by a factor of 2.306, or doubled the likelihood of reporting emotional difficulties. In order to ensure that shared variance among predictors did not suppress

Table 1 Summary of simultaneous logistic regression analysis for variables predicting clinical levels of emotional difficulties (N=322)

Variable	β	S.E. β	Wald's χ^2	df	p	e^{β} (odds ratio)	95 % CI	
							Lower	Upper
Age	−.05	.03	2.75	1	.10	0.950	0.895	1.009
Sibling gender	.84	.32	6.86	1	.01	2.306	1.234	4.311
Other family violence	.00	.01	0.81	1	.37	1.004	0.995	1.013
Total sibling aggression	.00	.00	7.54	1	.01	1.003	1.001	1.005
Constant	−1.00	.74	1.84	1	.18	0.368		

Variable(s) entered on step 1: age, sibling gender, other family violence, total sibling aggression

Sibling gender is dummy coded with 0 = female, 1 = male

the effect of other family violence, a second logistic regression was conducted in which Emotional Difficulties was regressed only on total sibling aggression and other family violence. Here, only total sibling aggression uniquely predicted Emotional Difficulties.

The Aggressive Behavior dichotomous variable regression found that the model was significant (χ^2 [7, N=321] = 51.404, p<.01; Nagelkerke R^2=0.197) and demonstrated acceptable fit (Hosmer -Lemenshow χ^2 [8, N=321] = 3.832, p=.87). As can be seen in Table 2, adult aggressive behavior (none/any) was significantly predicted by age (younger participants more likely to report aggressive behavior; Wald χ^2 [1] = 7.78; p<.01), other family violence (Wald χ^2 [1] = 6.99; p<.01), and total sibling aggression (Wald χ^2 [1] = 4.36; p<.04). Although Caucasian was significant, the positive beta weight is inconsistent with the univariate negative association and the means reported by each racial group. This is likely due to shared variance with other predictor variables and should be interpreted with extreme caution. An increase in other family violence by one aggressive act per year (on average, approximately 25 acts reported) was associated with an increase in the log odds of engaging in aggressive behavior by a factor of 1.013. An increase of sibling aggression by one act (more than 100 acts reported) was associated with an increase in the log odds by a factor of 1.003, while an increase in 1 year of age reduced the log odds by a factor of 0.936. In order to remove the effect of shared variance with other variables, a reduced model regressing aggressive behavior on only other family violence and sibling aggression was conducted. As with the complete model, both total sibling aggression and other family violence contributed unique variance to the prediction of aggressive behavior.

Moderators

Neither sibling relationship quality nor the interaction between sibling relationship quality and sibling aggression were found to be associated with either adult emotional difficulties or aggressive behavior. Neither gender nor the gender by sibling aggression interaction term contributed unique variance to adult emotional difficulties or aggressive behavior.

Table 2 Summary of simultaneous logistic regression analysis for variables predicting likelihood of any recent aggressive behavior (N=321)

Variable	β	S.E. β	Wald's χ^2	df	p	e^{β} (odds ratio)	95 % CI	
							Lower	Upper
Age	−.07	.02	7.78	1	.01	0.937	0.895	0.981
Caucasian	.67	.34	3.88	1	.05	1.948	1.003	3.783
Multiracial	−.03	.29	0.01	1	.92	0.971	0.545	1.729
Referral Source	.09	.29	0.10	1	.76	1.093	0.621	1.924
Other family violence	.01	.00	6.99	1	.01	1.013	1.003	1.022
Total sibling aggression	.00	.00	4.36	1	.04	1.003	1.000	1.006
Gender by total sibling aggression	.00	.00	0.96	1	.33	1.002	0.998	1.007
Constant	.44	.71	0.39	1	.53	1.554		

Variable(s) entered on step 1: age, Caucasian, Multiracial, Referral Source, other family violence, total sibling aggression, Gender by TSA. *Note*: Caucasian and Multiracial are dummy coded, with 0 = false, 1 = true. Referral Source dummy coded 0 = All other sources, 1 = UH undergraduate class

