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Hostility, Anger, and Dominance as Mediators of the Sibling Aggression–School Fighting Relationship: Mechanisms of Violence Generalization

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Abstract

Objective: Prior research indicates that siblings play a significant role in the formation of aggressive behavior inside and outside the home. The purpose of the current investigation was to identify the mechanism that links aggression toward siblings, referred to in this study as sibling aggression, with school-related violence and fighting, referred to in this study as school fighting. It was predicted that hostility, anger, and dominance would mediate the sibling aggression–school fighting relationship.

Method: Three candidate intermediary variables (hostility, anger, and dominance) were tested as putative mediators of the sibling aggression–school fighting relationship in a group of 713 middle-school students (339 boys, 374 girls). It was hypothesized that all three candidate intervening variables would mediate the relationship between sibling aggression and school fighting, with no significant differences in strength of effect between the three mediators.

Results: The research hypothesis was partially supported: hostility, but not anger or dominance, successfully mediated the sibling aggression–school fighting relationship and there was no difference in strength of effect between the three candidate mediators.

Conclusions: A practical implication of these results is that aggression prevention and treatment programs may be enhanced by targeting children who display aggressive relationships with siblings and other children in the home in an effort to change cognitive and behavior patterns before they generalize to the school setting and negatively impact the child’s relationships with schoolmates and peers.

Keywords

aggression toward siblings; causal mediation analysis; hostility; anger; dominance

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Parents and peers have received significantly more attention from researchers exploring the social roots of aggression and delinquency than siblings, even though siblings may be just as important as parents and peers in shaping early aggressive and delinquent behavior. The annual rate of inter-sibling physical aggression ranges from 35% to 91% in most surveys (Finkelhor, Ormrod, & Turner, 2006; Hoffman, Kiecolt, & Edwards, 2005; Mackey, Fromuth, & Kelly, 2010). This shows just how ubiquitous the problem of sibling aggression actually is. Of the handful of longitudinal studies that have been published on sibling effects, the majority have determined that sibling aggression or delinquency predicts youth aggression and delinquency above and beyond the contributions of parents and peers (Fagan & Najman, 2003; Garcia, Shaw, Winslow, & Yaggi, 2000; Walters, 2018). There is evidence, then, that sibling relations may rival parental control and support and peer influence and selection as a developmental influence in the evolution of an aggressive or delinquent lifestyle. The purpose of the current investigation was to determine whether a mechanism linking sibling-based aggression to school-based aggression could be identified.

Social Learning Theory

Social learning theory contains four concepts that may be of assistance in explaining the putative link between sibling-directed aggression in the home, referred to from henceforth as sibling aggression, and peer-directed aggression at school, referred to hereafter as peer aggression (Akers, 1998; Bandura, 1973, 1986). First, social learning theory holds that people not only learn through operant and classical conditioning, they also learn by observing others and modeling their behavior. Hence, children can learn aggression by observing violence in the home from family members. Second, social learning theory proposes that a behavior will only be performed if the person anticipates reinforcement. A child who experiences gratification from teasing or hitting a sibling may seek out similar gratification in his or her interactions with peers at school. Third, social learning theory maintains that aggressive behavior is cue-controlled and generalizable. If children perceive aggressive cues in the school environment that remind them of aggressive cues in the home environment, they are apt to respond as they did at home. Finally, social learning theory, particularly the social cognitive version promoted by Bandura (1986), assumes that cognitive processes like expectations, attributions, and thinking styles become internalized over time and potentially mediate the relationship between stimulus (sibling target of aggression) and response (aggression towards peers). Several potential mediators of the sibling-peer aggression relationship are described next.

Potential Mediators

There is a growing body of research showing that sibling aggression can lead to violence outside the home (Bank, Burraston, & Snyder, 2004; Ensor, Marks, Jacobs, & Hughes, 2010; Mathis & Mueller, 2015; Natsuaki, Ge, Reiss, & Neiderhiser, 2009). The purpose of the current investigation was to determine whether a series of three social cognitive or cognitive-affective variables were capable of mediating the sibling aggression—school fighting relationship. Hostility is one such variable. The belief that hostility or hostile attribution biases mediate the home-school aggression relationship can be traced to Bandura's (1986) social cognitive theory and Walters' (2017) control model of criminal lifestyle development.

The control model of criminal lifestyle development holds that social cognitive variables (e.g., hostile attribution biases) link environmental and personality characteristics (e.g., family violence, low self-control) to antisocial outcomes (e.g., aggression, bullying). In a study examining the transition from bullying victim to bullying victimizer, Walters and Espelage (in press) determined that hostility effectively mediated the bullying victimization–bullying perpetration relationship. Just like being the victim of bullying increased hostility and culminated in bullying perpetration in the Walters and Espelage (in press) study, so too may aggression toward siblings inside the home promote hostility which, in turn, increases subsequent aggression toward peers outside the home.

