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Adolescent Academic Success: Teacher-Child Interactions as a Buffer for Early Childhood Relational Adversity

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Abstract

Focusing on the period of 54-months (i.e., 4.5 years) through age 15, the current study explored the longitudinal influence of early childhood relational adversity (i.e., low-quality mother-child relationship) on adolescents' academic achievement and the moderating role of high-quality teacher-child interactions. Participants included 1077 children from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development. Academic success outcomes were obtained from official high school transcripts (i.e., grade point average at ninth grade) and direct assessments of adolescents' cognitive abilities at age 15 (i.e., language, literacy, and mathematics). High-quality teacher-child interactions throughout elementary school (i.e., first grade, third grade, and fifth grade) were measured at the classroom level and assessed using an observational tool of emotional climate and classroom management. Analyses of data revealed a significant three-way interaction. High-quality teacher-child interactions throughout elementary school moderated the relation between early childhood relational adversity and adolescent math development for children from middle and upper-class families, but not for children from lower-class families. Furthermore, child gender was found to moderate the relation between high-quality teacher-child interactions and adolescent language development. Specifically, high-quality teacher-child interactions were positively associated with adolescent female language development but negatively associated with male language development. Implications for the findings, future research, academic programs, and interventions are discussed.

Highlights

- Longitudinally examined teacher-child interactions as a buffer for adverse academic outcomes due to early childhood relational adversity.
- The moderating effect of quality teacher-child interactions differed for children from different socioeconomic backgrounds.
- Child gender moderated the relation between high-quality teacher-child interactions and adolescent language development.
- Academic trajectories are malleable and highlight the importance of contextual supports on developmental outcomes.
- Social and cultural groups' gender ideology variations could influence teacher role expectations and interaction quality.

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High-quality parent-child relationships during early childhood help lay the foundation for children's development and influence children's ability to succeed academically (Alfaro et al., 2006; Cash et al., 2018; Gordon, 2016; Lowe & Dotterer, 2013). Conversely, low-quality parent-child relationships, particularly with mothers, increases the probability of future problems in development and have been found to negatively relate to academic success (Buehler & Gerard, 2013; Chung et al., 2020). For children

who face relational adversity in early childhood, it is important to identify protective factors against negative academic outcomes. The Developmental Systems Theory (DST) framework posits, among other tenets, that interactions among factors in the child's microsystem affect developmental outcomes (Lerner, 2006). Accordingly, DST suggests that when children receive a substantial amount of positive care from adults besides their parents (e.g., teachers) then these adults can become mutually influential in improving children's outcomes (Gibbons & Poelker, 2016).

Supportive teacher-child interactions throughout childhood buffer well-documented drops in motivation, engagement, and academic success throughout childhood due to early childhood adversity (e.g., unequal access to high-quality instruction and family conflict; Niehaus et al., 2012; Vagi, 2008). Despite these findings, there is a lack of research examining teacher-child interactions as a buffer for negative academic outcomes due to relational adversity (i.e., low-quality mother-child relationship) in early childhood. Thus, to augment our knowledge on adolescent academic resilience, the goal of the study was to determine if the relation between low-quality mother-child relationships in early childhood and adolescent academic success (i.e., GPA, language, literacy, and mathematics) was moderated by the quality of children's interactions with their teachers throughout childhood.

Mother-Child Relationship Quality and Adolescent Academic Success

Academic success is generally defined as children's demonstration of understanding academic information across various domains (e.g., math, science, history; DeRosier et al., 1994). Adolescent academic success is comprised of such skills as those applied in language, literacy, and mathematics. In addition to these skills, an adolescents' grade point average (GPA) reflects a combination of skills that are not understood or expressed by any individual assessment, including: academic knowledge, test performance, classroom engagement, and assignment performance (Bowers, 2011). According to Vygotsky (1978), one way that children develop higher-level cognitive functions is through social interactions with adults. The Zone of Proximal Development (ZPD) is the gap between what a child can do independently and what they can achieve when adults guide and assist them. Research has shown that when a child experiences a trusting and respectful relationship with a teacher, they are more likely to be motivated to learn from that individual and therefore will more easily access the ZPD (Kim & Schallert, 2011). Thus, positive relationships and quality interactions between adults and children are beneficial for children's development and influential on children's ability to succeed academically (Alfaro

et al., 2006; Cash et al., 2018; Gordon, 2016; Lowe & Dotterer, 2013). However, negative relationships, particularly with mothers, have been shown to be a risk factor within the child's environment that increase the probability of future problems in development and negative or undesirable outcomes (Buehler & Gerard, 2013; Chung et al., 2020). Due to the social context of learning, relational adversity in early childhood could hinder the foundation of children's cognitive development, impacting their long-term academic success.

Warmth and responsiveness are central components in a high-quality parent-child relationship and these types of relationships are positively related to children's academic success (Nelson, 2011). Conversely, low-quality parent-child relationships that are conflictual lack warmth and responsiveness. Research has shown relationships that are characterized by conflict are negatively related to children's academic skill development (Caputi et al., 2017; Hess et al., 1984; Iruka et al., 2010; Pianta et al., 1991). Although concurrent low-quality mother-child relationships appear to negatively impact children's academic outcomes during childhood and adolescence (Iruka et al., 2010; Schofield et al., 2012), there is limited longitudinal research showing that low-quality mother-child relationships in early childhood have lasting effects on adolescent academic success. One longitudinal study of 45 Italian children's relationships with their mothers in early childhood found that mother-child conflict during preschool was significantly associated with children's academic achievement four years later, which was assessed by children's performance on text comprehension, math tasks, and teacher's evaluations of their academic confidence (i.e., nine years old, third grade; Caputi et al., 2017). These findings shed light on the potential long-term effects of low-quality mother-child relationships in early childhood and highlight the need to investigate these longitudinal effects into adolescence.

Teacher-Child Interactions and Children's Development

A growing body of research indicates that the school environment is an important avenue that can actively buffer against negative family experiences (Patton et al., 2000). Similarly, DST suggests that the social interactions and bonds a child develops at school can act as a buffer against adverse life events and help promote healthy development (Werner & Smith, 1989). Researchers also have shown supportive teacher-child interactions to be beneficial for children at risk for poor school performance due to their status on functional and demographic indicators of risk. For example, for children with risk characteristics (e.g., behavior problems, low attention, unsupportive home environment), more high-quality teacher-child interactions

predicted better academic outcomes (Hamre & Pianta, 2005; Rudasill et al., 2010). Additionally, theories of motivation suggest that children who experience sensitive, responsive, and positive interactions with teachers are more motivated within the academic contexts of schooling (Eccles & Roeser, 2009). Research has shown that when students establish caring and supportive relationships through quality interactions with their teachers, they feel more connected, and report higher academic achievement (Blum et al., 2002). Additionally, teacher-child interactions provide opportunities for teachers to promote the reorganization of relational schemata and buffer children from adverse developmental outcomes associated with problematic early caregiving experiences (e.g., Zajac & Kobak, 2006). Further, emotional support provided by teachers serves as an arena for comfort and promotes academic resilience (i.e., students succeeding academically, despite being exposed to an adverse life circumstance; Crosnoe et al., 2004; Wang et al., 1998). These findings indicate that teachers can facilitate academic resilience for children with conflict in their family environment (Muller, 2001; Nettles et al., 2000).