One participant was removed due to a standardized residual greater than 3

Discussion

The current study retrospectively examined involvement in childhood sibling aggression and its relationship to adult difficulties in a large and diverse sample. Almost all participants (>95 %) reported engaging in and/or being the victim of some level of aggression within their most conflictual sibling relationship between the ages of ten and fourteen. On average, participants reported experiencing over 100 acts per year of aggression with the index sibling. The rates of sibling aggression perpetration and victimization reported were highly correlated (r=0.87, p<.01), a finding that was suspected from rates of sibling aggression levels in other studies but rarely identified (Hardy 2001), precluding a meaningful analysis of individual effects of aggression perpetration and victimization.

Logistic regression analyses found that total sibling aggression was associated with both clinical levels of adult emotional difficulties and the presence of adult aggressive behavior, despite shared variance with reports of other family violence. Other family violence added additional prediction of adult aggressive behavior but did not do so for prediction of emotional difficulties. The finding that other family violence is associated with adult aggressive behavior is consistent with social learning theory, which shows that individuals who experience violence are more likely to use it in the future. Therefore, family violence on top of sibling aggression may lead to greater likelihood of using aggressive behavior in adulthood. The lack of contribution of other family violence to emotional difficulties is more difficult to explain, given past research showing that family violence leads to emotional difficulties on its own. This suggests that aggression with siblings may be more detrimental than the other violence in these families. Independent effects of perpetration and victimization on these outcomes, or the influence of being in a reciprocal rather than one-sided aggressive sibling relationship, were not amenable to examination due to the high correlation between perpetration and victimization. Finally, neither self-reported quality of the childhood sibling relationship, nor gender, moderated these effects.

These findings are generally consistent with prior studies and contribute to the literature in several ways. The percentage of participants who reported sibling aggression was slightly higher than past findings (Roscoe et al. 1987; Straus et al. 1980), which may reflect use of the CTS2 rather than the original CTS, or might reflect sampling differences (e.g., asking about most conflictual sibling relationship instead of most closely spaced) or other methodological factors. Nonetheless, the findings support the idea that some level of sibling aggression is normative.

The identified relationship between sibling aggression and emotional difficulties replicated and extended findings by Graham-Bermann et al. (1994) and Mackey et al. (2010). Utilizing a similar measure to assess sibling aggression and different measures of emotional difficulties, the present study controlled for the effects of experiencing other family violence and thereby, identified sibling aggression as a potential unique contributor to the development of adult emotional difficulties (measure of anxiety and depression in the current study). The finding that childhood sibling aggression was an independent predictor of adult aggressive behavior, even after controlling for other family violence is consistent with results by other authors (Gully et al. 1981; Mangold and Koski 1990). The current study confirmed and extended previous findings by examining the influence of shared variance with other family violence. These findings do not imply that sibling aggression causes the adult difficulties and effect sizes were small (0.10–0.20), but they do suggest that sibling aggression levels might contribute unique prediction to later adult functioning.

The need to combine sibling aggression victimization and perpetration into one variable makes it difficult to determine if the individual effects of childhood sibling aggression perpetration and victimization on adult behaviors are consistent with social learning theory or a developmental psychopathology perspective. Similarly, with such a high reciprocity rate, determining differences in one-way versus reciprocal sibling aggression was also problematical. The high rate of reciprocity and adult difficulties may be consistent with the General Aggression Model (reciprocity leads to higher levels of violence, and greater problems) but that is not clear from the current data. Combined sibling aggression was associated with both emotional difficulties and aggression perpetration in adulthood, but it is unclear whether victimization and perpetration are differentially associated with each type of adult problem. Further research with three distinct groups (aggressors only, perpetrators only, and reciprocators) would likely help elucidate each of these issues and provide better understanding of the theory or theories at work.