Anger is a second plausible mediator of the sibling–peer aggression relationship. This cognitive-affective construct is considered a cause or mediator of aggression in several major theories of aggression and crime (Agnew, 1992; Berkowitz, 1993; Spielberger, Jacobs, Russell, & Crane, 1983). The notion that sibling conflict leads to frustration or general strain, which then leads the individual to become violent and aggressive with peers is central to a model in which anger serves as the mediator. Although this explanation fits within a broad social learning framework, it is more affectively oriented than the previously mentioned hostility explanation. There is preliminary support for the notion that aggression towards siblings correlates with elevated levels of angry affect. In a study of 455 Australian children in grades 5 through 12, Tanrikulu and Campbell (2015) discovered that sibling bullying was three time more prevalent than peer bullying and that trait anger was strongly associated with sibling bullying.

Another variable that could potentially mediate the relationship between sibling aggression and peer aggression is dominance. Personality models of aggressive dominance consider dominance a personality trait in which the individual seeks interpersonal control and strives to be the center of attention. As one might imagine, the vast majority of studies on dominance and sibling aggression have been performed on nonhuman species (Müller, Moe, & Groothuis, 2014; Rizaldi & Watanabe, 2008). In one of the few sibling aggression and dominance studies conducted on humans, dominance correlated negatively with sibling conflict, contrary to predictions, and positively with peer victimization, consistent with predictions (Faith, Elledge, Newgent, & Cavell, 2015). Despite these mixed results, dominance was still considered a plausible potential mediator of the sibling aggression–school fighting relationship.

Present Study

The current investigation examined three potential mediators of the sibling aggression–school fighting nexus. Using three waves of longitudinal data organized into four regression equations, hostility, anger, and dominance were tested as mediators of the association believed to exist between sibling aggression and school fighting. A social learning framework was adopted with all three variables, each of which was viewed as a potential mechanism in explaining the sibling aggression–school fighting relationship. Because prior research indicates that family, parenting, and peer factors play a powerful role in sibling relationships (see Kuay et al., 2016; Tippett & Wolke, 2015), family structure, social support

from family and friends, parental monitoring, family violence, and peer delinquency were all controlled for in the current study. The hypothesis tested in this study reads as follows:

H1. The indirect effects for the hostility-, anger-, and dominance-mediated pathways will be significant and there will be no differences in the strength of effect between the three patterns.

Method

Participants

Participants came from the Illinois Study of Bullying and Sexual Violence (ISBSV; Espelage, Low, Anderson, & De La Rue, 2014). Use of these data for the current secondary analysis was approved by the Kutztown University Institutional Review Board (IRB). The 713 members of the ISBSV with complete data on at least four of five variables (i.e., Wave 1 sibling aggression, Wave 2 hostility, Wave 2 anger, Wave 2 dominance, and Wave 3 fighting) served as participants in the current investigation. The sample encompassed 339 boys and 374 girls who were between the ages of 10 and 15 ($M = 12.27$, $SD = 0.83$) at the time of the Wave 1 survey. The ethnic background of participants was 50.1% African-American, 32.0% White, 4.1% Hispanic, and 13.9% other. A power analysis was performed with Monte Carlo simulations, the results of which indicated that a sample of 566 was required to achieve 80% rejection of a false null hypothesis on the a and b paths of the indirect effect. This suggests that the current sample ($N = 713$) was sufficiently powered.

Measures

Independent Variable.—Aggression directed toward siblings, referred to as sibling aggression, served as the independent variable in this study. Sibling aggression was assessed with five items that asked respondents to indicate how often they engaged in the following behaviors with siblings and other children living in the home (“upset them for fun;” “got in a physical fight;” “started arguments;” “hit back when hit;” “teased them”) over the past month (Espelage & Stein, 2006). Each item was rated on a five-point frequency scale (0 = *never*, 1 = *one or two times*, 2 = *three or four times*, 3 = *five or six times*, 4 = *seven or more times*) and the item scores were averaged to create a mean score per item. The internal consistency of this scale was good ($\alpha = .82$).

Dependent Variable.—The dependent variable for this study was fighting at school, once again assessed over the past 30 days. The 4-item University of Illinois Fight Scale (UIFS; Espelage & Holt, 2001) served as an indicator of school fighting in the current study. Each item (“I fought other students I could beat;” “I got into physical fights;” “I hit back when someone hit me first;” “I got into a physical fight because I was angry”) were rated on the same five-point frequency scale as the sibling aggression scale (0 = *never*, 1 = *one or two times*, 2 = *three or four times*, 3 = *five or six times*, 4 = *seven or more times*). Mean item scores were again calculated. This scale achieved adequate internal consistency in the current sample of participants ($\alpha = .70$).

Mediator Variables.—There were three mediator variables included in the current investigation: hostility, anger, and dominance. Hostility was measured with six items from the Symptom Checklist-90 (SCL-90; Derogatis, Rickels, & Rock, 1976) Hostility scale —“annoyed or irritated;” “uncontrollable temper outburst;” “urges to beat, injure, or harm someone;” “urges to break things;” “frequent arguments;” “shout or throw things”—each rated on a four-point Likert-type scale (0 = *never*, 1 = *once in a while*, 2 = *fairly often*, 3 = *most of the time*). Item scores were again averaged to produce a mean score per item ($\alpha = .88$).