Despite research suggesting that high-quality teacher-child interactions promote academic resilience, there is a lack of integrated research connecting teacher-child interactions throughout middle childhood and their influence on adolescents' academic success specifically for children who faced relational adversity (i.e., low-quality mother-child relationship) in early childhood. Additionally, much of the research on teacher-child relationships have relied on informant report, either by the teacher or the student (Davis, 2003). Although this method has been useful in advancing research, the use of observational measures of teacher-child interactions in the school environment has emerged as a valid and reliable approach to assessing unique aspects of classroom processes that contribute to adolescent development (Pianta & Allen, 2008). Specifically, observational assessments can capture specific instances (e.g., shared affect) within teacher-student interactions that are not provided in reports of relational quality and can also aid in clarifying the nature of such supports (Pianta et al., 2008). Therefore, we used observed teacher-child interactions in school to longitudinally examine whether quality high-teacher-child interactions serve as a protective resource that help children at risk for negative academic outcomes due to low-quality mother-child relationship in early childhood.

The Present Study

The study focused on the period of 54-months through age 15 (i.e., 4.5 years, first grade, third grade, fifth grade, and ninth grade/age 15). We examined the degree to which high-quality teacher-child interactions throughout elementary school (i.e., first grade, third grade, and fifth grade) moderated the relation between relational adversity (i.e., low-quality mother-child relationship) during early childhood (i.e., 54-months), and children's academic success in adolescence (i.e., GPA, language, literacy, and mathematics at age 15). Based on previous research, it was hypothesized that relational adversity in early childhood would be negatively associated with adolescent academic outcomes. It also was hypothesized that high-quality teacher-child interactions would be positively associated with academic outcomes and mitigate the negative relation between early childhood relational adversity and academic outcomes.

The strength of the hypothesized associations might depend in part on child and family characteristics. Children's gender and family socioeconomic status (SES) are consistently related to mother-child relationships, teacher-child interactions, academic success, and the association between these constructs. Illustratively, the associations between low-quality parent-child relationships and low-quality teacher-child interactions for school engagement have been shown to be stronger for males than females (Roorda et al., 2011). Additionally, research has shown that children reared in less affluent households are generally outperformed by their peers on measures of academic achievement (Reardon, 2011; Sirin, 2005). Furthermore, there is some evidence that the links between low-quality parent-child relationships (Yeung et al., 2002) and low academic achievement through high school (De Brey et al., 2019) have been stronger for children living in poverty during early childhood in comparison to their more affluent peers. These findings highlight the need to explore relations among the study variables (i.e., relational adversity, quality of teacher-child interactions, and academic success) within these broader contexts, including the child's gender and poverty status. Thus, exploratory analyses were conducted to examine gender and family SES during early childhood as potential moderators in all analyses. In addition to the child's gender and family SES, other child characteristics that have historically been related to academic success were included in analyses as control variables (i.e., child's race, mother's race, mother's education).

Method

Participants

Participants included children, teachers, and parents from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD). Families apart of NICHD SECCYD were recruited in hospitals in or near 10 sites: Little Rock,

AK; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA, and Madison, WI. In 1991, research staff visited 8986 mothers giving birth in these hospitals. Of the initial 5416 eligible mothers recruited, 1364 mothers and their families were randomly selected to be in the NICHD study and remained in the sample at the 1-month home visit. Of that original sample, only 1077 children who had complete mother reports on the Child Parent Relationship Scale (CPRS; see description of measure below) at 54-months were included in the study. Attrition analyses revealed that the children with complete CPRS data at 54-months ($n = 1077$), compared to those excluded from the analyses due to incomplete CPRS data at 54-months ($n = 287$), had mothers with higher levels of education [$t(1361)=4.99$, $p = 0.000$], and were more likely to have been white [$t(1362)=2.62$, $p = 0.009$]. There was no evidence of differences on SES. Additionally, the NICHD study had non-random attrition based on income over time, which has been well-documented in previous studies (e.g., Vandell et al., 2010).

Among the 1077 children included in the study, 50.5% were male. Children were primarily White (82.7%), with some African American (11.3%), Other (4.3%), Asian or Pacific Islander (1.4%), and American Indian (0.3%). Mothers of the children in the sample were majority White (84.6%), followed by African American (11.1%), Asian or Pacific Islander (2.2%), Other (1.5%), and American Indian (0.6%). Most of the children (94.4%) were non-Hispanic, and the majority of the children's mothers (96.1%) were non-Hispanic. Maternal education ranged from 7 to 21 years, with an average of 14.4 years. Family SES was measured using income-to-needs ratio at 54-months. The ratio was computed by dividing family income by the poverty threshold for each household (U.S. Department of Labor, 1994). The family poverty threshold was calculated based on the number of adults and children that live in the home. According to the U.S. Department of Labor, in 1994 the average poverty threshold for a family of 4 was $15,141. In our study, the income-to-needs ratio at 54-months ranged from 0.10 to 56.96 with an average of 3.59. Thus, 11.6% of the families in this study lived in a family below the poverty level (income-to-needs <1).

Procedures

The study focused on the period of 54-months through age 15 (i.e., 4.5 years, first grade, third grade, fifth grade, and ninth grade/age 15). Data were obtained via data collection tools that were pre-developed and validated that targeted the children's relationships (i.e., mother-child), interactions (i.e., teacher-child) and academic success (i.e., overall GPA at ninth grade; language, literacy, and mathematics skills at

age 15). Specifically, data were obtained through parent questionnaires, observations in schools, and direct assessments by trained data collectors at 54-months, first grade, fifth grade, ninth grade, and age 15. Schools also provided information about the children. Additional information and documentation regarding the data collection procedures and protocols are included in the Manuals of Operation of the NICHD SECCYD (NICHD Early Child Care Research Network, 1993).

Measures

Relational Adversity

Adversity faced in early childhood was measured using data obtained from the original 30-item Child-Parent Relationship Scale (CPRS) developed by Pianta (1992) for understanding parent-child relationships. The CPRS, which was adapted from the Student-Teacher Relationship Scale (STRS; Pianta & Steinberg, 1992), assesses how warmly parents view their relationship with their child. The CPRS questionnaire was completed by mothers and asked them to rate how applicable the statements were to their relationship with their child at 54-months of age on a 5-point Likert scale that ranged from "1 (definitely does not apply)" to "5 (definitely applies)". Two features of the relationship were studied: closeness and conflict. The closeness subscale is an index of the amount of warmth and communication that is present in the relationship (e.g., "I share an affectionate, warm relationship with this child"). The conflict subscale measured the extent to which the relationship is marked by hostile interactions (e.g., "This child and I always seem to be struggling with each other"). The items on the closeness scale were reverse coded then averaged with the conflict scale to create a low-quality relationship, or relational adversity, scale ($\alpha = 0.81$).