Similarly to Mackey et al. (2010), this study examined the influence of sibling relationship quality on any relationship between childhood sibling aggression and adult functioning. Reported sibling relationship quality was not found to modify the relationship between childhood sibling aggression and adult outcomes. This lack of findings suggests that sibling aggression might lead to negative outcomes regardless of the overall quality of the sibling relationship.

Participant gender was not found to predict emotional difficulties or aggressive behavior, which was inconsistent with Noland et al.'s (2004) finding that gender was an independent predictor of dating violence perpetration and victimization. As has been discussed within the literature on partner violence, the CTS does not permit analysis of the meaning, context, or lethality of the aggressive acts, and it seems likely that there are qualitative differences not examined here.

Consistent with Simonelli et al. (victimization; 2002), the participant gender by sibling aggression interaction and adult aggressive behavior were associated, but when logistic regression was applied (which was not done in previous studies), the

interaction term did not contribute significantly. Analyses within each gender showed that for both males and females, there is a significant, positive association between sibling aggression and adult aggressive behavior. Although gender univariately modified the relationship between sibling aggression and adult aggressive behavior, the relative impact is difficult to determine because males reported somewhat more (although non-significantly) sibling and adult aggressive behavior than females. It is also important to keep in mind that there is a strong correlation between sibling aggression and the participant gender by sibling aggression interaction (r= 0.61), indicating that regression analysis may be compromised. Together, these factors suggest that while there may be some modification by gender, the overall finding of a relationship between sibling aggression and adult aggressive behavior provides more useful information in the current sample.

The current study also contributed to the knowledge base through the use of a different methodology. One such contribution involved estimating total sibling aggression, other family violence, and adult aggressive behavior by recoding CTS and CTS2 groups to reflect the midpoint number of acts per category (i.e., 4 acts for category 3, 3–5 acts per year). Graham-Bermann et al. (1994) is the only other study that used this method to generate an estimate of the number of aggressive acts engaged in by siblings each year. Other studies (Gully et al. 1981; Noland et al. 2004) added categorical responses, resulting in a restricted range which likely reduced skew but may not have provided clear aggressive behavior differentiation between participants who reported 1 act in the last year (category 1) and those who reported 21 or more acts in the last year (category 6) and therefore, may have affected results of the statistical analysis. In addition, the use of midpoints allows for more intuitive examination of the findings. The other methodological contribution involves dichotomization of the dependent variables and application of logistic regression. Although this method was employed because of data skew, it appears to have introduced another benefit. Logistic regression controls the statistical effect of high-frequency aggressors. Individuals with extremely high reported levels of aggression would heavily influence the results of a linear regression analysis, but logistic regression assured that each participant had the same amount of influence on the analysis as any other. Use of this method, therefore, extended the findings of Gully et al. (1981) by ensuring that all participants had equal influence on the analysis.

The current findings suggest that sibling aggression is independently associated with adult problems even after other family violence is entered into regression analyses, suggesting that it is important to include sibling aggression when investigating family violence. Although great care must be used when interpreting results from this preliminary study, a few potential applications are suggested. First, consistent with Mathis et al. (2010), failure to assess sibling aggression might reduce estimates of the number of acts of family aggression to which children are exposed each year. This suggests that therapists should assess sibling aggression when assessing physical and sexual abuse with all clients, regardless of age. The results of this study provide further indication that a societal belief of sibling fighting as healthy may be wrong or overly simplistic. While sibling aggression (at least with the sibling with the greatest amount of conflict) is common, it is also associated with increased odds for later maladjustment. Second, the association with later maladjustment, if replicated, suggests the need for greater education of families and dissemination of strategies designed to decrease sibling aggression.