The second mediator variable, anger, was assessed with three items from the University of Illinois Anger Scale (UIAS; Espelage & Stein, 2006). Although the UIAS is composed of four items (“I lost my temper for no reason;” “I was mean to someone when I was angry;” “I was angry all day;” “I got into a physical fight because I was angry”) the fourth item (“I got into a physical fight because I was angry”) was also included on the UIFS and so it was dropped from the UIAS for the purposes of this study. Each item was rated for the past 30 days using the same five-point frequency scale as the UIFS (0 = *never*, 1 = *one or two times*, 2 = *three or four times*, 3 = *five or six times*, 4 = *seven or more times*). Internal consistency was good considering there were only three items on the scale ($\alpha = .74$).

A 7-item dominance scale was used to assess the third mediator variable: interpersonal dominance. Each item (“I enjoy being the center of attention;” “I am usually the one who makes decisions;” “I force others to do what I want;” “I am usually the leader of my friends;” “I cooperate to get what I want;” “I am seen as one of the coolest kids;” “My friends are influenced by me”) is rated on a five-point Likert-type scale (1 = *does not describe me well*, 5 = *describes me very well*). A mean score per item was calculated and the scale produced adequate internal consistency in the current sample of participants ($\alpha = .79$).

Control Variables.—Eight control variables, all measured at Wave 1, were included in the current investigation. Three of these control variables were demographic in nature: age (in years), sex (0 = *male*, 1 = *female*), and race (1 = *White*, 2 = *Non-White*). The other five control variables were family structure, social support, parental monitoring, family violence, and peer delinquency. Family structure inquired as to whether the child currently lived with two parents (1 = *yes*, 0 = *no*), whereas social support assessed perceived support (“can talk to;” “get good advice;” “receive practical help”) from family, friends, and adults in the community. Each of the 9 social support items was rated on a three-point scale (0 = *none*, 1 = *some*, 2 = *a lot*) and the scores were summed to produce a scale that ranged from 0 to 18 ($\alpha = .85$). Parental monitoring was assessed with 8 items (e.g., “parents ask about homework;” “rules are clear;” “parents known about alcohol use”) rated on a three-point scale (0 = *never*, 1 = *seldom*, 2 = *often*, 3 = *always*), with average scores per item ranging from 0 to 3 ($\alpha = .87$). Family violence was evaluated with three items (e.g., “yelling, quarreling, or arguing in the household;” “family members lose their temper or blow up for no good reason;” “physical fights in the household, like people hitting, shoving, or throwing things”), each rated on a four-point Likert-type scale (0 = *never*, 1 = *sometimes*, 2 = *often*, 3 = *almost always*) to create a mean score per item ($\alpha = .79$). Finally, participants were asked to estimate how many of their friends engaged in 8 delinquent acts (“damaged or destroyed

property;" "been in a fight") on a scale from 0 (*none of them*) to 4 (*all of them*) to yield an average score per item ($\alpha = .75$).

Precursor Measures.—The temporal order of variables is established by using prospective data and the temporal direction of variables is established by including precursor measures of each predicted variable in their respective regression equations (Cole & Maxwell, 2003). Both were accomplished in the current study. Considering the fact that there were four regression equations, four precursor measures were required. Accordingly, Wave 1 hostility was included as a precursor measure in the equation predicting Wave 2 hostility, Wave 1 anger was included as a precursor measure in the equation predicting Wave 2 anger, Wave 1 dominance was included as a precursor measure in the equation predicting Wave 2 dominance, and Wave 1 fighting was included as a precursor measure in the equation predicting Wave 3 fighting.

Research Design and Statistical Analyses

The current study employed a three-wave prospective fixed-sample panel design with six months between waves. There were five main variables in this study: one independent variable (Sibling Aggression-1), three mediator variables (Hostility-2, Anger-2, Dominance-2), and one dependent variable (Fighting-3). *Mplus 5.2* (Muthén & Muthén, 1998–2007) was used to compute a four-equation path analysis with a maximum likelihood estimator. One regression equation predicted Hostility-2, a second regression equation predicted Anger-2, a third regression equation predicted Dominance-2, and a fourth regression equation predicted Fighting-3. Bias-corrected bootstrapped 95% confidence intervals ($b = 5,000$) were used to test the significance of all three pathways as well as the differences between pathways (Preacher & Hayes, 2008). A significant pathway or difference should have a bootstrapped confidence interval that does not include zero. Research indicates that nonparametric bootstrapping procedures are superior to normal theory z-tests in modeling indirect effects, which tend to conform to a non-normal distribution (Hayes, 2013; Rucker, Preacher, Tormala, & Petty, 2011).

Kenny's (2013) "failsafe ef" procedure— $(r_{my.x}) \times (sd_{m.x}) \times (sd_{y.x}) / (sd_m) \times (sd_y)$ —was used to evaluate all significant indirect effects for the purpose of determining their sensitivity to omitted variable bias. The coefficient produced by the "failsafe ef" denotes how strongly an unobserved covariate confounder would need to correlate with the mediator and dependent variables, controlling for the independent and mediator variables in the case of the latter, to lower the coefficient along the *b* path of the indirect effect to zero. It should be noted that the *a* path of the indirect effect runs from the independent variable to the mediator and the *b* path runs from the mediator to the dependent variable. Because precursor measures can potentially create endogenous selection bias, which could then artificially inflate pathway coefficients (Elwert & Winship, 2014) a second sensitivity test was conducted whereby precursor measures were removed from the analysis.