Teacher-Child Interactions

To measure teacher-child interaction quality throughout elementary school, we used observational data obtained from the Classroom Observation System for First Grade (COS-1), Third Grade, (COS-3) and Fifth Grade (COS-5; NICHD Early Child Care Research Network, 2002; NICHD Early Child Care Research Network, 2003). The COS, an early version of the Classroom Assessment Scoring System (CLASS; Pianta et al., 2008), is an observational tool of emotional climate and classroom management measured at the classroom level. Before rating classrooms, all coders underwent extensive reliability training. Training consisted of attending a workshop at which videos of actual classrooms were observed, discussed, and coded. All trainers read a manual with descriptions and examples of classrooms

scored at the various levels. In the reliability test, each coder watched five 20 min segments of classroom interactions. Their scores were compared with master ratings. To be deemed reliable, 80% of a coder's ratings needed to be within 1 scale point of the master ratings. All coders met or exceeded this level of reliability before conducting observations. Observations took place in schools during the school day school for one full day, during first grade, third grade, and fifth grade, resulting in eight separate observations per student per year.

Using global ratings of emotional climate (e.g., shared positive affect) and classroom management (e.g., anticipates problem behavior) the COS measured the average teacher-child interaction quality children experienced. A mean score was created for COS-1, COS-3, and COS-5 indicating each child's average teacher-child interaction quality experienced across elementary school, with high scores reflecting a higher quality or more positive overall experience (NICHD Early Child Care Research Network, 2002). To assess potential differences between average quality versus cumulative quality, all analyses were also conducted with a sum score for positive teacher-child interaction quality across elementary school (i.e., at first grade, third grade, fifth grade). Results with cumulative teacher-child interaction scores were consistent with the results for average scores. Only the results for the average teacher-child interaction quality are reported.

Academic Success

Grade Nine Grade Point Average (GPA) Adolescents ninth grade GPA were extracted from official school transcripts and was computed as the average grades they received in math, science, English, and history/social studies. Letter grades were recoded to numerical equivalents using the following scale: $A+ = 4.33$, $A = 4.0$, $A- = 3.67$, $B+ = 3.33$, $B = 3.0$, $B- = 2.67$, $C+ = 2.33$, $C = 2.0$, $C- = 1.67$, $D+ = 1.33$, $D = 1.0$, $D- = 0.67$, $F+ = 0.33$, $F = 0.0$. GPA was not available in grades first, third, and fifth.

Cognitive Abilities To measure the student's verbal abilities, literacy, and mathematic achievement, direct assessments were conducted at age 15. Subscales of the Woodcock-Johnson Psycho-Educational Battery – Revised (WJ-R; Woodcock & Johnson, 1989) were used. The WJ-R is a wide-range, comprehensive set of tests for measuring cognitive abilities and achievement. In grades first, third, and fifth and at age 15, children completed the Picture Vocabulary (language skills; 58 items, $\alpha = 0.81$ at age 15) and Applied Problems (mathematic skills; 60 items, $\alpha = 0.87$ at age 15) subscales. The measures of literacy varied across middle childhood and adolescence. In first

grade children completed the Letter-Word Identification subscale and in third and fifth grades they were administered the Broad Reading subscale, which adds assessment of Passage Comprehension to Letter-Word Identification. At age 15 adolescents were administered the Passage Comprehension (literacy skills; 35 items, $\alpha = 0.83$) subscale. Standard scores, based on a mean of 100 and a standard deviation of 15 and the equivalent percentile rank, were used.

Data Analysis

Analyses were conducted using M*plus*7 (Muthén & Muthén, 1998–2012). At 54-months, 1077 of the 1364 children had complete mother-child data on the CPRS. To determine whether the children with complete CPRS data were comparable to the children with missing CPRS data, an attrition analysis was conducted by comparing demographic measures. The children with complete CPRS data at 54-Months ($N = 1077$), compared to those with missing CPRS data at 54-months ($n = 287$), had mothers with higher levels of education [$t(1361)=4.99$, $p = 0.000$], and were more likely to have been white [$t(1362)=2.62$, $p = 0.009$]. At age 15 (ninth grade), 608 of those 1077 children with complete CPRS data had complete data on the outcome measures of interest (i.e., academic success). To determine whether the children with complete academic success data ($n = 608$) were comparable to the children with missing academic success data at age 15 ($n = 469$), a second attrition analysis was conducted by comparing demographic measures. The children with complete data at age 15 ($n = 608$), compared to those with missing data ($n = 469$), were more likely to be male [$\chi^2(1)=3.92$, $p = 0.048$], had mothers with higher levels of education [$t(1075)=2.76$, $p = 0.006$], were somewhat more likely to have higher SES [$t(1061) = 2.24$, $p = 0.025$], and were more likely to have been white [$t(1075)=2.85$, $p = 0.005$]. To address missing data, all models were estimated using a Full Information Maximum Likelihood (FIML) estimator for the full sample ($N = 933$). The variables that significantly differed (i.e., child's race, mother's race, mother's education) were included in the model as covariates, in addition to the elementary school cognitive ability covariates, to increase the likelihood that the 'missing at random' (MAR) assumption is not violated (Enders, 2010).

To test the study hypotheses using a traditional regression framework, a stepwise approach was utilized. First, models were estimated including only the covariate variables (i.e., child's race, mother's race, mother's education) on each adolescent academic success measure (i.e., GPA, language, literacy, and mathematics). Next, a main effects models in which low-quality mother-child relationships at 54-months, high-quality teacher-child interactions

Table 1 Descriptive Statistics for LQMCR, HQTCI, and Academic Success Outcomes

Variable	Full Sample							
	n	*%*	*M*	*SD*	Min	Max	Skew	Kurtosis
Covariates								
Child Race (White)	1077	82.70%						
Maternal Race (White)	1077	84.60%						
Maternal Education	1077		14.41	2.48	7.00	21.00	0.11	−0.05
Child Gender (Female)	1077	49.50%						
Family Socioeconomic Status								
Income-to-needs	1063		3.59	3.17	0.10	56.96	5.73	77.75
LQMCR								
CPRS	1077		42.38	10.99	18.00	85.00	0.49	0.12
HQTCI								
COS-1,COS-3,COS-5	1023		31.00	7.49	5.11	40.50	−1.32	0.84
Outcomes (9th Grade; Age 15)								
GPA	674		3.05	0.70	1.00	4.00	−0.55	−0.33
Language (WJ-R Picture Vocabulary)	839		100.16	14.69	34.00	158.00	0.31	0.98
Literacy (WJ-R Passage Comprehension)	887		107.71	15.72	44.00	160.00	0.40	0.54
Mathematics (WJ-R Applied Problems)	838		103.03	14.14	48.00	168.00	0.78	1.46

