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EMPIRICAL RESEARCH

Longitudinal Associations Between Sibling Relational Aggression and Adolescent Adjustment

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Abstract
Sibling relational aggression is an important but understudied dimension of sibling relationships that has potential implications for adolescents' adjustment. This study examined the longitudinal associations between being the target of sibling relational aggression and adolescent adjustment (i.e., depressive symptoms, risky behavior, self-worth, and romantic competence) among younger and older siblings over a three-year period in adolescence. The moderating roles of birth order, sibling gender, and sibling dyad gender constellation also were tested. Participants were 196 European American adolescent (firstborn-secondborn) sibling pairs who were 16.47 years (SD = 0.80) and 13.88 years (SD = 1.15) of age, respectively, at the onset of this study. Data were collected separately from each sibling during home interviews. Multilevel models revealed that being the target of sibling relational aggression was associated with all four adjustment outcomes at the *between-person* level, and with risky behavior and romantic competence at the *within-person* level. However, some of these effects were moderated by sibling dyad characteristics. Although often overlooked in the literature on adolescence, sibling relationship dynamics play a key role in youth development and adjustment.

Keywords: Adjustment · Gender · Relational Aggression · Siblings.

Introduction

Adolescence is an important developmental period to study the implications of relational aggression: Establishing close interpersonal relationships is a salient developmental task (Collins and Steinberg 2006; Sullivan 1953), and thus, problematic relationship behaviors may be particularly detrimental to adolescents' well-being. Relational aggression is characterized by behaviors that are intended to harm another by damaging the individual's close relationships via manipulation, exclusion, withdrawal of support/acceptance, and gossip or rumors designed to elicit rejection (Crick and Grotpeter 1995). A substantial body of research on peer relational aggression documents the negative implications for children's and adolescents' emotional well-being and psychosocial adjustment (Casper and Card 2017), but investigations of *sibling* relational aggression are rare, despite the centrality of siblings in adolescents' daily lives. Nearly 90% of individuals in the U.S. have a sibling (Milevsky 2011), and youth are more likely to grow up in a household with a sibling than with a father (McHale et al. 2012). Although the role of physical aggression in sibling relationships has received substantial attention (Khan and Rogers 2015; Krienert and Walsh 2011), relatively little is known about relational aggression in the sibling relationship.

Sibling relationships share some features of peer relationships, including for example, relatively more egalitarian power dynamics, when compared to adult-youth relationships (Buhrmester 1992; Updegraff et al. 2002). Yet, relationships among siblings also are different from peer relationships and friendships in a number of ways that make siblings a unique context for the study of relational aggression. First, sibling relationships are embedded in a shared family context and history; in childhood and adolescence youth spend more time in shared activities with siblings than with parents or peers and sibling relationships are the longest lasting relationships most individuals

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experience (McHale et al. 2012; Updegraff et al. 2005a). Second, sibling relationships are non-voluntary and not easily terminated when harmful behaviors such as relational aggression are prominent. Third, across cultural contexts, sibling relationships have been shown to be emotionally intense relationships, characterized by moderate to high levels of both positive and negative affect (Killoren et al. 2017; McGuire et al. 1996; McHale et al. 2007), and thus provide a distinct emotional context for relational aggression. Fourth, variations in the gender constellation of sibling relationships provide the opportunity to study how sibling relational aggression may differ within the context of same-gender versus mixed-gender dyads, as most research on peer relational aggression focuses on same-gender peers (Crick and Nelson 2002). Finally, sibling aggression is often considered normal and benign when compared to aggression by a friend or stranger (Khan and Rogers 2015), yet children and adolescents who experience sibling aggression also report mental health problems and future peer victimization (Tucker et al. 2013).

A small group of studies has examined sibling relational aggression in adolescence. Sibling relational aggression is negatively associated with (concurrent) emotional support and intimacy among siblings (Updegraff et al. 2005b), and has been shown to mediate the links between parental psychological control and adolescent adjustment problems (Campione-Barr et al. 2014). Using data from a three-year longitudinal study of European American adolescent siblings, the current study builds on this research by examining both between- and within-person associations between sibling relational aggression and adolescent adjustment. Between-person effects capture the (cross–time) average associations between relational aggression and adolescent adjustment, and the within-person associations document whether fluctuations over time in adolescents' relational aggression experiences are related to fluctuations in their adjustment, controlling for stable individual characteristics (Jacobs et al. 2002). In addition, sibling and sibling dyad characteristics (i.e., sibling gender, dyad gender constellation, birth order) were tested as moderators of these associations.

Sibling Relational Aggression and Adjustment in Adolescence

Social learning theory guides much of the research on sibling relationships as interpersonal contexts for social and emotional development (McHale et al. 2012). From this perspective, siblings may influence one another by modeling and rewarding each other's behaviors (Bandura 1977). Consistent with social learning tenets (Bandura 1977), research documents that sibling relationships provide opportunities for the development of antisocial and problematic behaviors through practice and reinforcement of aggressive and coercive behaviors (Patterson et al. 1984). Further, increases in the frequency and amplitude of coercive sibling exchanges over time may reinforce behavior patterns, such as aggression, that are further generalized to interactions with peers (Patterson et al. 1984; Stormshak et al. 1996). Given that adolescence is a time when interpersonal relationships are of key developmental significance (Sullivan 1953; Wentzel and McNamara 1999), relationally aggressive behaviors intended to damage or destroy these relationships may be particularly detrimental to youth well-being. In this study, we examined the links between relational aggression and four indicators of adjustment that represent key domains of well-being in adolescence (Harter 1988; Zahn-Waxler et al. 2008): depressive symptoms, risky behaviors, perceived self-worth, and perceived romantic competence.

