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Exploring pathways linking early childhood adverse experiences to reduced preadolescent school engagement☆

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ABSTRACT

Background: Cross-sectional studies link adverse childhood experiences (ACEs) with school disengagement, contributing to chronic absenteeism and underachievement.
Objective: This prospective longitudinal study explored malleable mediators that might account for the developmental progression from early childhood ACEs to preadolescent school disengagement. Negative cascades were tested that explored student-teacher relationship quality and child behavior problems (internalizing and externalizing) as potential mediators.
Participants and setting: 556 children were recruited from Head Start preschool classrooms (M_{age} = 4.67 years old, SD = 0.32; 51% female; 58% European American, 25% African American, 19% Latinx) at which time parents reported on ACEs.
Methods: Children were followed longitudinally; kindergarten and third grade teachers rated student-teacher relationship quality and classroom behavior problems. Students described their school engagement (i.e., academic involvement, school bonding, and teacher affiliation) in fifth grade as they prepared for the transition into middle school.
Results: Path models documented a mediated cascade linking early childhood ACES through poor kindergarten student-teacher relationship quality to elevated third grade internalizing problems (mediation path $\beta = 0.018$, $SE = 0.009$, $p < 0.05$) which, in turn, led to reduced fifth-grade school engagement (mediation path $\beta = 0.027$, $SE = 0.014$, $p = 0.05$). Early childhood ACEs also predicted elevated externalizing problems in elementary school, but without mediation by student-teacher relationship quality or link to fifth-grade school engagement.
Conclusion: Results are discussed in light of understanding developmental processes that link early ACEs with school difficulties and informing the design of preventive interventions for children at risk.

1. Introduction

During the past two decades, schools have increasingly recognized the role that social, emotional, and behavioral functioning play

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in promoting adaptive school engagement, and the value of early identification and support efforts to improve the school outcomes of vulnerable students (Chafouleas et al., 2016). A growing awareness of the negative impact of trauma on children's school performance has generated efforts to integrate trauma-informed practices into professional development programs for school staff and multi-tiered services for students (Chafouleas et al., 2016; Thomas et al., 2019). Fueling these efforts is research documenting the prevalence of exposure to adverse childhood experiences (ACEs; Crouch et al., 2019) and their negative impact on children's school functioning (Blodgett & Lanigan, 2018). Children exposed to multiple ACEs in early childhood are at high risk for social-behavioral adjustment difficulties in elementary school (Jimenez et al., 2016) and diminishing school engagement over time, reflected in frequent absenteeism and underachievement (Crouch et al., 2019).

Although early ACE exposure places children at risk for school difficulties, some show resilience, suggesting that preventive interventions could be effective at mitigating risk if more was known about the developmental processes that link early ACEs with later maladjustment (Bethell et al., 2014). To address this gap, the current study followed a sample of children from low-income families as they entered kindergarten and progressed through elementary school. Early childhood ACE exposure was assessed prior to school entry and student ratings of their school engagement were collected in preadolescence. This study examined two malleable dimensions of school experience in early elementary school, student-teacher relationship quality and behavior problems (internalizing and externalizing) as potential mediators of the impact of early childhood ACEs on preadolescent school engagement.

1.1. Adverse childhood experiences and school disengagement

ACEs refer to traumatic or repeated aversive events that expose children to harm, causing significant distress (Bethell et al., 2014). ACEs include acute trauma, such as exposure to child maltreatment or violence, and chronic risks that undermine socialization supports, such as parent dysfunction (depression, substance abuse, antisocial behavior) or family instability (parent-child separation, parent loss). National estimates suggest that 48% of American children have had at least one ACE and 23% have had two or more (Blodgett & Lanigan, 2018). Children who grow up in low-income families are more likely to be exposed to ACEs than children growing up in more favorable circumstances (Crouch et al., 2019), likely as a function of the financial strain that increases exposure to unsafe and stressful living conditions and undermines supportive relationships within families (Evans & Kim, 2013).

Exposure to ACEs has detrimental effects on child development, disturbing social-emotional well-being and diminishing school adjustment and attainment (Blodgett & Lanigan, 2018). In cross-sectional studies, ACEs have been linked with chronic absenteeism, underachievement, behavior problems, and increased risk for grade retention and drop out (Bethell et al., 2014; Blodgett & Lanigan, 2018; Stempel et al., 2017). Bethell et al. (2014) found that children with two or more ACEs were more likely than children with no ACEs to exhibit school disengagement (by parent report) and be retained in grade, while retained students with more ACE exposure showed the highest levels of school disengagement and diminished motivation for learning compared to their peers with less ACE exposure (Iachini et al., 2016). The effects of ACEs appear cumulative; the more adverse experiences children are exposed to, the greater their risk for school adjustment difficulties (Blodgett & Lanigan, 2018; Jimenez et al., 2016).

Evidence linking ACEs to school maladjustment relies primarily on cross-sectional studies. Few prospective longitudinal studies have examined the pathways by which ACEs in early childhood might contribute to school disengagement as children move through elementary school and transition into middle school.