Variable	Female							
	n	*%*	*M*	*SD*	Min	Max	Skew	Kurtosis
Covariates								
Child Race (White)	533	81.80%						
Maternal Race (White)	533	86.00%						
Maternal Education	533		14.51	2.46	7.00	21.00	0.15	0.04
Family Socioeconomic Status								
Income-to-needs	529		3.69	3.66	0.10	56.96	6.83	87.00
LQMCR								
CPRS	533		42.35	10.89	19.00	75.00	0.51	−0.06
HQTCI								
COS-1,COS-3,COS-5	510		31.51	7.21	5.56	40.50	−1.45	1.37
Outcomes (9th Grade; Age 15)								
GPA	354		3.20	0.67	1.00	4.00	−0.70	−0.36
Language (WJ-R Picture Vocabulary)	432		98.59	14.81	51.00	158.00	0.42	0.66
Literacy (WJ-R Passage Comprehension)	434		108.46	15.82	63.00	159.00	0.52	0.12
Mathematics (WJ-R Applied Problems)	431		101.65	13.81	51.00	167.00	0.81	1.43

Variable	Male							
	n	*%*	*M*	*SD*	Min	Max	Skew	Kurtosis
Covariates								
Child Race (White)	544	83.60%						
Maternal Race (White)	544	83.10%						

Table 1 (continued)

Variable	Male							
	n	%	M	SD	Min	Max	Skew	Kurtosis
Maternal Education	544		14.31	2.50	7.00	21.00	0.08	−0.14
Family Socioeconomic Status								
Income-to-needs	534		3.49	2.61	0.13	18.58	1.87	5.36
LQMCR								
CPRS	544		42.40	11.10	18.00	85.00	0.47	0.29
HQTCI								
COS-1,COS-3,COS-5	513		30.50	7.73	5.11	39.94	−1.21	0.43
Outcomes (9th Grade; Age 15)								
GPA	320		2.88	0.69	1.00	4.00	−0.45	−0.18
Language (WJ-R Picture Vocabulary)	407		101.82	14.40	34.00	155.00	0.23	1.54
Literacy (WJ-R Passage Comprehension)	404		107.45	15.58	44.00	160.00	0.22	0.93
Mathematics (WJ-R Applied Problems)	407		104.48	14.36	48.00	168.00	0.75	1.55

Note. $N = 1077$. *LQMCR* Low-Quality Mother-Child Relationship, *HQTCI* High-Quality Teacher-Child Interactions, *CPRS* Child Parent Relationship Scale, *COS-1* Classroom Observation System at First Grade, *COS-3* Classroom Observation System at Third Grade, *COS-5* Classroom Observation System at Fifth Grade, *GPA* Grade Point Average, *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Valid N (listwise) for Outcomes = 596

Note. $n = 533$. *LQMCR* Low-Quality Mother-Child Relationship, *HQTCI* High-Quality Teacher-Child Interactions, *CPRS* Child Parent Relationship Scale, *COS-1* Classroom Observation System at First Grade, *COS-3* Classroom Observation System at Third Grade, *COS-5* Classroom Observation System at Fifth Grade, *GPA* Grade Point Average, *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Valid N (listwise) for Outcomes = 310

Note. $n = 544$. *LQMCR* Low-Quality Mother-Child Relationship, *HQTCI* High-Quality Teacher-Child Interactions, *CPRS* Child Parent Relationship Scale, *COS-1* Classroom Observation System at First Grade, *COS-3* Classroom Observation System at Third Grade, *COS-5* Classroom Observation System at Fifth Grade, *GPA* Grade Point Average, *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Valid N (listwise) for Outcomes = 286

throughout elementary school, the child's gender, and their family SES (i.e., income to needs ratio), were included in addition to the covariate variables. In a third set of models, all potential interactions between low-quality mother-child relationships, teacher-child interactions, gender, and family SES including two three-way interaction terms (i.e., low-quality mother-child relationships x teacher-child interactions x gender and low-quality mother-child relationships x teacher-child interactions x family SES) were added. To control for family-wise error due to multiple comparisons, we used the stepdown Bonferroni procedure described by Holm (1979). This approach was used to obtain critical alpha levels. Only relations that reached significance using the critical alpha levels will be discussed in the results. Cohen's f^2 effect sizes were calculated to compare the predictive validity of each set of predictors across the covariate, main effects, and moderation effects models. If moderation was found, follow-up analyses were conducted to examine the simple slopes of the moderated effects (Aiken et al., 1991). All covariates and independent variables were allowed to correlate in all models. Due to differences in the scales between the predictor variables (i.e.,

mother child-relationships and teacher child-interactions) these variables were standardized prior to analyses.

Results

Preliminary analyses conducted using SPSS Version 25 examined the descriptive statistics, skewness, and kurtosis of all study variables for the full sample ($N = 1077$) and separately for female ($n = 533$) and male ($n = 544$) children (see Table 1). Correlations between and among the study predictors (i.e., low-quality mother-child relationship, high-quality teacher-child interactions, family SES) and outcomes (i.e., overall GPA at ninth grade; language, literacy, and mathematics skills at age 15) revealed significant associations between academic success outcomes and low-quality mother-child relationships, high-quality teacher-child interactions, and family SES (see Table 2). Relations between study variables varied slightly by child gender.

In the models examining all main effects, there was little support for the hypothesized relations between low-quality mother-child relationships and adolescent academic success

Table 2 Correlations Between and Among LQMCR, HQTCI, and Academic Success Outcomes

Variable	Full Sample						
	1	2	3	4	5	6	7
Family Socioeconomic Status							
1 Income-to-Needs	–						
LQMCR							
2 CPRS	−0.16***	–					
HQTCI							
3 COS-1,COS-3,COS-5	0.15***	−0.02	–				
Outcomes (9th Grade; Age 15)							
4 GPA	0.27***	−0.17***	0.18***	–			
5 Language (WJ-R Picture Vocabulary)	0.26***	−0.17***	0.15***	0.40***	–		
6 Literacy (WJ-R Passage Comprehension)	0.26***	−0.17***	0.13***	0.47***	0.70***	–	
7 Mathematics (WJ-R Applied Problems)	0.23***	−0.15***	0.18***	0.49***	0.59***	0.67***	–

Variable	Female/Male						
	1	2	3	4	5	6	7
Family Socioeconomic Status							
1 Income-to-Needs	–	−0.18***	0.11*	0.31***	0.34***	0.29***	0.32***
LQMCR							
2 CPRS	−0.14***	–	0.02	−0.16**	−0.25***	−0.24***	−0.24***
HQTCI							
3 COS-1,COS-3,COS-5	0.18***	−0.07	–	0.14**	0.11*	0.11*	0.17***
Outcomes (9th Grade; Age 15)							
4 GPA	0.25***	−0.18***	0.21***	–	0.35***	0.39***	0.49***
5 Language (WJ-R Picture Vocabulary)	0.23***	−0.10*	0.18***	0.48***	–	0.66***	0.56***
6 Literacy (WJ-R Passage Comprehension)	0.24***	−0.10*	0.14***	0.53***	0.75***	–	0.65***
7 Mathematics (WJ-R Applied Problems)	0.18***	−0.07	0.18***	0.53***	0.61***	0.68***	–