Depressive Symptoms

Adolescence is a developmental period marked by increases in internalizing symptoms (Zahn-Waxler et al. 2008). Studying sibling relational aggression in early to middle adolescence, Yu and Gamble (2008) provided cross-sectional evidence that older siblings' reports of sibling relational aggression were related to their own and to their younger siblings' internalizing problems in early adolescence; in contrast, younger siblings' reports of relational aggression were not associated with their own or their siblings' internalizing problems. In another cross-sectional study, sibling relational aggression predicted adolescents' reports of depressive symptoms and anxiety and mediated the link from maternal psychological control to adolescents' depression and anxiety (Campione-Barr et al. 2014). Looking more generally at adolescent sibling relationship dynamics, longitudinal changes in conflict (Kim et al. 2008) and reactive aggression (Tucker et al. 2015) were linked over time to adolescents' depressed mood. Extending this work and using a longitudinal design, this study tested the hypothesis that adolescents who experienced more frequent sibling relational aggression would report more depressive symptoms across time.

Risky Behavior

Longitudinal research on the links between physical and relational aggression among peers and delinquent behaviors suggests that youth who are both physically and relationally aggressive are more delinquent than youth who are not aggressive or who display only one form of aggression (Crick et al. 2006). Further, from a social interactional perspective, there is evidence that coercive sibling exchanges are related to youth problem behavior in the

school and peer settings (Bank et al. 2004; Patterson et al. 1984). Although there is no research that examines whether being a target of sibling relational aggression is linked to externalizing problems, some work shows that physical aggression towards one's sibling predicts externalizing problems longitudinally, accounting for pre-existing externalizing problems and mothers' punitive parenting and using a genetically-sensitive design (Natsuaki et al. 2009). Additionally, a meta-analysis on sibling relationship quality and psychopathology suggests that sibling conflict has stronger effects on internalizing and externalizing problems than either sibling warmth or differential parenting (Buist et al. 2013). Expanding research in this area, we tested the hypothesis that youth who experienced more sibling relational aggression would report more frequent risky behavior.

Perceived Self-worth

Adolescence is also an important time for the development of sense of self (Harter 1988) and when the formation of intimate relationships with peers and romantic partners is salient (Sullivan 1953). As relational aggression aims to harm others via damage to their interpersonal relationships (Crick and Grotpeter 1995), it may have implications for adolescents' self-worth. Indeed, being the target of peer relational aggression has been linked concurrently to lower levels of self-esteem for adolescent girls, and being the perpetrator of relational aggression is associated with lower self-esteem for both boys and girls (Prinstein et al. 2001). In the sibling relationship, research suggests that conflicts between siblings in the personal domain (e.g., borrowing something without permission) are associated with lower self-esteem (Campione-Barr et al. 2013). Based on this work, we tested the prediction that youth who experienced more sibling relational aggression would report lower self-worth.

Perceived Romantic Competence

Perceived romantic competence refers to individuals' ideas about how proficient they are in attracting a romantic partner and engaging in satisfying romantic relationships (Bouchey 2007). Interest and involvement in romantic relationships develops across adolescence and correspondingly, is increasingly tied to self-worth (Collins 2003). Thus, romantic competence is an important domain during this developmental period. In relation to sibling dynamics, prior research has shown that sibling conflict was associated with lower levels of romantic intimacy for girls, and that sibling control (i.e., dominant behaviors) predicted more perceived power in heterosexual romantic relationships (Doughty et al. 2015a). However, the link between sibling relational aggression and romantic relationship competence remains unknown. Based on this limited empirical literature, we tested whether adolescents who experienced sibling relational aggression would report less perceived competence in their romantic relationships.

Moderating Role of Sibling and Sibling Dyad Characteristics

The second goal of this study was to examine sibling and sibling dyad structural characteristics (i.e., sibling gender, dyad gender constellation, birth order) as moderators of the associations between sibling relational aggression and adjustment. Beginning with sibling gender, the limited research on gender differences in sibling relational aggression in adolescence suggests that sisters and brothers do not differ in the frequency of relational aggression (Campione-Barr et al. 2014; Updegraff et al. 2005b). Yet, whether there are gender differences in the associations between sibling relational aggression and adjustment is unknown. Looking to research on the linkages between peer relational aggression and adolescent adjustment, gender differences have emerged for some dimensions of adjustment, but not others. Prinstein et al. (2001) showed, for example, that being the target of peer relational aggression in adolescence was related to boys' and girls' internalizing symptoms, but only to girls' externalizing problems. However, a recent meta-analysis suggests that being the target of peer relational aggression is associated with lower levels of perceived social support and higher levels of internalizing and externalizing problems for *both* girls and boys in childhood and adolescence (Casper and Card 2017). Given the inconsistencies and gaps in the literature, we explored whether being the target of sibling relational aggression was differentially linked to adjustment for boys versus girls. As adolescence is a period when gender differences in adjustment become more pronounced such that girls exhibit more internalizing and boys exhibit more externalizing symptoms (Zahn-Waxler et al. 2008), we expected that relational aggression would be more strongly linked to boys' risky behaviors and girls' depressive symptoms. The test of moderation by gender was viewed as exploratory for adolescents' perceived self-worth and romantic competence, however, as existing research and theory were too limited to make specific predictions.

We also tested the moderating role of sibling dyad gender constellation. Social learning tenets suggest that observational learning and modeling of a sibling's behavior is more likely to occur under particular conditions, such as when the model is more similar in personal characteristics or interests (e.g., Tucker et al. 2008), expresses nuturing behavior (Tucker et al. 1999), or holds higher status, such as being the older sibling in the dyad (Abramovitch et al.