Limitations

As with any study, there are some methodological issues that limit the generalizability of the findings. Internet data collection allowed a broader sample than undergraduates alone, but some concerns remain. The sample was 71.4 % female, limiting analyses that included participant gender. One or more items were missing from 18 % of participants, necessitating some imputation of values. The average age of participants was approximately 23 years old, which is not representative of the general population. Although no direct measure of socioeconomic status was used, 60 % of participants were college students, participants' parents had a high level of education, and all participants completed the survey online, indicating they had access to a computer and knowledge of how to use the internet. Past research indicates that women from low-income households are more likely to experience domestic violence than women in high-income households (Rennison and Welchans 2000), suggesting that examination of sibling aggression in a wider socioeconomic sample is necessary. In addition, 60 % of participants were recruited from undergraduate psychology courses in the state of Hawaii, which may limit the generalizability. That said, the study sample is ethnically diverse, thereby extending the current literature by including more Asian and Pacific Island participants.

Other methodological difficulties include the types of siblings on which participants reported and the use of retrospective report. Almost 90 % of the current sample selected full siblings as the sibling with whom they had the most conflict, negating the possibility of extending the current findings to individuals with other types of conflictual sibling relationships (e.g, step, foster). The use of retrospective report introduced concerns about memory and report accuracy due to the length of time that has passed since childhood, especially for older participants. Paivio (2001) suggested that adults are able to report reliably with regard to childhood violence exposure based on the consistency of retrospective reports, but prospective assessment of childhood sibling aggression would likely

improve the accuracy of the findings. In addition, this retrospective study only assessed sibling aggression and family violence while participants were 10-14 years old. Levels of aggression experienced before or after the reference period and any impact on adult functioning remains unknown. The lack of knowledge of the percent of participants who had female siblings is also a limitation. Without this information, it is difficult to make conclusions about the significance of the finding that siblings who reported a female sibling as their most conflictual were more likely to experience emotional difficulties as an adult. Another limitation involves the necessity of combining sibling perpetration and victimization into one variable. Due to our interest in the associations for perpetration and victimization individually, we conducted analyses with perpetration and victimization included despite the multicollinearity. The results of these regression analyses were consistent with our findings reported earlier, such that both perpetration and victimization predicted adult difficulties above and beyond that predicted by other family violence.

In addition to difficulties related to methodology, there are some limitations related to the measurement instruments. The DASS21 reference period is typically 1 week, but a 1-month range was used in the current study and the cut point for the dichotomous variable may have been inappropriate with this range. Although the general pattern of results for other family violence was similar to past research with the same measure (Mathis et al. 2010), the current study found lower overall rates of other family violence than the previous study even within just the undergraduate group, which is very similar to the sample in Mathis et al. The truncated rate of other family violence may restrict the contribution to regression analyses. Nonetheless, in the current sample, when entered together, total sibling aggression is a stronger predictor of emotional difficulties than is other family violence.

Finally, limitations related to interpretation were also found. One such limitation involves the decision to combine the various types of sibling aggression. It is unlikely that verbal aggression has the same effect as severe physical aggression, but the strong relationship between the subtypes of sibling aggression introduces difficulty in analyzing the differential effects. The majority of sibling aggressive acts endorsed were verbal (78+ acts per year), but participants reported experiencing or perpetrating a considerable amount of mild (approximately 30 acts) and severe physical sibling aggression (22 acts) each year. A brief analysis of our data shows that all six types of sibling aggression (i.e., perpetration and victimization—verbal, less severe physical, severe physical) were associated with emotional difficulties when each was the only sibling aggression variable entered in the regression equation, but only verbal victimization was associated with adult aggression when measured alone. When perpetration and victimization were combined into one variable in each aggression category, total verbal aggression was associated with emotional difficulties and no associations were found with aggressive behavior. Although this is interesting, it must be noted that it is difficult to investigate any one type of sibling aggression independently. Only 50 participants reported no physical aggression at all, and in this small subsample, there was no association between verbal aggression and adult difficulties. Future investigations including large samples of participants who experienced only verbal or only physical aggression with siblings could be useful to examine this potential effect more closely.