Missing Data

Nearly half the participants in this study had complete data on all 17 study variables (46.0%). Another 8.6% were missing data on one variable, 0.9% were missing data on two

to four variables, 21.0% were missing data on nine variables, and 23.4% were missing data on ten variables. Individual variables with more than 10% missing data included age (23.4%), Wave 1 social support (44.9%), Wave 1 parental monitoring (44.6%), Wave 1 family violence (45.0%), Wave 1 peer delinquency (44.6%), Wave 1 sibling aggression (44.9%), Wave 1 hostility (44.9%), Wave 1 anger (44.7%), Wave 1 dominance (44.9%), and Wave 1 fighting (44.7%). Missing data were handled with full information maximum likelihood (FIML). Analyzing all non-missing data, FIML computes model parameters and standard errors for the entire sample using these estimates. There is a growing body of research showing that FIML generates significantly less biased results than traditional missing data procedures like simple imputation and listwise deletion (Allison, 2012).

In that most of the missing data for this study came from Wave 1, a supplemental analysis was performed with seven auxiliary variables from other waves in the ISBSV and a robust maximum likelihood estimator that generates Huber-White sandwich estimated standard errors and corrected test statistics. The 8 auxiliary variables (Wave 2 age, Wave 2 social support, Wave 2 parental monitoring, Wave 2 family violence, Wave 2 peer delinquency, Wave 2 sibling aggression, Wave 3 sibling aggression, and Wave 2 fighting) correlated .43 to .84 with their Wave 1 counterparts, consistent with the range recommended by Graham (2009) for auxiliary variables. These 8 variables were not included in the analyses but were used to enhance the plausibility of the missing at random (MAR) assumption made by FIML (Collins, Schafer, & Karn, 2001). The other assumption upon which FIML is based (i.e., multivariate normality) was supported by the general absence of large differences between the standard errors from the ML and MLR analyses: $M = 4.6\%$, Range = 0.0%–17.5%.

Results

Preliminary Analyses

Descriptive statistics for the 17 variables included in the current investigation are listed in Table 1. Nearly half the zero-order correlations in Table 1 achieved statistical significance using a Bonferroni-corrected alpha level. Analyzing the four regression equations for collinearity revealed no evidence of multicollinearity between predictor variables (tolerance = .510–.968, variance inflation factor [VIF] = 1.033–1.960). In addition, the dependent variable (Fighting-3) was mildly non-normal (skew = 1.65, kurtosis = 2.68).

Gender moderation was tested by including the Sibling Aggression-1 \times sex, Hostility-2 \times sex, Anger-2 \times sex, and Dominance-2 \times sex interaction terms in the four-equation path analysis. The results failed to show evidence of a single significant interaction effect and so the interactions were removed from the main analysis.

Main Analysis

The results of the four-equation path analysis are summarized in Table 2 (see also, Figure 1) and the bias-corrected bootstrapped confidence intervals can be found in Table 3. Both tables indicate that while the *a* and *b* paths of the hostility-mediated pathway and the hostility-mediated pathway itself were significant, the *a* paths of the anger- and dominance-mediated

pathways and the anger- and dominance-mediated pathways themselves were non-significant. As predicted, there were no significant differences between the three pathways.

Auxiliary Analysis

The path coefficients changed very little when the eight auxiliary variables were added to the FIML analysis and an MLR estimator was employed. As with the non-auxiliary ML analysis, the a ($z = 2.98, p < .01; \beta = .15$) and b ($z = 3.86, p < .001; \beta = .21$) paths of the hostility-mediated pathway and the b paths of the anger- and dominance-mediated pathways ($z = 3.23, p < .01; \beta = .17$, and $z = 2.20, p < .05; \beta = .09$, respectively) were significant, whereas the a paths of the anger- and dominance-mediated pathways were non-significant ($z = 1.57, p = .12; \beta = .10$, and $z = 1.09, p = .27; \beta = .06$, respectively).

Because bootstrapping is incompatible with structural equation models in which auxiliary variables are included as part of an “m” specifier, total indirect effects were evaluated using the Monte Carlo Method of Assessing Mediation (MCMAM: Preacher & Selig, 2012) rather than bias-corrected bootstrapping. The MCMAM analysis (20,000 repetitions) revealed a significant hostility-mediated pathway (95% CI = 0.0073, 0.0527), a non-significant anger-mediated pathway (95% CI = -0.0029, 0.0362) and a non-significant dominance-mediated pathway (95% CI = -0.0036, 0.0156).

Sensitivity Testing

Kenny’s (2013) “failsafe e_f ” procedure was used to evaluate the sensitivity of the current results to omitted variable bias. The results indicated that an unobserved covariate confounder would need to correlate .27 with the mediator (Hostility-2) and .27 with the dependent variable (Fighting-3), controlling for Sibling Aggression-1 and Hostility-2 in the case of Fighting-3, to nullify the b path of the significant indirect effect. This indicates that the current results were moderately robust to the confounding effects of omitted variables on the hostility-mediated pathway.

Sensitivity testing designed to rule out endogenous selection bias as an explanation for the significant hostility-mediated pathway was accomplished by removing the four precursor measures (Hostility-1, Anger-1, Dominance-1, Fighting-1) from the analysis. Without precursor measures, the hostility-mediated (estimate = 0.040, 95% bootstrapped confidence interval = 0.014, 0.080), anger-mediated (estimate = 0.034, 95% bootstrapped confidence interval = 0.013, 0.068), and dominance-mediated (estimate = 0.016, 95% bootstrapped confidence interval = 0.004, 0.039) pathways were all significant. The differences between pathways remained non-significant.