1979). In line with these tenets, cross-sectional research in late childhood/early adolescence found that younger (secondborn) sisters reported greater empathy when their older siblings were more empathic (Tucker et al. 1999). Additionally, peer relational aggression has been studied largely within the context of *same*-gender peer relationships (Crick and Nelson 2002). Thus, the variation in sibling dyad gender constellation provides a unique opportunity in the study of relational aggression. Only one study has examined sibling gender constellation effects and found no evidence of moderation in the cross-sectional links between relational aggression and internalizing symptoms among young adolescent siblings (Yu and Gamble 2008). We expanded on this work to test whether gender constellation moderated the links between sibling relational aggression and other domains of adjustment from early through late adolescence. Given the limited literature, these tests were largely exploratory. As noted, however, social learning tenets and prior research (Doughty et al. 2015b; Ickes and Turner 1983) suggest that the links between sibling relational aggression and (heterosexual) romantic relationship competence may be stronger for siblings in mixed-gender versus same-gender relationships. This mixed-gender sibling context may provide the opportunity to practice relationship skills and learn about the other gender. With regard to birth order, prior research shows that older siblings are more likely to influence younger siblings than the reverse (McHale et al. 2001; Tucker et al. 1999). Thus, in the present study, we hypothesized that sibling relational aggression – adjustment linkages would be stronger for younger than for older siblings (McHale et al. 2012).

Current Study

This study addressed two goals. First, we investigated the longitudinal within- and between-person associations between experiencing (i.e., being the target of) sibling relational aggression and youth adjustment, using data spanning a three-year period in adolescence. Drawing on social learning theory and prior research, we predicted that more frequent experiences of sibling relational aggression would be linked over time to more depressive symptoms and risky behavior and lower levels of general self-worth and perceived romantic competence. Second, we tested whether sibling gender, sibling dyad gender constellation, and birth order moderated these linkages. Here we predicted that the longitudinal associations between relational aggression and adjustment would be stronger for younger (secondborn) siblings, for girls' depressive symptoms and boys' risky behavior, and for the romantic competence of youth from mixed-gender sibling dyads.

Method

Participants

The data came from a larger longitudinal study of family relationships and youth development. Participants were recruited through letters sent home to fourth and fifth-grade students in 16 school districts in the northeastern US. The letters described the study and criteria for participation (i.e., firstborn child in 4th or 5th grade with a secondborn sibling one to four years younger, and an intact marriage) at the time of recruitment. Interested families returned a postcard, and of those families who were eligible and responded, over 90% agreed to participate ($N = 203$). Data for the present analyses included the 196 sibling pairs who participated in waves 6, 7, and 8 of the study (97% of the larger sample), when measures of sibling relational aggression were collected. The six sibling pairs that were excluded did not provide data at waves 6, 7, and 8. For our purposes here, we refer to these waves as Times 1, 2, and 3 (T1, T2, T3) hereafter.

The sample was 95.5% White (4.5% other), corresponding with the racial composition of the region where the study was conducted (85% White; U.S. Census Bureau 2000). At T1, more than 80% of mothers and fathers had completed high school, and their average education levels were 14.58 years (SD = 2.15) and 14.67 years (SD = 2.43), respectively on a scale where 12 = high school graduate, 15 = some college and 16 = college graduate. Between recruitment and T1, six families experienced a parental separation or divorce and five families experienced a parental death. Median family income at time of recruitment was $55,000 (SD = $28,613), which was similar to the median income for married-couple families in the state ($55,714; U.S. Census Bureau 2000), and median family income at T1 was $78,489 (SD = $35,060). The average family size was 4.55 (SD = 0.75), with 113 families including only the two target siblings, and 80 families including at least one additional sibling. Older (firstborn) and younger (secondborn) siblings were 16.47 (SD = 0.80) and 13.88 (SD = 1.15) years of age at T1, 17.34 (SD = 0.80) and 14.77 (SD = 1.16) years at T2, and 18.38 (SD = 0.78) and 15.78 (SD = 1.13) years at T3, respectively. There were almost equal numbers of female (51.7%) and male (48.3%) siblings, and same-gender (48.3%) and mixed-gender (51.7%) sibling dyads. On average, siblings were about two-and–one-half years apart in age ($M = 2.61$, SD = 0.88).

Procedure

After obtaining informed consent and assent forms (for siblings under age 18), data were collected in home

interviews. Questions were read aloud, and siblings' responses were recorded on paper surveys. Interviews were conducted separately with each sibling and lasted an average of 2 h. The current study included siblings' ratings of their experiences of relational aggression and adjustment outcomes that were assessed at the same three time points as relational aggression. Families received $200 honorariums for participating at each time point.

Measures

For all study measures, higher scores indicated higher levels of the targeted construct. Given that Cronbach's alphas were acceptable for all time points for both siblings, only the range is reported.

Sibling relational aggression

Older and younger siblings completed a six-item scale to assess their perceptions of being the *target* of relationally aggressive behaviors by their sibling in the past year (O'Brien and Crick 1995; Updegraff et al. 2005b). Items were rated on a 5-point Likert scale (1 = *never;* 5 = *very often*) to indicate the frequency of each event (e.g., "he/she leaves me out of things when he/she is mad at me"). Items were summed to create a measure of the overall frequency of relational aggression from one's sibling. Prior principal components analyses (Updegraff et al. 2005b) showed that this scale captured a distinct dimension of sibling relationships from intimacy and conflict. Cronbach's alphas ranged from .74 to .83.

Depressive symptoms

Depressive symptoms were assessed using a 10-item version of the Children's Depression Inventory (Kovacs 1985). Items were rated on a 3-point scale using three statements for each item (e.g., 0 = *I am sad once in a while;* 1 = *I am sad many times*; 2 = *I am sad all the time*) to describe the frequency of experiences over the past week. Items were summed to create the scale score, and higher scores indicated higher depressive symptoms. Cronbach's alphas ranged from .79 to .84.

Risky behavior

Older and younger siblings' risk behavior was measured using an adaptation of The Risky Behavior Scale (Eccles and Barber 1990). Items assessed how often each sibling engaged in 18 risky behaviors (e.g., use of alcohol, drugs, cigarettes, skipped a day of school) in the past year using a 4-point scale (1 = *never*; 4 = *more than 10 times*). Items were averaged, and higher scores indicated more risk behavior (alphas ranged from .87 to .91).