Note. $N = 1077$. *CPRS* Child Parent Relationship Scale, *COS-1* Classroom Observation System at First Grade, *COS-3* Classroom Observation System at Third Grade, *COS-5* Classroom Observation System at Fifth Grade, *GPA* Grade Point Average, *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Standardized beta estimates (standard errors) and *p*-values are reported. $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Note. Correlations between and among the study variables for children who are female ($n = 533$) are on the lower half of the diagonal and children who are male ($n = 544$) are on the upper half of the diagonal. *LQMCR* Low-Quality Mother-Child Relationship, *CPRS* Child Parent Relationship Scale, *HQTCI* High-Quality Teacher-Child Interactions, *COS-1* Classroom Observation System at First Grade, *COS-3* Classroom Observation System at Third Grade, *COS-5* Classroom Observation System at Fifth Grade, *GPA* Grade Point Average, *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Standardized beta estimates (standard errors) and *p*-values are reported. $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

outcomes (see Table 3). As expected, there was a significant negative effect between low-quality mother-child relationships and adolescent GPA, accounting for children's gender, race, maternal race, maternal education, and the quality of their interactions with teachers throughout elementary school. Also consistent with hypotheses was a significant positive relation between high-quality teacher-child interactions and adolescent mathematic abilities. As expected, having high-quality teacher-child interactions throughout elementary school was positively related to children's mathematics skills in adolescence, above and beyond the other study variables, and their mathematic abilities throughout elementary school. Although not hypothesized, there were also several significant relations between child

gender and various academic outcomes (see Table 3). Specifically, females had a higher GPA compared to males, yet males outperformed females on directly assessed academic measures (i.e., language and mathematics). Furthermore, there was a significant negative relation between family SES and children's mathematic abilities in adolescence. The Cohen's effect sizes for *R*-square change were small but significant for GPA ($f^2 = 0.07$) and WJ-R mathematics scores ($f^2 = 0.04$), indicating that the main effects model added predictive validity beyond the covariates for these outcomes.

In the models examining moderation effects, there were no significant interactions between high-quality teacher-child interactions and low-quality mother-child relationships

**Table 3** Regression Coefficients for All Models on Adolescents Academic Success

Model	GPA β	SE	p	(critical α)	Language WJ-R Picture Vocabulary β	SE	p	(critical α)	Literacy WJ-R Passage Comprehension β	SE	p	(critical α)	Mathematics WJ-R Applied Problems β	SE	p	(critical α)
Covariate Effects Models																
WJ-R (First[*])	–	–	–	–	0.16	(0.03)***	0.000	–	−0.02	(0.04)	0.570	–	0.19	(0.04)***	0.000	–
WJ-R (Third[*])	–	–	–	–	0.21	(0.03)***	0.000	–	0.26	(0.06)***	0.000	–	0.17	(0.04)***	0.000	–
WJ-R (Fifth[*])	–	–	–	–	0.45	(0.03)***	0.000	–	0.32	(0.05)***	0.000	–	0.40	(0.04)***	0.000	–
Child Race (White)	0.01	(0.05)	0.810	–	0.06	(0.03)*	0.019	–	0.09	(0.03)**	0.002	–	0.02	(0.04)	0.560	–
Maternal Race (White)	0.18	(0.05)***	0.000	–	0.01	(0.03)	0.621	–	0.02	(0.03)	0.550	–	−0.05	(0.04)	0.221	–
Maternal Education	0.41	(0.03)***	0.000	–	0.12	(0.02)***	0.000	–	0.20	(0.03)***	0.000	–	0.17	(0.03)***	0.000	–
Variance R^2 (SE)	0.22	(0.03)***			0.70	(0.02)***			0.48	(0.03)***			0.46	(0.03)***		
Main Effects Models																
Gender (Female)	**0.19**	**(0.03)***	0.000	(0.00)	−0.06	(0.02)**	0.005	(0.01)	0.00	(0.03)	0.902	(0.05)	−0.09	(0.03)***	0.001	(0.00)
Family SES	0.06	(0.03)	0.063	(0.01)	0.00	(0.03)	0.916	(0.05)	0.03	(0.03)	0.316	(0.01)	−0.06	(0.03)*	0.025	(0.01)
LQMCR	−0.08	(0.03)*	0.019	(0.01)	−0.02	(0.02)	0.465	(0.02)	−0.03	(0.03)	0.282	(0.01)	−0.01	(0.03)	0.611	(0.02)
HQTCI	**0.10**	**(0.05)***	0.023	(0.01)	0.04	(0.03)	0.167	(0.01)	0.04	(0.03)	0.214	(0.01)	**0.10**	**(0.03)**	0.002	(0.01)
Variance $R^2\Delta$ (f^2)	0.05	(0.07)			0.00	(0.01)			0.00	(0.01)			0.02	(0.04)		
Moderation Effects Models																
LQMCR X HQTCI	0.00	(0.03)	0.895	(0.03)	0.07	(0.03)*	0.015	(0.01)	0.04	(0.07)	0.549	(0.01)	0.03	(0.05)	0.464	(0.01)
LQMCR X GEN	−0.01	(0.05)	0.806	(0.01)	0.04	(0.03)	0.143	(0.01)	0.06	(0.04)	0.094	(0.00)	0.08	(0.03)*	0.023	(0.01)
HQTCI X GEN	−0.01	(0.06)	0.922	(0.05)	**0.10**	**(0.03)***	0.001	(0.00)	0.01	(0.04)	0.798	(0.02)	0.03	(0.04)	0.413	(0.01)
LQMCR X HQTCI X GEN	−0.01	(0.06)	0.878	(0.02)	−0.03	(0.03)	0.315	(0.01)	−0.05	(0.04)	0.258	(0.01)	0.01	(0.04)	0.780	(0.05)
LQMCR X SES	0.06	(0.03)	0.059	(0.01)	−0.01	(0.02)	0.640	(0.03)	−0.01	(0.03)	0.847	(0.03)	−0.07	(0.03)**	0.009	(0.01)
HQTCI X SES	−0.06	(0.04)	0.077	(0.01)	−0.04	(0.02)	0.078	(0.01)	0.02	(0.03)	0.599	(0.01)	0.01	(0.03)	0.723	(0.03)
LQMCR X HQTCI X SES	−0.01	(0.03)	0.708	(0.01)	0.06	(0.02)*	0.018	(0.01)	0.04	(0.04)	0.303	(0.01)	**0.11**	**(0.03)**	0.001	(0.01)
Variance $R^2\Delta$ (f^2)	0.01	(0.02)			0.01	(0.05)			0.00	(0.00)			0.01	(0.02)		