Discussion

The purpose of this study was to determine which of three putative intervening variables was capable of mediating the sibling aggression—school fighting relationship in a sample of early to mid-adolescent children. Results revealed that only one of the three mediators, the social cognitive variable, hostility, effectively mediated the prospective sibling aggression—school fighting association. The emotion of anger and the interpersonal style of dominance, by contrast, failed to mediate the effect of sibling aggression on subsequent fighting in school,

although, as predicted, the three pathways did not differ significantly from one another. Sensitivity testing revealed that the effect of hostility on the sibling aggression–school fighting relationship was moderately robust to the obfuscating effects of unmeasured covariate confounders and that endogenous selection bias did not explain the results. The reader may have noticed that all three pathways achieved significance when precursor measures were removed from the analysis. This particular analysis can be used to demonstrate that endogenous selection bias does not account for the current findings but it should not be used to determine pathway significance because failure to include precursor measures in a mediation analysis violates the temporal direction assumption of causal mediation analysis (Preacher, 2015). These results need to be replicated in other samples because of generalizability concerns, given that the sample was not nationally representative but rather came from two school districts in a single U.S. state.

Limitations

Despite an adequately sized sample ($N = 713$) and methods appropriate for conducting a mediation analysis (Hayes, 2013), the present study still suffered from several limitations. First, whereas Wave 2 (mediator variables) and Wave 3 (dependent variable) had low levels of missing data, nearly half the data for Wave 1 variables were missing. FIML ordinarily does a good job of managing even large amounts of missing data (Allison, 2012), but it rests on two assumptions: MAR and multivariate normality. The missing at random (MAR) assumption is usually untestable because the data required to test it are, by definition, missing (e.g., those who engage in the highest levels of sibling aggression are also the ones most likely to leave questions about sibling aggression blank). Nevertheless, when auxiliary variables from Waves 2 and 3, that not only correlated well with the Wave 1 variables but also had virtually no missing data, were added to the analysis—an approach designed to enhance the plausibility of the MAR assumption—the results did not change. The multivariate normality assumption, which can be tested by comparing the standard errors achieved using an ML estimator with those obtained using an MLR estimator, was clearly satisfied in the current study.

A second limitation of this study is that all of the variables were based on self-report. This leaves the study open to charges of mono-operational bias and the possibility that some of the significant coefficients in this study were the result of shared method variance (Shadish, Cook, & Campbell, 2002). Additional research using non-self-report measures such as parent and teacher ratings is required to address this issue. Concerns could also be raised about a non-normal dependent variable. Although there are no universally accepted rules of thumb for normality, best evidence suggests that non-normality is generally not an issue where skew < 2 and kurtosis < 7 , as they were in the current study (Curran, West, & Finch, 1996). Furthermore, bootstrapping in the main analysis and an MLR estimator in the auxiliary analysis are ways of dealing with non-normality in a dependent variable given a reasonably sized sample, as was the case in the present study (Klein, 2010; Preacher, 2015). Finally, the majority of items found on the sibling aggression and school fighting measures used in this study covered relational violence rather than predatory violence. Greater attention should be paid to predatory violence in future research in this area.

Theoretical and Research Implications

Findings from the current investigation suggest that the relationship between sibling aggression and violence against peers (Bank et al., 2004; Ensor et al., 2010; Mathis & Mueller, 2015; Natsuaki et al., 2009) is mediated, in part, by hostility, although these results, given their preliminary nature, are in need of replication. According to these preliminary results, sibling aggression in the home contributed to the development of a social cognitive pattern of hostility, marked by antagonistic cognitive schemes and social information processing anomalies like hostile attribution biases (Crick & Dodge, 1996), which then increased the child's odds of engaging in physical altercations at school. This supports a fundamental tenet of the control model of criminal lifestyle development (Walters, 2017)—in which social cognitive variables like hostile attribution biases are believed to mediate the effects of variables like low self-control and psychosocial strain on delinquent and violent outcomes—and is consistent with Walters and Espelage's (in press) earlier observation that hostility mediates the bullying victimization—bullying perpetration association. These results also support the notion that social cognitive variables make especially good mediators to the extent that they are capable of both predicting and being predicted by social and behavioral variables (Bandura, 1986; Wu & Zumbo, 2008). In the current study, for instance, both anger and dominance predicted school fighting (*b* path of each pathway) but neither was sufficiently sensitive to sibling aggression (*a* path of each pathway) to produce a significant indirect effect.

We would like to direct the reader's attention to the fact that while there was no evidence in this study that anger mediated the sibling aggression—school fighting nexus, the current study was not designed to directly test Berkowitz's (1993) revised frustration-aggression hypothesis. The revised frustration-aggression hypothesis holds that frustration or general strain (Agnew, 1992) arouses anger which, in turn, stimulates aggression or delinquency. This particular connection was not tested in the current investigation. Hence, anger could still serve as a link between frustrating experiences and aggressive behavior, although in an earlier study using many of the same participants as were included in the present investigation, Walters and Espelage (in press) determined that anger fell short of mediating the relationship between a frustrating experience (bullying victimization) and subsequent aggressive behavior (bullying perpetration). A social cognitive variable central to Bandura's (1986) social cognitive theory and Walters' (2017) control model of criminal lifestyle development (i.e., hostility), by contrast, was effective in mediating the sibling aggression—school fighting relationship that anger and dominance failed to mediate.