Perceived self-worth and romantic competence[1]

Perceived self-worth and romantic competence were assessed using subscales of the Self-Perception Profile (Harter 1988). For each subscale, siblings first identified which of two statements best described them and then indicated whether the statement was *really true* or *sort of true* of them. Sample items are "Some teenagers like the kind of person they are,—BUT—, Other teenagers often wish they were someone else," (Self-Worth) and "Some teenagers don't think the people they are really attracted to would want to date them,—BUT—Other teenagers think people they are attracted to would like to date them," (Romantic Competence). Items were rated on a 4-point scale and averaged. Cronbach's alphas ranged from .83 to .89 for self-worth and from .65 and .81 for romantic competence.

Moderators and covariates

Three sibling/dyad characteristics were included to test for moderation: sibling gender (0 = *female*; 1 = *male*); sibling dyad constellation (0 = *mixed-gender*; 1 = *same-gender*); and birth order (0 = *older*; 1 = *younger*). Covariates included sibling age spacing (i.e., older siblings' age in years minus younger siblings') and family socioeconomic status (SES), calculated as the average of mothers' and fathers' reports of their education and annual family income (after transformation to correct for skewness) using T1 standardized variables.

Analytic Strategy

To examine the associations between sibling relational aggression and siblings' adjustment (i.e., depressive symptoms; risky behavior, perceived self-worth, and perceived romantic competence) across three time points, we used a multilevel modeling (MLM) approach in SAS 9.3. MLM accounts for clustered data (time within sibling, siblings within families), accommodates missing data, and reduces biases in parameter estimates and standard errors (Enders 2010; Raudenbush and Bryk 2002).

We estimated three-level models (i.e., one set for each of the four outcomes) and conducted the analyses in two steps. First, we tested models to examine whether sibling relational

[1] At T3 only, older siblings who were involved with a romantic partner ($n = 139$) reported on the gender of their partner, and the majority of older siblings ($n = 133$) reported an opposite-gender partner. These questions were not asked of younger siblings. Thus, findings of this study likely generalize primarily to heterosexual romantic relationships.

aggression predicted each of the four outcomes (Models 1a–4a). Second, we included interactions to test whether these associations differed by sibling gender, sibling dyad gender constellation, and birth order (Models 1b–4b). At Level 1 (within individual over time), age was entered as the metric of time and centered at 16 years of age (the mean across siblings and across time points). We included polynomial age terms (e.g., linear, quadratic, cubic) to describe the development of each outcome variable. Only significant polynomial terms were retained in the final models. Two variables were calculated to examine sibling relational aggression-adjustment linkages, including both between- and within-person effects. The Level 1 (L1) *within-person* (WP) sibling relational aggression variable captured within-person variation, or how an individual deviated from his/her own cross-time average (i.e., group-mean centered); the Level 2 (L2) *between-person* (BP) sibling relational aggression variable captured between-person variation, or how the individual's cross-time average differed from the rest of the sample (i.e., grand-mean centered). Other variables that distinguished between siblings within a family, specifically, sibling gender and birth order, were included at L2. At Level 3 (L3) we entered family level variables, including sibling age spacing, dyad gender constellation, and the family SES covariate. Birth order, sibling gender, and dyad gender constellation were also tested as moderators, and significant interactions were retained in the final models (Aiken and West 1991). Further, intraclass correlation coefficients (ICCs) were calculated to assess the variance at each level of the models. ICCs ranged from .55 to .87 for within-person (L1), .05 to .30 for between-person (L2), and .18 to .42 for family-level effects (L3).

Results

Table 1 shows the means, standard deviations, and bivariate correlations among the study variables. Older and younger siblings' reports of relational aggression at all three time points fell below the midpoint (i.e., below 18) on the summed scale score (i.e., possible range from 6 to 30), indicating low levels of sibling relational aggression reported in this sample. There were no significant gender differences in older or younger siblings' experiences of relational aggression at T1, T2, or T3 (t-values ranged from 0.16 to 0.98, and p-values ranged from .33 to .87). Siblings' reports of risky behaviors and depressive symptoms also fell below the midpoint (i.e., below 45 and 10, respectively) of the summed scale scores (i.e., possible ranges 18 to 72 and 0 to 20, respectively), indicating low levels of risky behaviors and depressive symptoms among the adolescent participants. Siblings' ratings of perceived self-worth and romantic competence, in contrast, were above scale midpoints (i.e., above 2 on 1 to 4 scales), indicating high levels of perceived self-worth and romantic competence among the adolescent participants. Further, the majority of the correlations were significant, with more relational aggression associated with the outcomes in the expected directions (i.e., relational aggression associated with higher levels of reported depressive symptoms and risky behavior engagement, and lower levels of self-worth and romantic competence). In presenting the results of each model, only significant effects are discussed.

Depressive Symptoms

Gender and age spacing were significant covariates, such that girls reported more depressive symptoms than boys, and large age spacing between siblings was associated with more depressive symptoms (Table 2; Models 1a and 1b). At the between-person level, siblings who reported receiving more relational aggression also reported more depressive symptoms, on average. This effect was qualified by interactions with sibling gender and dyad gender constellation. Follow-ups revealed, as predicted, that the between-person effect of sibling relational aggression on depressive symptoms was significant for girls, $\gamma = 0.27$, SE = 0.04, $p = < .0001$, but not for boys, $\gamma = 0.07$, SE = 0.04, $p = .12$. The between-person effect also was significant for siblings in mixed-gender dyads, $\gamma = 0.27$, SE = 0.04, $p = < .0001$, but not for siblings in same-gender dyads, $\gamma = 0.06$, SE = 0.05, $p = .21$.