Note. First[*] = the corresponding outcomes measured in first grade for Language, Literacy, and Mathematics. Third[*] = the corresponding outcomes measured in third grade. Fifth[*] = the corresponding outcomes measured in fifth grade. Family *SES* Family Socioeconomic Status, *LQMCR* Low-Quality Mother-Child Relationship, *HQTCI* High-Quality Teacher-Child Interactions, *GEN* Gender of Child, *GPA* Grade Point Average. *WJ-R* Woodcock-Johnson Psycho-Educational Battery – Revised. Standardized beta estimates, standard errors, and *p*-values are reported for all models. Critical alpha values derived using the Holm-Bonferroni procedure (Holm, 1979) are also reported for the Main Effects and Moderation Effects Models. Bold indicates significance using the critical alpha values. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fig. 1 Moderated Effect of Child Gender on the Relation between HQTCI and Adolescents Language Scores. *Note.* HQTCI High-Quality Teacher-Child Interactions, WJ-R Woodcock-Johnson Psycho-Educational Battery – Revised. [*]$p < 0.001$
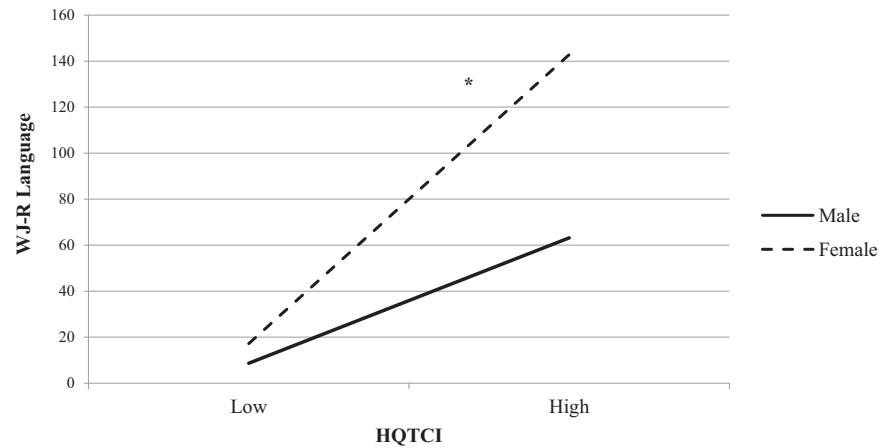
Fig. 2 Moderated Effect Between LQMCR, HQTCI, and Low Family SES on Adolescents Math Scores. *Note.* LQMCR Low-Quality Mother-Child Relationship, LQTCI Low Levels of Quality Teacher-Child Interactions, MPTCI Medium Levels of Quality Teacher-Child Interactions, HQTCI High Levels of Quality Teacher-Child Interactions, SES Socioeconomic Status, WJ-R Woodcock-Johnson Psycho-Educational Battery – Revised. [*]$p < 0.01$
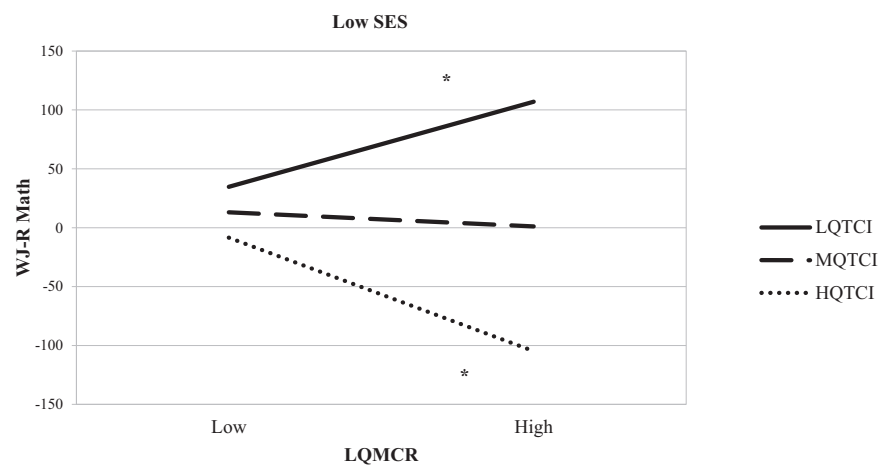
for adolescents' academic outcomes (see Table 3). Child gender and family SES during early childhood were also considered as potential moderators of all hypothesized relations (see Table 3). Child gender was found to moderate the relation between high-quality teacher-child interactions and adolescent language development (WJ-R language). There also was a significant 3-way interaction indicating significant moderation between low-quality mother-child relationships, high-quality teacher-child interactions, and family SES on adolescent math scores (WJ-R mathematics). The Cohen's effect sizes for the R-square change were significant when comparing the main effect and interaction models for both WJ-language and WJ-R mathematics outcomes ($f^2 = 0.05$ and 0.02, respectively).

Simple slopes were examined to determine the nature of the interactions between high-quality teacher-child interactions and child gender on adolescents' WJ-R language scores (Fig. 1). Simple slope analyses revealed that the relation between high-quality teacher-child interactions and WJ-R language scores in adolescence was significantly positive for females ($\beta = 0.10$, $p = 0.001$), but not males

($\beta = -0.03$, $p = 0.356$; Fig. 1). Simple slopes were also examined to determine the nature of the 3-way interactions between low-quality mother-child relationships, high-quality teacher-child interactions, and family SES on WJ-R mathematics scores. Interestingly, for children from low SES family backgrounds, there was a counterintuitive effect in which low-quality mother-child relationships were positively related to adolescent's math achievement scores for children with low-quality teacher-child interactions ($b = 1.08$, $p = 0.000$) and negatively related to adolescent's math achievement scores for children with high-quality teacher-child interactions ($b = -1.44$, $p = 0.000$; see Fig. 2). Consistent with hypotheses, for children from moderate (mean) to high (+1 SD) SES family backgrounds, high-quality teacher-child interactions buffered the negative effect of low-quality mother-child relationships on math achievement. In other words, for moderate and high levels of early childhood family SES, there was an absence of significant associations between low-quality mother-child relationships and math achievement in the medium to high-quality range of teacher-child interactions (see Figs. 3