1.2. Understanding developmental pathways

Research suggests the school difficulties of ACE-exposed children start early, emerging by age 5 as they enter school and begin to navigate the social-emotional and behavioral demands of kindergarten (Blodgett & Lanigan, 2018; Jimenez et al., 2016). Early ACE exposure is associated with poor-quality student-teacher relationships and with classroom behavior problems in elementary school, including elevations in both internalizing and externalizing difficulties (Hunt et al., 2017; O'Connor et al., 2012). Analyzing retrospective data from a young adult sample, Porche et al. (2011) found that elevated externalizing problems mediated the association between childhood ACEs and school drop-out. They postulated that negative experiences with unsupportive teachers in the early school years amplified the behavioral maladjustment of children exposed to early ACEs, serving as key links between early ACEs and the adolescent school disengagement that preceded school drop-out. As noted in the following sections, extant research documents cross-sectional and short-term longitudinal associations that are consistent with this speculation. However, the hypothesis that ACE-exposed children experience a negative cascade during elementary school, with student-teacher relationships and behavior problems mediating links between early ACEs and later school disengagement requires empirical testing with a prospective longitudinal design.

1.2.1. Student-teacher relationship quality

A substantial body of research highlights the central role that elementary student-teacher relationships play in shaping the school experiences of children, with close and conflict free relationships predicting adaptive social and behavioral adjustment in school (Baker et al., 2008; Hughes, 2011) and associated with positive academic motivation and achievement later in preadolescence (Furrer & Skinner, 2003). Conversely, emotionally distant or conflictual experiences with early elementary teachers are linked with reduced classroom participation and school engagement and predict heightened internalizing and externalizing behavior problems in subsequent school years (Hughes, 2011; Roorda et al., 2011).

Student-teacher relationships may be especially influential for children exposed to early ACEs who often experience elevated family stress and compromised parent-child relationship support (Steele et al., 2016). According to attachment theory and validated with longitudinal studies, ACE-related disturbances in parent-child relationships predict lower social competence and difficulties forming

positive relationships with teachers and peers at school entry (Groh et al., 2017; O'Connor et al., 2012). Theorists speculate that high-quality student-teacher relationships in kindergarten promote feelings of felt-security, decreasing child anxiety and facilitating adaptive classroom participation, which may be especially impactful during the initial transition to elementary school (Blodgett & Lanigan, 2018; Crosnoe & Cooper, 2010; Hamre & Pianta, 2001). Positive, non-conflictual student-teacher relationships in kindergarten may buffer vulnerable children by providing a foundation of consistency and predictable behavioral support and guidance, thereby enhancing self-regulatory control and social integration, and reducing behavior problems (Hamre & Pianta, 2001; Hughes, 2011).

1.2.2. Internalizing and externalizing problems

Extant research documents associations between early ACE exposure and elevated rates of internalizing behavior problems, reflecting emotional distress (anxiety, sadness) and social avoidance (Hunt et al., 2017; Reynolds et al., 2010; Wang et al., 2018). Early ACEs also confer risk for externalizing problems including rule-breaking, aggressive-disruptive, and antisocial behaviors (Craig et al., 2017; Hunt et al., 2017). Internalizing and externalizing problems may emerge initially in response to the parenting difficulties often associated with ACEs (maternal depression, parenting stress, parent-child conflict) which diminish emotional support (O'Connor et al., 2012) and contribute to inconsistent and harsh discipline practices (Mesman et al., 2001). In addition, exposure to extreme or chronic stressors in early childhood can overwhelm developing stress response systems, contributing to elevated vigilance for threat and distrust of others that exacerbate internalizing problems, as well as a weakened capacity for inhibitory control that can increase externalizing problems (Blair & Raver, 2015; Pine et al., 2005).

At kindergarten entry, wariness and anxiety may amplify social withdrawal, contributing to trajectories of elevated withdrawal and internalizing problems that remain high throughout elementary school (Mesman et al., 2001; Reynolds et al., 2010), especially when teacher support and positive guidance is lacking. Internalizing problems can contribute to academic disengagement in later elementary school years, as children feel increasingly isolated and socially disconnected in the school context (Hughes & Coplan, 2010).

Early externalizing problems can also escalate over time, especially if conflictual interactions with teachers and school punishment experiences fuel student anger and resistance (Hughes, 2011). Externalizing problems disrupt academic learning (Hamre & Pianta, 2001), and are associated with peer rejection and student feelings of alienation and hostility toward school (Olivier et al., 2020).

Students who finish elementary school with negative feelings about school and diminished expectations about their academic potential and social acceptance are primed for heightened stress during the middle school transition and decreased post-transition levels of school bonding and learning motivation (Aikins et al., 2005; Goldstein et al., 2015). Low levels of school engagement become increasingly predictive of academic achievement and overall well-being as students move into adolescence, likely as a function of the increased autonomy students experience in middle school and also because of the emerging importance of the self-system in directing behavior and effort (Catalano et al., 2004; Li & Lerner, 2011).

1.3. The current study

This prospective longitudinal study sought to understand developmental pathways linking ACEs in early childhood with low levels of school engagement in preadolescence. Understanding the developmental pathways to negative school attitudes can inform the design of prevention programs, hopefully mitigating the negative impact of early ACEs on school engagement.