Future Directions

While this study provided considerable information about sibling aggression and its relation to adult emotional functioning and aggressive behavior, there are many avenues for continued research. Research that attempts to address the limitations described above could move the literature forward, especially the issues of generalizability. Research investigating adult difficulties across the lifespan (instead of at one particular time) would be helpful, as would investigations of victims/perpetrators only. In addition, future studies might focus on more severe levels of sibling aggression, although the results of the current study suggest that any aggression may be related to adult difficulties. It may also be helpful to utilize other relationship measures that provide a better assessment of the effect of warmth/closeness on adult behavior, especially after childhood sibling aggression.

Another important area of inquiry involves the context of the aggression, such as the course or length of an aggressive interaction, the intention of the aggressor, and other related factors. For example, future studies could examine the precursors to aggressive incidents and the actions of both siblings, the number and type of acts perpetrated by each sibling within one aggressive interaction, and events occurring after the incident ends. Relatedly, studies that examine verbal and physical aggression in concert with sexual aggression between siblings may contribute to the already substantial body of literature on the effects of childhood sibling aggression. The current study's focus on number of acts does not reveal if these incidents are consistent across time or occur in unusual spates of high aggression preceded and followed by an aggression-free relationship. Past research suggests that sibling aggression may increase or decrease based on parent response (Felson and Russo 1988; Smith and Ross 2007), but there is little information on the effect of parent response on later behavior. Investigation of injuries sustained or need for medical attention due to sibling aggressive acts would provide information on the potential negative impact of sibling aggression. Continued investigations of the meaning and impact of sibling aggression will help elucidate these and other factors related to childhood sibling aggression.

Appendix

Table 3 Bivariate correlations and phi coefficients for demographic, predicator, and dichotomous criterion variables

	M (SD)	Mdn	Age	Gender	AV Age Diff	Sibling gender	Caucasian	Multiracial	OFV	SP	SV	TSA	LSRS	ED (not/ clinical)	AB (no/ any)
Age			1	.00	−.11	.13*	.34*	−.15*	−.09	−.13*	.01	−.06	−.09	−.12*	−.24*
Gender[a]				1	−.05	.02^	−.11^	.05^	−.12	.03	.07	.05	.00	−.05^	.03^
AV Age Diff					1	−.01	−.09	.17	−.03	−.17*	−.14*	−.16*	−.01	−.03	.01
Sibling gender[a]						1	−.03	.09	−.09	.14*	.12*	.13*	.00	−.14*^	.04^
Caucasian[b]							1	−.53*	−.08	.07	.11	.09	−.08	−.08^	−.18*^
Multiracial[b]								1	.12	.01	.03	.02	.03	.02^	.12*^
OFV	25.54 (30.74)	12.00							1	.33*	.31*	.33*	−.18*	.13*	.23*
SP	63.32 (63.41)	46.50								1	.87*	.96*	−.24*	.17*	.23*
SV	68.67 (68.19)	49.00									1	.97*	−.31*	.17*	.22*
TSA	131.99 (127.26)	96.00										1	−.29*	.17*	.23*
LSRS	71.69 (17.93)	73.00											1	−.07	−.04
ED (not/ clinical)	(*N*=263/*N*=59)													1	.17*
AB (no/any)	(*N*=152/*N*=170)														1

Possible range for SP and SV is 0 – 399; TSA: 0 – 798; LSRS: 24 – 120; OFV: 0 – 105 per person in the home; ED: 0 – 42; AB: 0 – 273. *Emotional Difficulties scores must be doubled to compare to normative data

Associations were calculated between all demographic variables, predictor variables, dichotomous outcome variables, and the dichotomous predictor variables. Type of association used varied by type of variable (i.e., Pearson's correlation for two continuous variables, Phi coefficients for two dichotomous variables, and point-biserial correlations for one continuous and one dichotomous variable

AV Age Diff absolute value of age difference, *OFV* other family violence, *SP* Sibling aggression perpetration, *SV* sibling aggression victimization, *TSA* total sibling aggression, *LSRS* Lifespan Sibling Relationship Scale

[a] Female = 1, Male =2

[b] True = 1.* $p<.05$, ^ Phi Coefficient

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