Fig. 3 Moderated Effect Between LQMCR, HQTCI, and Moderate Family SES on Adolescents Math Scores. *Note.* LQMCR Low-Quality Mother-Child Relationship, LQTCI Low Levels of Quality Teacher-Child Interactions, MPTCI Medium Levels of Quality Teacher-Child Interactions, HQTCI High Levels of Quality Teacher-Child Interactions, SES Socioeconomic Status, WJ-R Woodcock-Johnson Psycho-Educational Battery – Revised. *p < 0.01
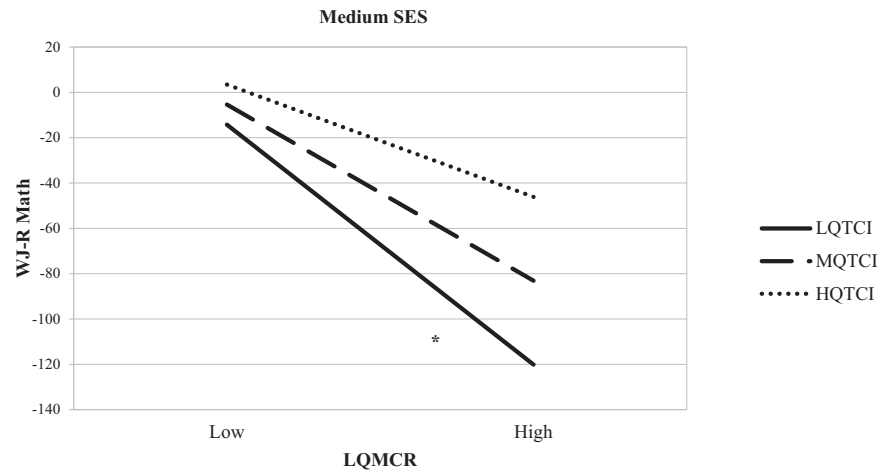
Fig. 4 Moderated Effect Between LQMCR, HQTCI, and High Family SES on Adolescents Math Scores. *Note.* LQMCR Low-Quality Mother-Child Relationship, LQTCI Low Levels of Quality Teacher-Child Interactions, MPTCI Medium Levels of Quality Teacher-Child Interactions, HQTCI High Levels of Quality Teacher-Child Interactions, SES Socioeconomic Status, WJ-R Woodcock-Johnson Psycho-Educational Battery – Revised. *p < 0.01
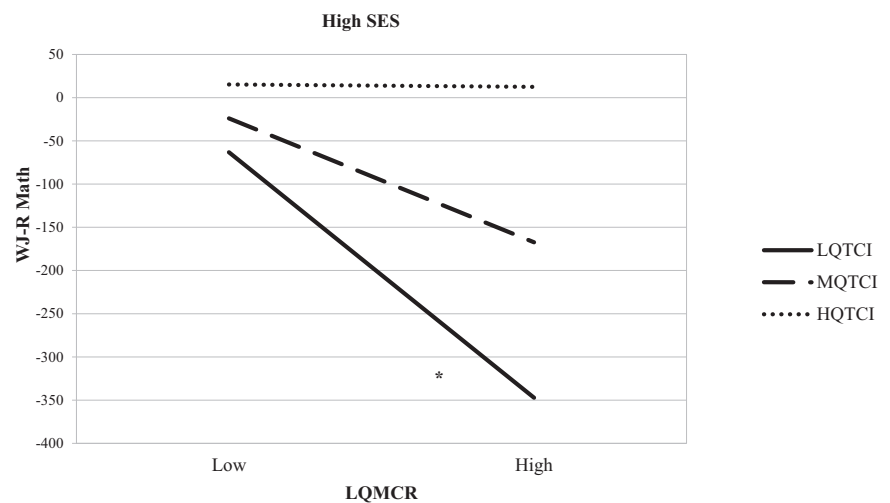
and 4). The significant negative relations between low-quality mother-child relationships and math achievement were present at low levels of teacher-child interaction quality for moderate ($b = -1.58$, $p = 0.000$) and high levels ($b = -4.24$, $p = 0.000$) of family SES, respectively; see Figs. 3 and 4).

Discussion

We examined whether high-quality teacher-child interactions moderate the association between children's low-quality mother-child relationships and academic success outcomes. There were several key findings that support the study's hypotheses. There was a direct relation between low-quality mother-child relationships and adolescent academic success (i.e., GPA). Furthermore, high-quality teacher-child interactions throughout elementary school were related to adolescent mathematic abilities. We also found that high-quality teacher child-interactions diminished the negative effects of low-quality mother-child relationships on math achievement

for children from middle- and upper-class families. However, this buffering effect was not found in children from families living in poverty (i.e., low SES). The findings in the present study add to our understanding of how early childhood mother-child relationship quality, elementary school teacher-child interaction quality, and family SES interact and are associated with adolescents' academic success.

In line with past research, low-quality mother-child relationships in early childhood are negatively related to adolescents' academic success (i.e., GPA). Although researchers have established the association between mother-child relationships and academic outcomes in elementary school (Caputi et al., 2017; Iruka et al., 2010), middle school (Camacho-Thompson et al., 2019), and high school populations (Alfaro et al., 2006), findings from our study help to establish the longitudinal link between relational adversity at 54 months and adolescents' academic outcomes in ninth grade. Specifically, findings indicate that low-quality relationships with mothers at 54 months are linked with students throughout their academic elementary and secondary education.

Despite the negative impact relational adversity can have on adolescents' ability to succeed academically, children demonstrate resilience by thriving in the face of adversity. According to Masten (2014), to foster resilience, positive factors, influences, and actions must be recognized which can result in a risk factor (i.e., relational adversity) being buffered. Our study demonstrates that positive teacher-child interactions can serve as an important buffer against adverse circumstances throughout elementary school. High-quality teacher-child interactions have been consistently found to relate to adolescent academic engagement and success (Benner et al., 2016; Farmer et al., 2011). Extending the prior literature, our study revealed significant main effects of having overall high-quality teacher-child interactions throughout elementary school on adolescents' mathematic abilities. Past research conducted in education settings has revealed that children experience gains in language skills when they experience high-quality teacher-child interactions (Burchinal et al., 2016; Hatfield et al., 2016). Yet, contrary to this research, the current findings showed no direct effect of high-quality teacher-child interactions on language or literacy development. However, according to Adachi & Willoughby (2015), effect sizes in longitudinal studies are often dramatically smaller in comparison to effect sizes in cross-sectional studies.

To examine the extent to which the quality of teacher-child interactions serve as a buffer for the relational adversity experienced in early childhood, we explored teacher-child interaction quality as a moderator. The hypothesized moderation was not supported for the overall sample. Follow-up analyses, however, revealed a significant three-way interaction between the quality of early childhood mother-child relationships, teacher-child interactions throughout elementary school, and family SES on adolescent math scores. To understand the significant moderation in our study, we turn to the cumulative risk perspective. Previous research shows that children have the potential to be academically resilient when exposed to only a single risk factor (Evans et al., 2013). The findings suggesting that high-quality teacher child-interactions were found to diminish the negative effects of low-quality mother-child relationships on math achievement for middle- and upper-class children support this perspective. In the face of a single adverse experience, high-quality teacher-child interactions were enough to buffer the negative effects of adversity for adolescent mathematic abilities. However, for children who experienced low-quality mother-child relationships and poverty, there was not a buffering effect. These findings indicate that multiple adverse experiences might be more difficult to overcome, regardless of the quality of teacher-child interactions throughout elementary school.

Consistent with previous research, findings from our study indicate that students from high-income and low-income backgrounds differ in their paths to academic success in STEM fields (Liu & Schunn, 2020). When adolescents from low SES families have poor-quality relationships with their teachers, poorer quality mother-child relationships were related to better mathematic abilities. Overall, 90% of the adolescents were categorized as in a medium to high range of family SES. Given that only about 10% of the sample was in the low SES range, there might be some other factors associated with the relations that we are not considering. For example, in line with Coll et al., (1996) integrative model for the study of developmental competencies in minority children, researchers have explored how social position variables (e.g., SES, ethnicity) are associated with minoritized students' experiences by creating alternative routes to competencies (e.g., academic outcomes). Thus, future researchers should consider measuring positive and negative parenting behaviors as separate constructs when working with students from low SES settings as researchers have found that standard approaches to measuring parenting do not apply to minoritized groups. For example, research with Latinx families has found that positive and negative parenting practices occur simultaneously (Bámaca-Colbert et al., 2018). Families from low SES backgrounds that exhibit both positive and negative parenting practices have adolescents who report (a) comparable levels of self-esteem as families who exhibit high levels of positive parenting and low levels of negative parenting practices and (b) higher levels of self-esteem as families who exhibited low levels of positive parenting behaviors and high levels of negative parenting behaviors (Bámaca-Colbert et al., 2018). It is possible that measuring one dimension of parenting might mask important contributions of parenting and alternative routes to competencies for youth from low SES backgrounds.