This study focused on developmental pathways thought to operate via the school socializing and supports affected by early ACEs (Crosnoe & Cooper, 2010). First, we tested the hypothesis that ACEs in early childhood would predict low-quality student-teacher relationships and elevated internalizing and externalizing problems during the early elementary years, as well as diminished school engagement at the end of elementary school. We then tested cross-lagged longitudinal path models to evaluate the degree to which low-quality student-teacher relationships and elevated internalizing and externalizing problems in the early elementary years accounted for the effects of early childhood ACEs on later school disengagement. Based upon prior research, we hypothesized that mediated pathways of influence would emerge, reflecting a negative cascade in which early childhood ACEs led to lower quality student-teacher relationships at kindergarten entry which, in turn, exacerbate internalizing and externalizing behavior problems over the course of the early elementary grades leading to diminished school engagement by the end of elementary school.

2. Method

2.1. Participants

This study used longitudinal data collected during two randomized trials of the Head Start REDI (*Re*search-based *D*evelopmentally *I*nformed) program (Bierman et al., 2017). Participants were 556 children recruited from 44 Head Start classrooms at the start of their prekindergarten year (M_{age} = 4.67 years old, SD = 0.32; 51% girls; 58% European American, 25% African American, 19% Latinx). Families were low-income, reflecting the eligibility requirements of Head Start. All study procedures followed the American Psychological Association standards for ethical research and had the approval of the university IRB.

To recruit families, letters describing the study were sent home to parents of all children in participating classrooms who were eligible to start kindergarten the following year. In the first trial initiated in 2003, 356 families were recruited, and Head Start centers were randomly assigned to receive a classroom intervention or to serve as usual practice controls. In the second trial initiated in 2008, 200 families were recruited from Head Start centers already using the classroom intervention and were randomly assigned to receive a family-focused home learning program along with the classroom program or serve as a control group who received the classroom

program alone. Children in both studies were followed as they left Head Start and were assessed annually through third grade and then again in fifth grade. This developmental study examined child adjustment beginning in kindergarten after the completion of all intervention activities. Intervention status, which was not associated with ACEs, was included as a control variable in all analytic models.

2.2. Procedure

ACEs were reported by parents when children entered the study, during the fall of their prekindergarten year. Research staff visited families in their homes, attained informed consent, and read questionnaires to parents, recording their answers. Student-teacher relationships and child behavior problems were measured by teacher ratings collected at the end of the kindergarten and third grade years. Teachers were provided with rating forms; they completed them independently and returned them to the project office. School engagement was measured with child reports in fifth grade, collected during home visits made by research staff in the spring of the year. Parents and teachers were compensated financially for their participation; students received small gifts.

2.3. Measures

2.3.1. ACEs

During interviews held at the start of the study, parents reported on the presence or absence of seven adverse experiences during the first five years of the child's life. These items and their prevalence included: 1) report of child abuse, 9%; 2) living apart from the parent or primary caregiver, 25%; 3) exposure to violence, 26%; 4) frequent harsh discipline (swatting or spanking 5 times or more in the last week), 33%; 5) frequent moves (3 or more family moves), 43%; 6) parent incarceration, 46%, and 7) parent depression, based upon primary caregiver's self-reports in the clinical range on the Center for Epidemiologic Studies-Depression Scale, 44%. These seven items were combined using item response theory (IRT) analyses (ltm package in R 3.4.3; R Core Team, 2017) to create a weighted cumulative index of ACE exposure. IRT weights take into account the extremity of exposure to specific experiences (e.g., the relative frequency of exposure within the sample) and discernment (e.g., the degree to which each risk differentiates those with higher vs. lower overall risk scores). The weighted IRT score was used to represent early childhood ACEs (see item statistics in Table S1).

2.3.2. Student-teacher relationships

Kindergarten and third grade teachers rated the quality of their relationship with each child using the Student-Teacher Relationship Scale (STRS; Pianta, 2001). The total score was used in analyses, reflecting 8 items describing feelings of closeness (e.g., “I share an affectionate, warm relationship with this child”; “This child openly shares her/his feelings and experiences with me”) and 7 items describing conflict (e.g., “The child and I always seem to be struggling with each other.”). Items were rated on a 5-point scale ranging from 1 (definitely does not apply) to 5 (definitely does apply). The closeness and conflict scales were moderately negatively correlated in kindergarten ($r = -0.45$, $p < 0.01$) and third grade ($r = -0.37$, $p < 0.01$). For the total score, conflict items were reverse-scored and summed with the closeness items to create a total score ($\alpha = 0.91$ and $\alpha = 0.91$, respectively).

2.3.3. Internalizing and externalizing problems

Kindergarten and third grade teachers rated children's internalizing problems using a 5-item scale developed for the REDI project (Bierman et al., 2008) focused on social withdrawal (“keeps to himself/herself, tends to withdraw”; “avoids playing with other children.”) and distressed mood (“sad, unhappy”). Teachers also completed a 7-item version of the *Teacher Observation of Child Adaptation-Revised (TOCA – R;* Werthamer-Larsson et al., 1991) assessing externalizing problems, including verbal and physical aggression and disruptive behaviors. For both of these scales, items were scored using a 6-point scale that ranged from 1 (almost never) to 6 (almost always) and summed to create a total score each year (for internalizing problems, α =0.81 and 0.83, respectively; for externalizing problems, α =0.90 and 0.89, respectively).