Risky Behavior

Gender and family SES were significant covariates, with boys reporting more risky behaviors than girls, and lower family SES associated with more risky behavior (see Table 2; Models 2a and 2b). The significant between-person relational aggression effect (Model 2a) was qualified by an interaction with birth order (Model 2b), such that younger siblings who reported receiving more relational aggression also reported more risky behaviors, $\gamma = 0.33$, SE = 0.09, $p < .0001$, but this association was not significant for older siblings, $\gamma = -0.40$, SE = 0.15, $p = .33$. Further, a significant within-person effect indicated that on occasions when siblings reported receiving more relational aggression than usual (i.e., compared to their own cross-time average), they also reported engaging in more risky behaviors than usual, and this effect was not moderated by birth order, dyad gender constellation, or gender.

Self-Worth

Gender, birth order, age spacing, and family SES were significant covariates, such that boys, older siblings, dyads with larger age spacing, and siblings from lower SES

Table 1 Correlations between study variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. RA T1	**.22****	.52***	.56***	.22***	.22**	.22**	−.16*	−.09*	−.26***	.21*	.16*	.29***	−.10	−.15*	−.16*
2. RA T2	.60***	**.36*****	.57***	.26***	.33***	.18*	.23*	.20*	−.30***	.14	.27***	.31***	−.08	−.04	−.11
3. RA T3	.62***	.65***	**.36*****	.10	.22*	.19*	−.08	−.16*	−.25***	.14	.16*	.32***	−.06	−.07	−.14
4. DS T1	.15*	.16*	.09	**.09****	.55***	.44***	−.58***	−.44***	−.40***	.25***	.28***	.28***	−.35***	−.30***	−.32***
5. DS T2	.16*	.16*	.14	.60***	**.13*****	.67***	−.31***	−.54***	−.49***	.22*	.32***	.26***	−.17*	−.30***	−.30***
6. DS T3	.13	.08	.16*	.43***	.46***	**.10*****	−.30***	−.44***	.64***	.07	.17*	.23**	−.19*	−.28***	−.42***
7. SW T1	−.21**	−.17*	−.12	−.60***	−.50***	−.32***	**.20*****	.47***	.38***	−.27***	-.25***	-.21**	.30***	.31***	.25***
8. SW T2	−.18*	−.24***	−.27***	−.43***	−.64***	−.39***	.59***	**.20*****	.66***	−.19*	−.22*	−.23*	.14	.58***	.44***
9. SW T3	−.18*	−.26***	−.27***	−.33***	−.47***	−.51***	.49***	.64***	**.17*****	−.14	−.24***	−.32***	.17*	.43***	.51***
10. RB T1	.01	−.07	−.03	.23**	.11	.12	−.15*	−.11	−.17*	**.25*****	.76***	.54***	.08	.13	.04
11. RB T2	.05	.03	.04	.26***	.21**	.12	−.19**	−.19**	−.25***	.83***	**.30*****	.79***	.05	.17*	.01
12. RB T3	.02	.09	.07	.17*	.15*	.14	−.09	−.14	−.27***	.63***	.78***	**.27*****	.08	.14	.01
13. RC T1	−.14	−.16*	−.10	−.43***	−.28***	−.18*	.48***	.43***	.30***	.13	.10	.15*	**.18*****	.47***	.37***
14. RC T2	−.17*	−.27***	−.25***	−.38***	−.38***	−.29***	.37***	.53***	.41***	.14	.12	.14	.64***	**.14*****	.66***
15. RC T3	−.04	−.08	−.16*	−.28***	−.28***	−.40***	.31***	.47***	.55***	−.02	−.03	.07	.51***	.59***	**.06***
OS *M*	11.68	11.03	10.60	2.28	2.20	1.99	3.32	3.13	3.19	26.66	27.92	29.35	2.67	2.59	2.67
OS SD	4.21	3.58	3.49	2.73	2.81	2.45	0.58	0.67	0.62	8.00	8.56	8.81	0.56	0.58	0.61
YS *M*	12.95	12.13	10.99	1.86	1.96	2.22	3.43	3.04	3.08	23.67	24.57	26.18	2.62	2.50	2.56
YS SD	4.21	4.33	4.11	2.41	2.75	2.83	0.52	0.68	0.68	6.30	6.67	7.98	0.45	0.58	0.61

Older sibling correlations are below the diagonal, younger sibling correlations are above the diagonal, and the bolded correlations on the diagonal are correlations between older and younger siblings

T1 Time 1, *T2* Time 2, *T3* Time 3, *RA* relational aggression, *DS* depressive symptoms, *SW* self-worth, *RB* risk behaviors, *RC* romantic competence, *OS* older siblings, *YS* younger siblings

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 2 Results from multilevel models with sibling relational aggression predicting adolescent adjustment