Clinical Implications

A key practical implication of the current results is that sibling aggression needs to be taken seriously by parents confronted by such behavior and properly assessed by clinicians working with families burdened by aggression problems. The near universality of sibling aggression (Finkelhor et al., 2006; Hoffman et al., 2005; Mackey et al., 2010) and the fact that it may be a source of future interpersonal conflict demonstrates its relevance to both research and practice. In all likelihood, aggressive patterns of behavior usually begin in the home. Based on social learning and stimulus-response principles, it then generalizes to other settings and individuals. Interventions should accordingly be developed to address these

problems when they first appear, before they have had a chance to generalize to situations outside the home. For parents, it begins with learning how to differentiate between normal sibling rivalry and sibling abuse (Shadik, Perkins, & Kovacs, 2013). For clinicians, it involves identifying the sources of conflict within the family and empowering the family and its members to work together to overcome these problems (Caspi, 2012).

It is worth noting that the hostility that mediated the sibling aggression–school fighting relationship in the current investigation may be just as effective a target for intervention as inter-sibling aggression. Using family and individual therapy to address the social cognitive construct of hostility, the variable that effectively linked sibling aggression in the home to peer fighting at school, would appear to make a great deal of practical sense. As a case in point, multisystemic therapy, an intervention that combines the family and individual approaches, was found to significantly reduce hostility in a group of 12–18-year-old Dutch adolescents (Asscher, Dekovi , Manders, van der Laan, & Prins, 2013). Easing the hostility that links sibling aggression to school fighting may therefore be just as effective as reducing inter-sibling aggression in alleviating subsequent peer violence.

Reducing inter-sibling aggression and interpersonal hostility, while vital, may be insufficient in bringing about a meaningful change in behavior if they are the sole focus of intervention. Targeting hostile attitudes and aggressive behavior will not engender the warm and positive sibling associations that have been found to improve a child’s conflict negotiation skills and general interpersonal outlook (Dirks, Persram, Recchia, & Howe, 2015; Kramer, 2010). Consequently, it may be just as important to encourage positive sibling relationships as it is to prevent negative ones. Two prevention programs designed to improve sibling relationships in children 4 to 9 years of age have produced encouraging preliminary results: *More Fun with Sisters and Brothers* (MFWSB; Kennedy & Kramer, 2008) and *Siblings are Special* (SIBS; Feinberg et al., 2013). Additional research is required, however, to determine the moderating variables that make these programs more or less effective with certain subgroups of siblings and ascertain whether the combined effect of programs designed to improve sibling relationships and programs intended to reduce inter-sibling conflict and hostility are significantly greater than the effects of each program separately.

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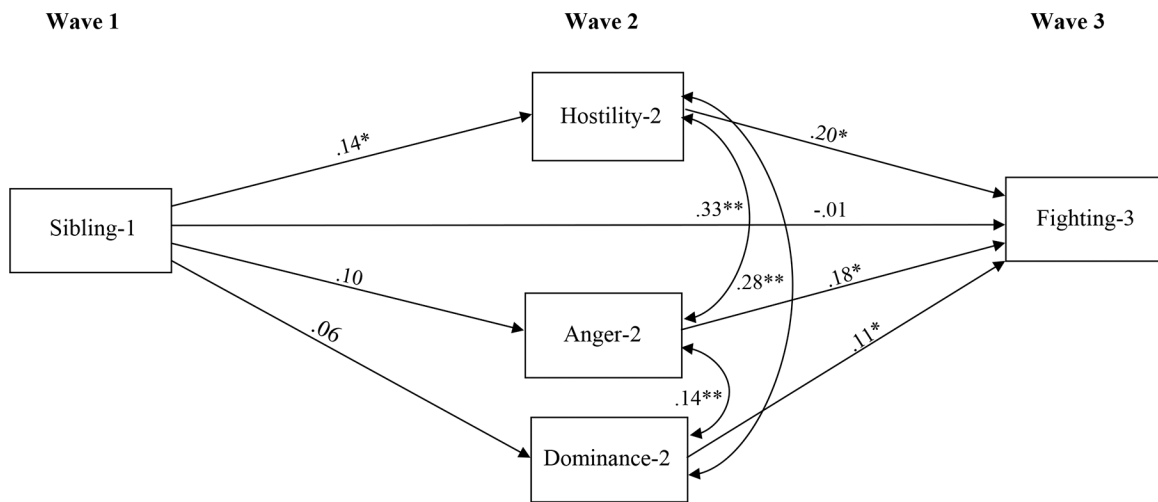


Figure 1. Path analysis of the sibling aggression–school fighting relationship with mediation by hostility, anger, and dominance

Note. Standardized beta coefficients are reported; Control variables and precursor measures are not shown; Sibling-1 = sibling aggression at Wave1; Hostility-2 = hostility at Wave 2; Anger-2 =anger at Wave 2; Dominance-2 = dominance at Wave 2; Fighting-3 = school fighting at Wave 3; $N = 713$.