2.3.4. School engagement

In fifth grade, children reported on their school engagement using the People in my Life questionnaire (PIML; Murray & Greenberg, 2000). Items reflected three sub-scales representing academic involvement (3 items, “I like to take part in class discussions and activities”; “I feel sure about how to do my work at school”), school bonding (4 items, “I feel safe at school”; “My school is a nice place”), and affiliation with teachers (7 items, “I like my teacher this year”; “I trust my teacher”). Items were rated on a scale ranging from 1 (almost never or never true) to 4 (almost always or always true) and were summed within sub-scale and analyzed as a latent score representing school engagement ($\alpha = 0.87$).

2.4. Covariates and missing data

Analytic models controlled for cohort, county, and intervention condition, as well as child's sex, ethnic/racial group, and age. Attrition occurred at a rate of about 2–3% each assessment wave, with a retention rate at fifth grade of 81%. Retained and attrited participants did not differ significantly at baseline on ACE items or measures of student-teacher relationships or behavior problems, with one exception. Students in families reporting more family moves in early childhood were more likely to be lost in the follow-up sample in fifth grade (see Table S2). In addition, retained participants were sometimes missing one teacher rating or self-report at one of the assessment waves. Missing data was handled using Full Information Maximum Likelihood Estimation, which is recommended for

analyses of constructs with incomplete indicators (Cham et al., 2017).

2.5. Data analysis plan

Following preliminary descriptive analyses, path analyses in Mplus (Muthén & Muthén, 2015) were used to test hypotheses concerning longitudinal associations among constructs. The contributions of internalizing and externalizing problems were tested in separate models. Each model included four constructs: 1) ACEs reported by parents when children were in preschool, 2) student-teacher relationships rated by kindergarten and third grade teachers, 3) internalizing or externalizing problems rated by kindergarten and third grade teachers, and 4) school engagement rated by students in fifth grade, represented by a latent factor reflecting academic involvement, school bonding, and affiliation with teachers.

A first set of path models tested the direct associations between early childhood ACEs and each of the subsequent measures of elementary school adjustment (student-teacher relationship quality, internalizing or externalizing problems, and fifth-grade school engagement). A second set of path models tested all direct and indirect paths from ACEs to student-teacher relationships, internalizing or externalizing problems, and school engagement. Student-teacher relationships and internalizing/externalizing problems were both tested as potential mediators of the association between early childhood ACEs and later school engagement. In addition, cross-lagged paths evaluated longitudinal associations between student-teacher relationships and internalizing/externalizing problems in the early elementary grades. Fig. 1 indicates the hypothesized paths for both the direct effects model and the indirect effects model. Adequate model fit was determined using the following criteria: Root Mean Square Error of Approximation (RMSEA) ≤ 0.08, Comparative Fit Index (CFI) ≥ 0.90, and Standardized Root Mean Square Residual (SRMR) ≤ 0.08.