	Depressive symptoms		Risky behaviors		Self-worth		Romantic competence	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 4a	Model 4b
Fixed effects								
Intercept	0.53(0.43)	0.44(0.42)	−0.02(1.15)	−0.43(1.15)	0.17(0.11)	0.19(0.11)	0.00(0.10)	0.00(0.10)
Time								
Linear	−0.16(0.09)	−0.16(0.09)	1.44(0.15)***	1.44(0.15)***	−0.09(0.02)***	−0.09(0.02)***	−0.00(0.01)	−0.00(0.01)
Quadratic	−0.05(0.02)**	−0.06(0.02)**	–	–	0.02(0.00)***	0.02(0.00)***	–	–
Cubic	0.02(0.01)**	0.02(0.01)**	–	–	–	–	–	–
Covariates								
Sib. gender	−1.45(0.21)***	−1.46(0.20)***	1.68(0.55)**	1.69(0.54)**	0.17(0.05)***	0.17(0.05)***	0.15(0.05)**	0.15(0.05)**
Age-spacing	0.26(0.13)	0.30(0.13)*	−0.13(0.34)	−0.11(0.34)	−0.08(0.03)*	−0.09(0.03)**	−0.03(0.03)	−0.03(0.03)
Sib. DC	−0.18(0.23)	−0.18(0.22)	−0.53(0.60)	−0.54(0.60)	0.05(0.05)	0.05(0.05)	0.05(0.05)	0.05(0.05)
Family SES	−0.14(0.15)	−0.08(0.14)	−1.55(0.39)***	−1.53(0.40)***	0.09(0.04)**	0.08(0.04)*	0.06(0.03)	0.06(0.03)
Birth-order	−0.32(0.26)	−0.32(0.25)	0.05(0.70)	0.13(0.69)	−0.24(0.06)***	−0.24(0.06)***	−0.07(0.06)	−0.07(0.06)
Relational agg.								
BP RA	0.17(0.03)***	0.36(0.05)***	0.22(0.09)*	−0.15(0.15)	−0.05(0.01)***	−0.06(0.01)***	−0.02(0.01)**	−0.02(0.01)***
WP RA	0.04(0.03)	0.04(0.03)	0.15(0.06)**	0.15(0.06)**	−0.00(0.00)	−0.00(0.01)	−0.01(0.01)	−0.02(0.01)*
Interactions								
BP RA X DC	–	−0.20(0.06)**	–	–	–	−0.04(0.02)*	–	–
BP RA X BO	–	–	–	0.48(0.17)**	–	–	–	–
BP RA X Gender	–	−0.19(0.06)**	–	–	–	–	–	–
WP RA X BO	–	–	–	–	–	–	–	0.02(0.01)*
Random effects								
L1 residual	3.15(0.17)***	3.16(0.17)***	17.01(0.93)***	17.00(0.93)***	0.17(0.01)***	0.17(0.01)***	0.14(0.01)***	0.14(0.01)***
L2 inter. var.	2.51(0.38)***	2.36(0.37)***	29.65(3.60)***	28.30(3.50)***	0.20(0.03)***	0.19(0.03)***	0.13(0.01)***	0.13(0.02)***
L3 inter/linear var.	–	–	5.48(0.89)***	5.52(0.88)***	0.00(0.01)	0.00(0.01)	0.01(0.00)**	0.01(0.00)**
L3 linear sl.	–	–	0.48(0.34)	0.52(0.34)	0.01(0.01)	0.01(0.01)	0.00(0.00)	0.00(0.00)
L3 inter/quad. var.	0.63(0.31)*	0.55(0.30)*	–	–	−0.02(0.01)**	−0.02(0.01)**	–	–
L3 linear/quad. var.	–	–	–	–	0.00(0.00)	0.00(0.00)	–	–
L3 quad. sl. var.	–	–	–	–	0.00(0.00)*	0.00(0.00)*	–	–
L3 inter/residual var.	–	–	6.36(2.54)**	7.23(2.55)**	0.04(0.02)*	0.04(0.02)**	0.03(0.01)*	0.03(0.02)*

Note Sib. = Sibling; DC = Dyad constellation; Agg. = Aggression; BP = Between-person effect; WP = Within-person effect; RA = Relational aggression; BO = Birth order; Family SES = Average of mothers' education, fathers' education, and annual family income; L1 = Level 1; L2 = Level 2; Inter. = Intercept; Var. = Variance; Sl. = Slope; Quad = Quadratic. Time centered at T1 mean age (16 years old). Gender coded 0 = female; 1 = male. Birth order coded 0 = older siblings; 1 = younger siblings. DC coded 0 = opposite-gender dyad constellation; 1 = same-gender dyad constellation. Dashed lines indicate non-significant interactions that were removed from final models

*$p < .05$; **$p < .01$; ***$p < .001$

families reported lower self-worth than girls, younger siblings, more closely spaced dyads, and siblings from higher SES families, respectively (see Table 2; Models 3a and 3b). At the between-person level, a significant main effect indicated that siblings who reported receiving more relational aggression also reported lower self-worth, on average, but this effect was qualified by a relational aggression by dyad gender constellation interaction. Follow-ups showed a stronger association for mixed-gender dyads, $\gamma = -0.06$, SE = 0.01, $p < .0001$, than for same-gender dyads, $\gamma = -0.03$, SE = 0.01, $p = .02$.

Romantic Competence

Gender was significant, such that boys reported greater romantic competence than girls (see Table 2; Models 4a and 4b). At the between-person level, siblings who reported receiving more relational aggression also reported lower perceived romantic competence, on average. At the within-person level, a significant effect of relational aggression on perceived romantic competence was qualified by an interaction with birth order: For older siblings only, receiving more relational aggression than usual (compared to their own cross-time average) was related to less romantic competence than usual, $\gamma = -0.02$, SE = 0.01, $p = .02$ (younger siblings, $\gamma = 0.002$, SE = 0.01, $p = .76$).

Sensitivity Analyses

We conducted several additional sets of analyses to test the robustness of our findings. First, we added family structure (0 = *two-parent* versus 1 = *divorced, separated, or deceased*) as a covariate and re-ran all analyses. This family structure variable was not a significant covariate in any of

the models and all findings remained the same as reported above. Next, we added a covariate to account for sibling structure (0 = *only target siblings* versus 1 = *one or more additional sibling*). This covariate, the presence of additional siblings in the family, was not significant in any model and did not change the findings. As a final step, we tested whether associations differed by the combination of adolescent gender and sibling dyad gender constellation by testing the three-way interactions (adolescent gender X sibling gender dyad constellation X between-person/within-person relational aggression), after adding relevant two-way interactions to each model. These analyses allowed us to examine whether sibling gender constellation (i.e., girls with sisters vs. brothers and boys with sisters vs. brothers) moderated these findings. There were no significant three-way interactions.