* $p < .05$; ** $p < .001$.

Table 1
Demographic Characteristics and Correlations for the 17 Independent, Dependent, Mediator, and Control Variables

Variable	n	M	SD	Range	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	546	12.27	0.83	10-15	-.08	.09	-.10	-.02	-.07	.10	.28†	.17	.14	.10	.11	.09	.09	.12	.18†	.07
2. Sex	713	0.52	-	0-1	.02	.02	.01	.09	.12	.08	-.03	-.00	.13	.04	.17	.08	-.04	-.07	-.05	-.04
3. Race	713	1.68	-	1-2			-.17†	-.10	-.11	.02	.16	.06	.07	.06	.09	.09	.06	.11	.29†	.29†
4. Family Structure	713	0.30	-	0-1				.05	.08	-.07	-.09	.09	-.09	-.07	-.10	-.13	.03	-.01	-.08	-.14†
5. Social Support	393	12.40	3.74	0-18				.35†	-.09	-.09	-.10	-.01	-.12	-.14	-.04	-.06	.04	.07	-.15	-.12
6. Parental Monitoring	395	2.38	0.74	0-3						-.17	-.23†	-.15	-.19†	-.24†	-.14	-.11	-.14	-.02	-.24†	-.21†
7. Family Violence	392	1.31	1.25	0-5						.32†	.35†	.37†	.38†	.47†	.30†	.36†	.12	.14	.29†	.23†
8. Peer Delinquency	395	0.60	0.60	0-3									.41†	.32†	.29†	.24†	.20†	.17	.40†	.31†
9. Sibling Aggression	393	0.79	0.93	0-4										.40†	.43†	.32†	.29†	.22†	.45†	.27†
10. Hostility-1	393	0.81	0.78	0-3										.67†	.56†	.49†	.18†	.10	.38†	.33†
11. Hostility-2	713	0.76	0.76	0-3											.49†	.54†	.12	.29†	.31†	.41†
12. Anger-1	394	0.54	0.80	0-4											.50†	.25†	.22†	.52†	.30†	.30†
13. Anger-2	712	0.58	0.86	0-4												.20	.25†	.30†	.39†	.39†
14. Dominance-1	393	2.49	0.98	1-5													.48†	.30†	.15	.15
15. Dominance-2	712	2.54	0.98	1-5														.22†	.28†	.28†
16. Fighting-1	394	0.61	0.74	0-4																
17. Fighting-3	655	0.61	0.79	0-4																.39†

Note. Variable = study variables; n = number of participants with non-missing data; M = mean, SD = standard deviation; Range = range of scores in the current sample; Age = chronological age in years measured at Wave 1; Sex = 0 (male) or 1 (female); Race = 1 (White) or 2 (Nonwhite); Family Structure = 1 (two-parent home) or 0 (other than two-parent home) at Wave 1; Social Support = social support at Wave 1; Parental Monitoring = parental monitoring/knowledge at Wave 1; Family Violence = violence within the family at Wave 1; Peer Delinquency = peer delinquency at Wave 1; Sibling Aggression = sibling aggression at Wave 1; Hostility-1 = hostility at Wave 1; Hostility-2 = hostility at Wave 2; Anger-1 = anger at Wave 1; Anger-2 = anger at Wave 2; Dominance-1 = dominance at Wave 1; Dominance-2 = dominance at Wave 2; Fighting-1 = school fighting at Wave 1; Fighting-3 = school fighting at Wave 3.

* p < .00037 (Bonferroni-corrected alpha level; .05 / 136 correlations)

Table 2

Maximum Likelihood Path Analysis of Relationship between Sibling Aggression and Fighting at School as Mediated by Hostility, Anger, and Dominance

Predictor	b(95% CI)	β	z	p
Hostility-2 (Outcome)				
Sibling Aggression	0.116(0.036, 0.196)	0.143	2.82	.005
Age	-0.009(-0.071, 0.056)	-0.010	-0.28	.781
Sex	0.024(-0.071, 0.116)	0.016	0.50	.620
Race	-0.045(-0.149, 0.047)	-0.028	-0.90	.365
Family Structure	-0.039(-0.139, 0.065)	-0.023	-0.74	.456
Social Support	-0.008(-0.025, 0.009)	-0.041	-0.94	.347
Parental Monitoring	-0.095(-0.189, -0.006)	-0.094	-2.06	.039
Family Violence	0.071(0.007, 0.136)	0.117	2.17	.030
Peer Delinquency	0.028(-0.087, 0.148)	0.022	0.47	.641
Hostility-1	0.485(0.378, 0.594)	0.504	8.86	<.001
Anger-2 (Outcome)				
Sibling Aggression	0.092(-0.018, 0.213)	0.100	1.58	.114
Age	-0.005(-0.089, 0.077)	-0.005	-0.12	.903
Sex	0.048(-0.076, 0.169)	0.028	0.77	.443
Race	0.034(-0.095, 0.163)	0.018	0.52	.607
Family Structure	-0.162(-0.266, -0.052)	-0.087	-2.94	.003
Social Support	-0.005(-0.031, 0.019)	-0.023	-0.41	.679
Parental Monitoring	0.010(-0.130, 0.130)	0.009	0.16	.876
Family Violence	0.142(0.058, 0.223)	0.208	3.36	<.001
Peer Delinquency	0.058(-0.093, 0.221)	0.041	0.73	.464
Anger-1	0.362(0.216, 0.500)	0.337	5.04	<.001
Dominance-2 (Outcome)				
Sibling Aggression	0.058(-0.053, 0.175)	0.055	0.99	.320
Age	0.058(-0.041, 0.155)	0.049	1.15	.251
Sex	-0.107(-0.245, 0.030)	-0.054	-1.54	.124
Race	0.169(0.032, 0.312)	0.080	2.34	.019
Family Structure	0.005(-0.145, 0.154)	0.002	0.06	.949
Social Support	0.011(-0.013, 0.034)	0.041	0.91	.365
Parental Monitoring	0.082(-0.060, 0.225)	0.062	1.12	.262
Family Violence	0.071(-0.015, 0.153)	0.090	1.65	.099
Peer Delinquency	0.050(-0.158, 0.255)	0.030	0.48	.631
Dominance-1	0.447(0.351, 0.541)	0.447	9.03	<.001
Fighting-3 (Outcome)				
Hostility-2	0.206(0.076, 0.324)	0.200	3.28	.001
Anger-2	0.160(0.065, 0.271)	0.175	3.09	.002
Dominance-2	0.088(0.022, 0.154)	0.111	2.57	.010
Age	-0.063(-0.140, 0.016)	-0.067	-1.60	.110