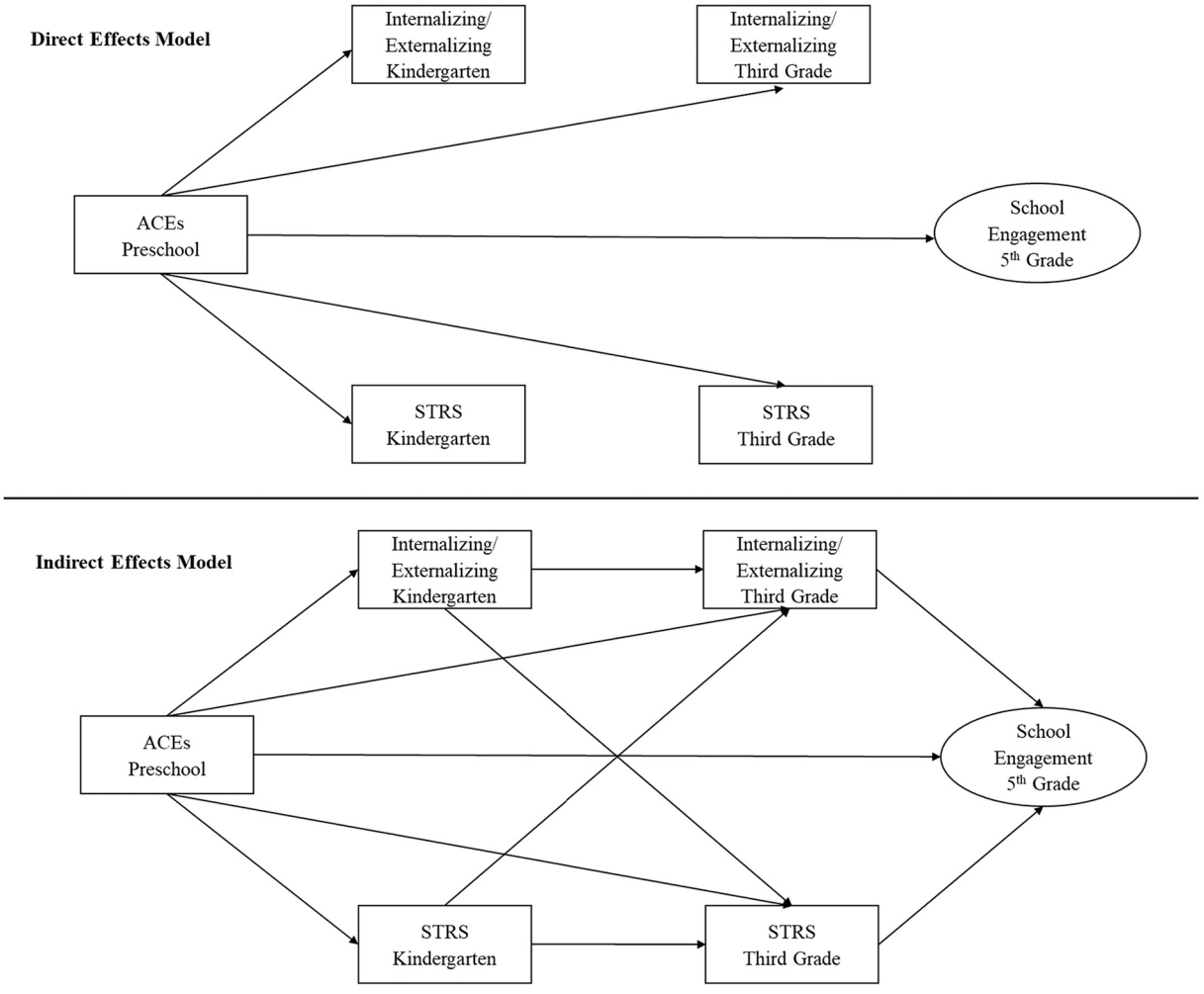

Fig. 1. Hypothesized paths for the direct and indirect effects models.

3. Results

Table 1 shows the means, standard deviations, and correlations among study measures of early childhood ACEs, student-teacher relationships in kindergarten and third grade, internalizing and externalizing problems in kindergarten and third grade, and fifth-grade school engagement.

3.1. Direct pathways from ACEs to school experiences

The first direct effect model testing internalizing problems showed adequate fit to the data, RMSEA = 0.03, CFI = 0.99, SRMR = 0.02. Hypothesized pathways were all significant, with the exception of ACEs to kindergarten internalizing ($\beta = 0.058$ $SE = 0.04$, $p = 0.19$). ACEs predicted lower quality student-teacher relationships in kindergarten ($\beta = -0.11$, $SE = 0.04$, $p = 0.01$) and third grade ($\beta = -0.15$, $SE = 0.05$, $p = 0.001$), higher levels of internalizing problems in third grade ($\beta = 0.10$, $SE = 0.05$, $p = 0.03$), and reduced levels of school engagement in fifth grade ($\beta = -0.11$, $SE = 0.06$, $p = 0.04$).

The direct effect model testing externalizing problems showed adequate fit to the data, RMSEA = 0.024, CFI = 0.993, SRMR = 0.017. ACEs predicted lower quality student-teacher relationships in kindergarten ($\beta = -0.12$, $SE = 0.04$, $p = 0.01$) and third grade ($\beta = -0.15$, $SE = 0.05$, $p = 0.001$), higher levels of externalizing problems in kindergarten ($\beta = 0.14$, $SE = 0.04$, $p = 0.002$) and third grade ($\beta = 0.11$, $SE = 0.05$, $p = 0.02$), and reduced levels of school engagement in fifth grade ($\beta = -0.11$, $SE = 0.06$, $p = 0.04$).

3.2. Testing a negative cascade with cross-lagged mediation

The internalizing model showed adequate fit to the data, RMSEA = 0.03, CFI = 0.99, SRMR = 0.02. ACEs was significantly associated with lower-quality kindergarten student-teacher relationships, which in turn contributed to elevated levels of internalizing problems in third grade (Fig. 2). The indirect effect of this mediated path was significant (see Table 2). There was also a significant direct path from ACEs to lower-quality student-teacher relationships in third grade through student-teacher relationships in kindergarten (Table 2), although the direct path to third grade student-teacher relationship quality remained significant (Fig. 2). Finally, there was a significant indirect path from kindergarten student-teacher relationships to fifth grade school engagement through internalizing problems in third grade (Table 2). The direct effects of ACEs on internalizing problems in third grade and school engagement in fifth grade were no longer significant after accounting for the indirect effects.

The externalizing model showed adequate fit to the data, RMSEA = 0.02, CFI = 0.99, SRMR = 0.02. ACEs were significantly associated with lower-quality student-teacher relationships in kindergarten and third grade (Fig. 3). There was a significant indirect path from ACEs to third grade student-teacher relationships through kindergarten student-teacher relationships (Table 3). ACEs were also significantly associated with more externalizing problems in kindergarten (Fig. 3). There was a significant indirect path from ACEs to third grade externalizing problems through kindergarten externalizing problems (Table 3). There were no direct nor indirect effects on school engagement through this path model.