Discussion

Peer relational aggression has been associated with internalizing and externalizing difficulties during adolescence (Casper and Card 2017). As adolescence is a time in which interpersonal relationships are of great importance, relational aggression, which is intended to damage interpersonal relationships, may be particularly detrimental to youth development (Crick and Grotpeter 1995). However, relatively little is known about relational aggression in the sibling relationship, which is often the longest lasting relationship most individuals experience (McHale et al. 2012) and a context in which aggression is often deemed normal and benign (Khan and Rogers 2015). Building on a small body of prior research, the goals of this study were to examine the longitudinal associations between sibling relational aggression and adolescent adjustment, as well as possible moderation by sibling gender, sibling dyad gender constellation, and birth order, during the developmental period of adolescence. Guided by social learning theory and a small body of research, the findings of this study suggested that being the target of sibling relational aggression was associated with a range of adjustment outcomes in adolescence, albeit in *different* ways for boys versus girls, siblings in mixed- versus same-gender dyads, and older versus younger siblings. These findings contribute to a growing body of research highlighting the detrimental implications of sibling aggression on adolescent adjustment (Tucker et al. 2013) and suggest further examination of this relatively understudied dimension of sibling relationships.

For depressive symptoms, relational aggression at the between-person level (i.e., averaged across time to capture individual differences) was more strongly related to depressive symptoms for girls than boys. This study provides new insight regarding gender differences in the association between sibling relational aggression and depressive symptoms in adolescence, although the literature in this area is notably small. As close, intimate sibling relationships are more common among females than males (Kim et al. 2006; Updegraff et al. 2005a) and females are more sensitive to interpersonal relationship stressors during adolescence (Flook 2011; Leadbeater et al. 1999), experiences of sibling relational aggression may be more salient for females' as compared to males' adjustment. Identifying the sources of girls' vulnerability to sibling relational aggression, such as their physiological responses, stress reactions, and strategies for coping with interpersonal stressors, is one potential avenue for future research.

Linkages between relational aggression (at the between-person level) and both depressive symptoms and perceived self-worth varied by sibling dyad gender constellation, and highlighted the vulnerability of siblings in mixed-gender dyads to experiences as the target of relational aggression. There was a positive association between relational aggression and depressive symptoms only for siblings in mixed-gender dyads, and there was a stronger negative association between relational aggression and perceived self-worth among mixed-gender as compared to same-gender sibling dyads. As adolescence is a time when cross-gender friendships and romantic relationships are emerging (Collins et al. 2009), being the target of relational aggression within the context of a *mixed*-gender sibling dyad may be particularly salient for one's well-being. However, sibling relational aggression may not be related to one's perceptions of romantic competence, as we found no association between sibling relational aggression and romantic competence for mixed-gender dyads. Given that studies of peer relational aggression typically focus on same-gender friendships (Crick and Nelson 2002), studies of sibling relationships provide a unique opportunity to examine relational aggression—adjustment linkages in different naturally occurring gender constellations.

Sibling relational aggression was related to risky behavior involvement at both the within-person and between-person levels. At the within-person level, when adolescents reported more frequent experiences of relational aggression than usual (i.e., compared to their own cross-time average), they also reported more risky behaviors than usual. This pattern was consistent across siblings. As noted, a strength of this within-person approach is that stable individual differences are controlled, thus allowing us to rule out stable third variable explanations for the observed associations (Jacobs et al. 2002). These findings are consistent with the social interactional model (Patterson et al. 1984), which suggests that coercive sibling exchanges may lead to externalizing behaviors, and with research linking other dimensions of sibling negativity (e.g., conflict, control) and risk-taking behavior in adolescence (Solmeyer et al. 2014).

Adolescents who display relational aggression toward their siblings may apply these behaviors in other relational contexts, with implications for their friendship opportunities, and associations with less socially competent and deviant peers may lead to greater risk behavior (Solmeyer et al. 2014).

At the between-person level, sibling relational aggression was related to risky behavior for younger siblings only, such that higher average levels of relational aggression (across time) were related to higher average levels of risky behavior engagement. That this pattern emerged for younger siblings, but not for older siblings, may be explained by differences between siblings in birth order *or* age, two factors that are confounded in this study's design. One explanation for the between-person associations for younger siblings may be their inclination to look up to and model their older siblings, who have a more elevated status within the family hierarchy (McHale et al. 2012). Younger siblings' position in early adolescence also may be a factor given that this is a time when risky behaviors increase (Solmeyer et al. 2014; Zahn-Waxler et al. 2008). In fact, our prior work documenting growth curves for risk behavior engagement in this sample (Solmeyer et al. 2014) suggests higher levels and the greatest increases for younger siblings' risky behavior when compared to older siblings' behavior during early to middle adolescence. Thus, the combination of these birth order and age differences may explain the sibling differences (i.e., between- and within-person associations for younger siblings, and only within-person associations for older siblings). Disentangling birth order and age effects is a potential avenue for future research. More generally, the findings suggest that problematic dynamics within the sibling relationship may be an important risk factor in the emergence of externalizing behaviors during adolescence. Additionally, building on the peer relational aggression literature (Crick et al. 2006), future empirical work examining sibling relational aggression should account for other types of aggression (e.g., physical) within the sibling context. Further empirical work is necessary to delineate the mechanisms underlying these and other associations, including family dynamics (e.g., parenting and marital relationship dynamics) that may play a role in the development and maintenance of sibling relational aggression.

Turning to perceived romantic relationship competence, there was a significant within-person association between sibling relational aggression and romantic competence only for older siblings: on occasions when older siblings reported being the more frequent target of relational aggression from their younger siblings, they also reported lower romantic competence controlling for their own cross-time averages. Research suggests that older siblings are more likely to (a) be involved in romantic relationships (e.g., 70% of 18-year olds versus 50% of 15-year olds are involved in romantic relationships; Carver et al. 2003), and (b) have longer lasting romantic relationships (e.g. more than a year in late adolescence versus several weeks in early adolescence; Carver et al. 2003). Together, the prevalence and longer duration of romantic relationships (Carver et al. 2003) may make older siblings particularly vulnerable to the negative impacts of sibling relational aggression. Being the target of relationally harmful behaviors from a sibling may undermine self-confidence and developing perceptions of competence in romantic relationships, particularly during a time when romantic involvement is an emerging and salient developmental task (Collins et al. 2009). More generally, these findings suggest that sibling relationships, although often overlooked as influences on the development of adolescents' romantic relationships, deserve more empirical attention (Doughty et al. 2015a, b).