Although additional research is needed to confirm and explain these findings, these results help elucidate some of the factors underlying children's academic success. Most research examining environmental factors as moderators have focused on samples of ethnic minority children, from low SES families. However, the children in this sample are predominately white middle-class children who have faced low to mid-levels of adversity. Thus, the present study addressed the gap in literature and examined how the quality of school interactions (i.e., teacher-child) can be a protective resource for children who have faced less adversity than ethnic minority populations, but who potentially have differences in relationships with their family.

Exploratory analyses revealed differences in adolescent's GPA, language, and mathematic academic outcomes based on the child's gender. Previous research has shown that females tend to have more positive relationships with their teachers. Yet, across all genders, all children who are deemed at-risk are strongly influenced by positive

relationships with their teachers (Roorda et al., 2011). Consistent with prior research (Voyer & Voyer, 2014), females earned a higher GPA compared to males, while males outperformed females on all direct assessments. Furthermore, gender significantly moderated the relation between high-quality teacher-child interactions and adolescent language development. In particular, the relation between high-quality teacher-child interactions and language scores was positive for females, but negative for males. Different social and cultural groups vary in gender ideology which could potentially influence the different expectations for male and female teacher roles impacting the quality of the interactions between the teacher and the child.

Limitations and Directions for Future Research

The limitations of the study are worth noting as they provide valuable directions for future research. First, there are important variables and potential risk factors (e.g., child abuse and neglect, racial/ethnic discrimination) not captured in our study that might significantly influence the observed relations. For example, one potential risk factor excluded from our study was the quality of the father-child relationship. Following prior research on relational adversity, which is guided by an extended attachment perspective, our study focused on mother-child relationships. However, it would be consistent with attachment theory and the cumulative risk perspective to expect that low-quality father-child relationships also would be a risk factor for adolescents' academic success (Ainsworth et al., 2015). Therefore, future research should examine multiple risk factors, such as how low-quality father-child relationships impact on adolescents' academic success. Moreover, the study does not account for continued low-quality parent interactions during elementary school years which would suggests the potential for cumulative risks overtime. Encountering multiple risk factors can negatively impact an adolescent's developmental outcomes and undermine family functioning (Conger & Conger, 2008).

Overall, the children in the study might have faced fewer risk factors than the general population, thus reducing the generalizability of the results. Due to recruitment and selection criteria, the sample included in our study were majority White, English-speaking, middle-income children, and mothers. These characteristics do not reflect the rapidly growing racial/ethnic minority population in the United States which has been projected to constitute over 50% of all children by 2050 (Federal Interagency Forum on Child & Family Statistics, 2013). Additionally, ethnic minority youth often face additional race-related risk factors such as racial discrimination, which has been shown to be a significant risk factor for academic success (Alfaro et al., 2009; Martinez et al., 2004).

In addition to facing more risk factors overall, racial, ethnic, and cultural variations can produce a wide range of relational patterns which contribute to how families respond and adapt to adversity (Patterson, 2002). Research has shown that high-quality parent-child relationships are shaped by cultural norms which affect the meaning and importance of certain parenting behaviors (Crockett et al., 2007). Moreover, various dimensions of parent-child relationships are more salient in certain cultural groups than others. Therefore, the lack of one aspect of parent-child relationships in one culture could be presented as a risk factor, but in another context, it could be seen as a strong form of resilience. Understanding and considering these differences is critical to fully understand the relations among parent-child relationships and academic resilience as well as in designing effective interventions and treatments for all children.

A final limitation is the compositing of only a couple of years (i.e., first grade, third grade, fifth grade) of teacher-child interactions throughout elementary school. Children's interactions with their teachers and experiences in classrooms could be vastly different from day-to-day and year-to-year throughout elementary and middle school. Research has shown that when children have variability in the amount and quality of their interactions with their teachers throughout the school day, they experience more conflict, resulting in children being less engaged (Pianta & Allen, 2008; Reyes et al., 2012; Wentzel et al., 2010). Therefore, consistent exposure to high-quality teacher interactions is an important feature of children's school experiences throughout their childhood. Although the findings of the current research on children's average experience with teachers across elementary school, the compositing of several years of teacher-child interaction data may be obscuring important nuances related to variability. Multiyear longitudinal studies that observe teacher-child interactions throughout the school year may be an important starting point to address this issue.

Conclusions and Study Implications

Overall, the core findings from our study are in line with previous research demonstrating that high-quality teacher-child interactions in the school environment can actively buffer against an adverse experience (Spilt et al., 2012) and can generate and promote the capacity for resilience among adolescents (Olsson et al., 2003). Additionally, the malleability of children's academic trajectories provides support for DST that highlight the importance of contextual supports (e.g., high-quality teacher-child interactions) on children's developmental outcomes (Ford & Lerner, 1992).

Findings from the present study have important implications from an educational perspective. Indeed, at a more

practical level, findings from our study shed new light on the possible effects of interventions aimed at building and strengthening teacher-child interactions. Results suggest that it is possible to mitigate the effects of low-quality parent-child relations, as they provide further evidence that high-quality teacher-child interactions are important and contribute to an adolescent's ability to be academically resilient. This seems to only be true, however, for children who are not facing other forms of adversity such as poverty.

Findings support the need for targeted interventions that either reduce children's exposure to early relational adversity or that increase children's exposure to protective factors, such as high-quality teacher-child interactions. For children from lower SES families, it is unclear what other factors may be at play in the significant relation between low quality mother-child relationships and positive academic outcomes. Nevertheless, previous research consistently demonstrates the negative impact of early relational adversity (Buehler & Gerard, 2013). Thus, it seems that all children, including those children who experience poverty, would be benefit from interventions that address early relational adversity. Of all parent focused interventions, those that have parents practice skills (e.g., positive communication) with their own child during training sessions seem to be the most effective at producing more positive parent-child relationships (Kaminski et al., 2008).

For children in middle- to upper-SES families, perhaps the more efficient approach is targeting teachers. Teacher professional development and interventions that promote emotional support for children are of relevance because they can cultivate and facilitate improvement in teacher-child interaction quality. Intervening with teachers and improving relational interactions in school settings could be a more cost-effective approach, with a broader impact, than intervening at home. Several studies have demonstrated the effectiveness of early interventions targeting teacher-child interactions (e.g., Hamre et al., 2012; Van Craeyevelt et al., 2017). Programs that support teachers in maintaining high-quality teacher-child interactions can be especially useful and provide strategies for teachers working with children who are at-risk for lower levels of academic success due to a history of adversity in early childhood. Thus, future academic programs and interventions aimed at fostering adolescent academic resilience could apply our findings to carefully develop and target students at different time points to better support families, teachers, and children.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethics Secondary data analysis was approved by Texas State University Institutional Review Board (IRB). Texas State IRB is not the approving group for the original research. The original research was conducted by the NICHD Study of Early Child Care and Youth Development (NICHD SECCYD).

Informed Consent Written informed consent to participate in this study was provided by the participants.

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