4. Discussion

Study findings documented predictive associations over time and identified developmental pathways that link early ACEs with later school disengagement. The negative effects of ACEs appear to cascade through elementary school by reducing student-teacher relationship quality at school entry, which increases the likelihood of elevated internalizing problems by third grade. The effects of ACEs on these early markers of school adjustment then impact children's attitudes toward school – their feelings of school involvement, school bonding, and affiliation with teachers – as they complete elementary school in fifth grade and prepare to transition to middle school. ACEs also predicted elevated externalizing problems that continued across the waves studied. However, student-teacher relationships did not mediate the impact of ACEs on externalizing problems, and externalizing problems did not mediate the impact of ACEs on school disengagement. Understanding these developmental pathways may offer important insights that can inform preventive

Table 1
Means, standard deviations, and correlations for study variables.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. PreK ACEs	−0.03	0.76									
2. K internalizing	2.09	0.83	0.08								
3. K externalizing	1.83	0.86	0.15**	0.38**							
4. K STRS	4.26	0.65	−0.14**	−0.48**	−0.73**						
5. Gr. 3 internalizing	2.25	0.85	0.12**	0.37**	0.22**	−0.32**					
6. Gr. 3 externalizing	1.85	0.82	0.14**	0.12*	0.44**	−0.38**	0.37**				
7. Gr. 3 STRS	4.08	0.69	−0.20**	−0.22**	−0.34**	0.39**	−0.56**	−0.71**			
8. Gr. 5 teacher affiliation	14.93	4.46	−0.05	−0.04	−0.09	0.09	−0.16**	−0.20**	0.20**		
9. Gr. 5 school bond	7.56	2.60	−0.10*	−0.04	−0.08	0.08	−0.18**	−0.16**	0.17**	0.51**	
10. Gr. 5 academic involvement	6.35	1.96	−0.08	−0.13**	−0.14**	0.12*	−0.20**	−0.09	0.14**	0.43**	0.46**

Note. SD = standard deviation. ACEs = adverse childhood experiences, STRS = Student-Teacher Relationship Scale. K = Kindergarten. Gr. = grade. * $p < 0.05$. ** $p < 0.01$.

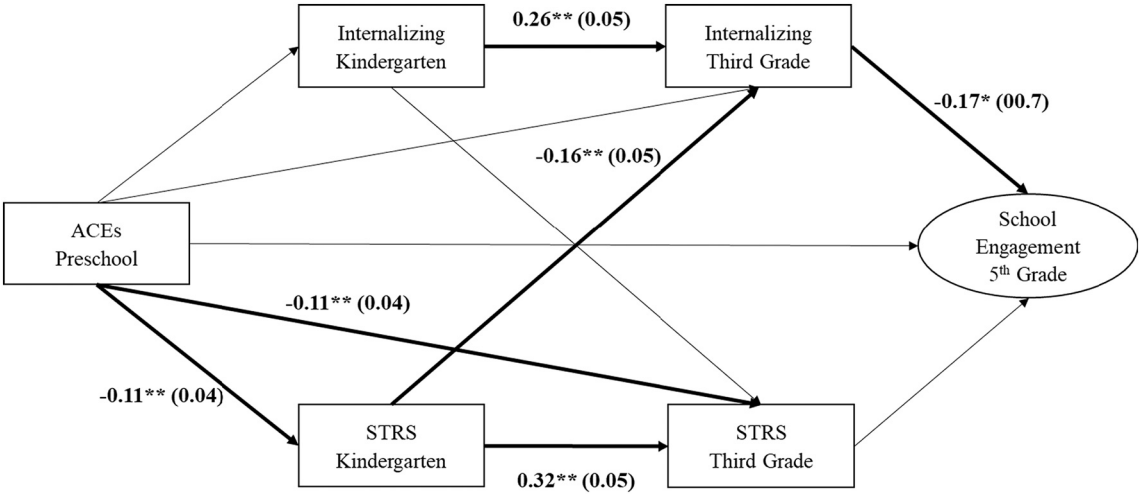

Fig. 2. Model from ACEs to school engagement with student-teacher relationships and internalizing problems as mediators.
Note: ACEs were reported by parents, student-teacher relationships and internalizing problems were rated by teachers, and school connectedness was rated by students. Control variables include child age, sex, race, sample cohort, county, and treatment group. ACEs = adverse childhood experiences, STRS = Student-Teacher Relationship Scale.
*$p < 0.05$, **$p < 0.01$.

Table 2
Standardized indirect effects in the mediated path model with internalizing problems.

Model paths	Third grade student-teacher relationship	Third grade internalizing behaviors	Fifth grade school engagement
	β (SE)	*β (SE)*	*β (SE)*
ACEs ➔ K STRS ➔ 3rd grade STRS	−0.04 (0.02)*		
ACEs ➔ K internalizing ➔ 3rd grade STRS	−0.002 (0.003)		
ACEs ➔ K STRS ➔ 3rd grade internalizing		0.02 (0.01)*	
ACEs ➔ K internalizing ➔ 3rd grade internalizing		0.02 (0.01)	
K STRS ➔ 3rd grade internalizing ➔ 5th grade school engagement			0.03 (0.01)*
K internalizing ➔ 3rd grade STRS ➔ 5th grade school engagement			−0.003 (0.01)
ACEs ➔ K internalizing ➔ 3rd grade STRS ➔ 5th grade school engagement			0.001 (0.001)
ACEs ➔ K STRS ➔ 3rd grade internalizing ➔ 5th grade school engagement			−0.003 (0.002)

Note: ACEs = adverse childhood experiences, STRS = Student-Teacher Relationship Scale. K = Kindergarten.
* $p < 0.05$.

interventions designed to enhance the school adjustment of children at-risk for school disengagement due to early ACEs exposure.