The findings of this study should be interpreted with both the strengths and limitations of the study in mind. A key strength of our study was the longitudinal design, which allowed us to capture both *between-* and *within*-person variations in the linkages between sibling relational aggression and adjustment and allowed us to control for possible third variable effects such as stable personality traits or response bias (Jacobs et al. 2002). Additionally, our longitudinal approach provided insights regarding how sibling relationally aggressive behaviors are related to adolescent adjustment during a time when interpersonal relationships and the development of a sense of self are of great importance, and internalizing and externalizing problems are becoming more pronounced (Zahn-Waxler et al. 2008). Further, we examined data from two siblings in each family, which enabled comparisons of the effects of relational aggression experienced by older and younger siblings and in mixed- and same-gender sibling dyads.

In addition to its strengths, several limitations should be noted. First, with our correlated self-reports, we cannot untangle whether sibling relational aggression gives rise to adjustment or whether adjustment gives rise to sibling relational aggression experiences. Teasing apart the direction of effects will be an important next step. Second, the sample was primarily European American, reflecting the population of the region where the data were gathered. Thus, in future work it will be important to consider whether sibling relational aggression is linked to adolescents' outcomes in other sociocultural contexts. For example, the implications of sibling relational aggression may be more pronounced in cultural contexts where the emphasis on family support is high. Third, as this study examined biological sibling pairs from two-parent married families, future research should explore sibling relational aggression in other family structures (e.g., single-parent, step families) as contextual factors may alter these associations (Deater-

Deckard and Dunn 2002). Fourth, our study only measured adolescents' experiences as the target of sibling relational aggression. As demonstrated in peer literature (Wang et al. 2009), adolescents may be the target, perpetrator, or both the target and perpetrator of relational aggression.

Future work should examine siblings' experiences as both targets and perpetrators of relational aggression to increase the understanding of how sibling relational aggression is related to adolescent well-being and adjustment. As this research is guided by social learning principles, future work may benefit by examining the effects of sibling relational aggression from parenting style and attachment perspectives, building on literature linking harsh parenting and uninvolved parenting to increased peer relational aggression use (Kawabata et al. 2011). As sibling relationships provide youth with their first opportunities to interact within a "peer-like" relationship (Dunn 1993), the exploration of sibling relational aggression as a mediator between parenting styles and attachment and peer relational aggression is an important next step.

Future research should also examine potential mediating processes that may link sibling relational aggression and adolescents' romantic competence, such as whether sibling relational aggression spills over to their romantic relationship behaviors, and thus reduces adolescents' experiences of competence in establishing and maintaining satisfying romantic relationships (Goldstein and Tisak 2004). It will also be important to move beyond a focus on romantic competence to study the effects of sibling relational aggression on the perceived qualities of romantic relationships in addition to relationship behaviors (Goldstein and Tisak 2004; La Greca and Harrison 2005; Leadbeater et al. 2008). Further, researchers should examine linkages between same-gender sibling relationships and same-gender romantic couples, as our current sample was virtually all heterosexual (Kan et al. 2008).

Turning to the link between sibling relational aggression and risky behavior, this finding builds on prior research linking sibling physical aggression and externalizing behaviors (Natsuaki et al. 2009) and provides new implications for practice. Intervention efforts aimed at enhancing sibling relationships to promote social competencies and prevent youth behavior problems (Feinberg et al. 2013; Feinberg et al. 2013) may benefit by identifying and addressing relational aggression within the sibling context. Interventions can target this overlooked relationship dynamic through the use of existing strategies, such as those aimed to increase communication, problem solving, and respect in the relationship (Durlak et al. 2011; Feinberg et al. 2013). Additionally, interventions designed to decrease relational aggression among peers (Leff et al. 2009) could be extended to address these same dynamics within the family context.

Conclusion

This study expands on the small body research examining sibling relational aggression and provides evidence of its negative associations with adjustment across adolescence using a longitudinal design and examining within-person fluctuations. Our findings contribute new insights about an often-neglected and understudied family relationship (McHale et al. 2012). At the most general level, our findings revealed that being the target of sibling relational aggression was associated with all four adjustment outcomes at the between-person level, and with risky behavior and romantic competence at the within-person level. However, the results revealed that the implications of sibling relational aggression differed across domains of adjustment and for siblings with different characteristics. For girls only, between-person fluctuations in sibling relational aggression were associated with higher levels of depressive symptoms. For younger siblings, between-person sibling relational aggression was associated with higher involvement in risky behavior, but for older siblings within-person fluctuations in sibling relational aggression were related to lower romantic competence. Together, these findings highlight the complex associations between sibling relational aggression and youth adjustment in adolescence. Moving forward, future intervention efforts to promote positive sibling relationship dynamics should attend to the role of sibling relational aggression as an often covert relationship dimension that has potentially negative implications for youth.

Data Sharing Declaration

This manuscript's data will not be deposited.

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Authors' Contributions AG conceived the study, performed the statistical analyses, and contributed to the writing of the manuscript. KU contributed to the conceptualization, interpretation of the findings, and the writing of the manuscript. JP performed statistical analyses and reviewed all drafts. SM oversaw the implementation and administration of the larger study in which the data are drawn and reviewed all drafts. All authors read and approved the final manuscript

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures involving human participants were in accordance with the ethical standards of the institution and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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