Predictor	b(95% CI)	β	z	p
Sex	-0.060(-0.170, 0.054)	-0.038	-1.05	.292
Race	0.278(0.159, 0.392)	0.166	4.67	<.001
Family Structure	-0.092(-0.203, 0.017)	-0.054	-1.64	.100
Social Support	-0.007(-0.033, 0.016)	-0.035	-0.59	.557
Parental Monitoring	-0.050(-0.214, 0.107)	-0.047	-0.62	.538
Family Violence	-0.038(-0.119, 0.044)	-0.062	-0.95	.341
Peer Delinquency	0.147(-0.041, 0.344)	0.113	1.48	.138
Sibling Aggression-1	-0.010(-0.120, 0.118)	-0.012	-0.17	.868
Fighting-1	0.165(-0.010, 0.363)	0.158	1.75	.081
Hostility-2 with Anger-2	0.129(0.088, 0.183)	0.330	5.40	<.001
Hostility-2 with Dominance-2	0.126(0.085, 0.174)	0.275	5.57	<.001
Anger-2 with Domiance-2	0.086(0.039, 0.142)	0.142	3.33	<.001

Note. Outcome = outcome measure for specified regression equation; Age = chronological age in years measured at Wave 1; Sex = 0 (male) or 1 (female); Race = 1 (White) or 2 (Nonwhite); Family Structure = 1 (two-parent home), 0 (other than two-parent home) at Wave 1; Social Support = social support at Wave 1; Parental Monitoring = parental monitoring/knowledge at Wave 1; Family Violence = violence within the family at Wave 1; Peer Delinquency = peer delinquency at Wave 1; Sibling Aggression = sibling aggression at Wave 1; Hostility-1 = hostility at Wave 1; Hostility-2 = hostility at Wave 2; Anger-1 = anger at Wave 1; Anger-2 = anger at Wave 2; Dominance-1 = dominance at Wave 1; Dominance-2 = dominance at Wave 2; Fighting-1 = school fighting at Wave 1; Fighting-3 = school fighting at Wave 3; with = covariance; b(95% CI) = unstandardized coefficient and the lower and upper limits of the 95% confidence interval for the unstandardized coefficient (in parentheses); β = standardized coefficient; z = Wald Z-test statistic; p = significance level of the Wald Z-test statistic; $N = 713$.

Table 3

Total, Direct, and Indirect Effects for Pathways Running from Sibling Aggression at Wave 1 and Fighting at School at Wave 3

Pathways	BCBCI		
	Estimate	Lower	Upper
Total Effect	0.034	-0.071	0.161
Direct Effect	-0.010	-0.120	0.118
Total Indirect Effect	0.044	0.014	0.086
Specific Indirect Effects			
Sibling Aggression-1 → Hostility-2 → Fighting-3	0.024	0.007	0.055
Sibling Aggression-1 → Anger-2 → Fighting-3	0.015	-0.001	0.044
Sibling Aggression-1 → Dominance-2 → Fighting-3	0.005	-0.003	0.021
Preacher-Hayes Contrast Test			
Hostility vs. Anger	0.009	-0.020	0.040
Hostility vs. Dominance	0.019	-0.003	0.049
Anger vs. Dominance	0.010	-0.010	0.037

Note. Sibling Aggression-1 = sibling aggression at Wave 1; Hostility-2 = hostility at Wave 2; Anger-2 = anger at Wave 2; Dominance-2 = dominance at Wave 2; Fighting-3 = school fighting at Wave 3; Preacher-Hayes Contrast Test = test of the difference between the three indirect effects (hostility-mediated, anger-mediated, and dominance-mediated) using the test described in Preacher and Hayes (2008); BCBCI = bias-corrected bootstrapped 95% confidence interval ($b = 5,000$); Estimate = unstandardized point estimate; Lower = lower boundary of the 95% confidence interval; Upper = upper boundary of the 95% confidence interval; $N = 713$