4.1. ACEs and school adjustment in the early elementary school years

In this study, children with higher ACE exposure in early childhood formed lower-quality relationships with teachers when they entered kindergarten, which led to lower-quality relationships and more internalizing problems in third grade. ACEs include a range of events that expose children to unpredictable threatening, and stressful caregiving. In some cases, caregiving adults may contribute directly to child stress exposure, as in the case of maltreatment, family violence, or the use of frequent harsh punishment. Alternatively or in addition, caregiving adults may experience hardships that reduce their capacity to provide consistent support or protection to reduce child exposure to harm or distress, for example due to parent-child separation or parenting difficulties related to substance use or depression (Evans & Kim, 2013).

One of the consequences of ACEs exposure is that children often experience feelings of heightened vulnerability and insecurity in the context of interpersonal relationships and find it difficult to trust other caregiving adults who come into their lives such as teachers (Blodgett & Lanigan, 2018; Groh et al., 2017). Theorists speculate that children internalize representations of early caregiving, forming internal working models that inform future relationship expectations (McCarthy & Maughan, 2010). Children exposed to ACEs who are unable to rely on caregivers for sensitive-responsive support in the early years may find it more difficult to form trusting and high-quality relationships with teachers because they feel uncertain, insecure, or afraid of the way they will be treated (O'Connor et al.,

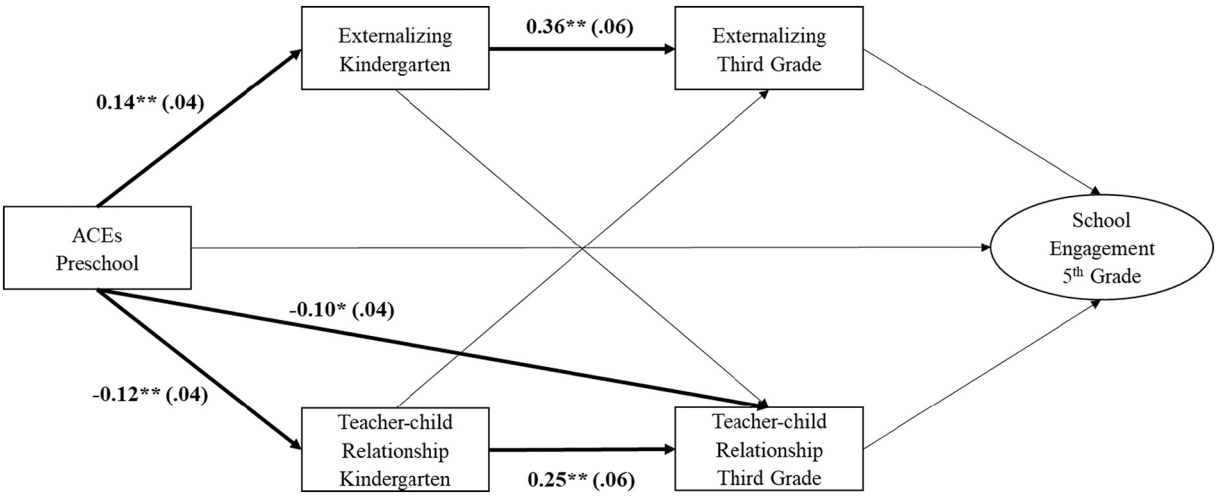

Fig. 3. Model from ACEs to school engagement with student-teacher relationships and externalizing problems as mediators.
Note: ACEs were reported by parents, student-teacher relationships and externalizing problems were rated by teachers, and school connectedness was rated by students. Control variables include child age, sex, race, sample cohort, county, and treatment group. ACEs = adverse childhood experiences, STRS = Student-Teacher Relationship Scale.
*$p < 0.05$, **$p < 0.01$.

Table 3
Standardized indirect effects in the mediated path model with externalizing problems.

Model Paths	Third grade student-teacher relationship	Third grade externalizing behaviors	Fifth grade school engagement
	β (SE)	*β (SE)*	*β (SE)*
ACEs ➔ K STRS ➔ 3rd grade STRS	−0.03 (0.01)*		
ACEs ➔ K externalizing ➔ 3rd grade STRS	−0.02 (0.01)		
ACEs ➔ K STRS ➔ 3rd grade externalizing		0.01 (0.01)	
ACEs ➔ K externalizing ➔ 3rd grade externalizing		0.05 (0.02)**	
K STRS ➔ 3rd grade externalizing ➔ 5th grade school engagement			0.01 (0.01)
K externalizing ➔ 3rd grade STRS ➔ 5th grade school engagement			−0.02 (0.01)
ACEs ➔ K externalizing ➔ 3rd grade STRS ➔ 5th grade school engagement			−0.002 (0.002)
ACEs ➔ K STRS ➔ 3rd grade externalizing ➔ 5th grade school engagement			−0.001 (0.001)

Note: ACEs = adverse childhood experiences, STRS = Student-Teacher Relationship Scale.
* $p < 0.05$.
** $p < 0.01$.

2012). School entry brings heightened expectations for behavioral compliance, social collaboration, and independent work completion (Hamre & Pianta, 2001), and the inability to rely on the teacher as a support in this context may account for associations with elevated anxiety and withdrawal in later school years. Consistent with this conceptual model, the current study demonstrated that children exposed to ACEs had trouble developing supportive relationships with their kindergarten teachers (O'Connor et al., 2012), contributing to lower quality relationships and heightened internalizing problems by third grade.

Exposure to high and chronic levels of stress in early childhood can also negatively affect the development and functioning of children's stress response systems (Blair & Raver, 2015). Developmental studies suggest that chronic stress overstimulates and overwhelms HPA axis, creating an atypical over-reactivity to threat and difficulties regulating responses to threat both physiologically and psychologically (Blair & Raver, 2015), particularly without a sensitive-responsive caregiving support systems that might buffer feelings of vulnerability (McCoy et al., 2016). By increasing stress reactivity and diminishing effective self-regulation, ACEs may exacerbate distress (anxiety, sadness), leading to avoidance or social withdrawal when children enter school, and may also increase impulsive and aggressive acting out (McCoy et al., 2016). In this study, ACEs was linked directly with elevated externalizing problems (but not internalizing problems) at school entry, suggesting that the negative impact of ACEs on self-regulation is most immediately evident in dysregulated, undercontrolled behavior. Negative effects on internalizing problems did not emerge until third grade, mediated by student teacher relationship quality. Both externalizing and internalizing behavior were stable across the elementary school years, likely reflecting the reduced opportunities children have to develop interpersonal and self-regulation skills when their

behavior alienates others and instigates conflict (in the case of externalizing problems) or avoids others and results in isolation (in the case of internalizing problems; Wang et al., 2018).

4.2. ACEs and school disengagement in the later elementary school years

Study models confirmed the link between ACEs and school disengagement that was identified in prior cross-sectional studies, demonstrating predictive associations in this longitudinal study. The path linked low-quality student-teacher relationships in kindergarten with internalizing problems by third grade leading to school disengagement in fifth grade. The findings validate the hypothesis that low-quality student-teacher relationships and internalizing behavior contribute to subsequent school disengagement and suggest that the likelihood of following this developmental pathway is increased by early exposure to ACEs. Without the warm and non-conflictual support of their teachers when they enter school, ACE exposed children lack an important buffer for their anxiety as well as the guidance that could foster growth in social competence. The result may be a trajectory of increased anxiety, depression, and social withdrawal that over time reduces classroom participation and social integration (Gazelle & Rudolph, 2004), thereby diminishing feelings of school bonding and interpersonal connection by fifth grade.

Interestingly, externalizing problems did not show a similar link with diminished school engagement in fifth grade. This may be due to the mode of measurement. That is, school engagement was assessed via self-ratings that focused on feelings of bonding, connectedness, and support at school. These feelings may align more with internalizing distress than with externalizing acting out. Students who engage in high rates of aggressive, disruptive, and rule-breaking behavior at school are behaviorally disengaged at school, and at high risk of future academic problems and early drop out (Craig et al., 2017; Porche et al., 2011), but they do not necessarily experience distress about their school difficulties.

4.3. Strengths and limitations

One important strength of this study was its prospective longitudinal design. ACEs were assessed prior to kindergarten entry, and children were followed from the transition into kindergarten through the end of elementary school. This design illuminated important developmental associations among ACEs, early elementary school experiences, and children's feelings about school and learning as they completed elementary school in fifth grade and prepared to transition into middle school. In addition, this study used multiple reporters to examine the associations between ACEs and school experiences (parents, multiple elementary school teachers, and the children themselves). However, there are study limitations that must be taken into account.

First, the study reflects associations between the model variables over time but causal inferences are purely speculative. Although the timing of the measures is consistent with the interpretations made regarding the direction of effects, alternative interpretations cannot be ruled out.

Second, the data in this study were collected as a part of a larger, longitudinal study examining the effects of an early preventive intervention. The intervention was completed in preschool before the first outcome of this study was measured and hence the impact of the intervention should have occurred prior to the start of this study. In addition, intervention status was controlled for in all study analyses. Nonetheless, it is possible that there were intervention effects that were unaccounted for that contributed to the developmental pathways observed in this study.

Third, the sample, though diverse, was drawn from a limited set of Head Start Programs in Pennsylvania. This might hinder the ability to generalize the results to other low-income samples. In addition, the sample was low income with attenuated variance in parent education levels (fewer than 3% had four-year college degrees) and income levels. The restricted variance in these areas precluded the ability to determine whether low parent education or low income had effects on children's school adjustment distinct from the effects of the family factors reflected in ACEs.

Fourth, ACEs were assessed just once in this study, by parent report at the start of the prekindergarten year. Most of the ACEs on the scale reflected family factors (such as harsh discipline, parent depression, parent incarceration, family mobility) that create adverse conditions for early child development. Children with high levels of ACE exposure at that time point were likely also exposed to elevated ACEs during the later years of the study, possibly with more adversity contributed by factors or contexts outside of the family. The present study design does not allow for a clear separation between the effects of ACE exposure prior to school entry and ACE exposure that may have occurred at older ages.

Finally, the method of measurement used in this study may have affected the findings. Using different sources for measurement (parent report of ACEs, teacher rating of student-teacher relationships and behavior problems, student rating of school engagement) reduces the risk that associations among constructs are inflated by shared method variance. At the same time, these different raters have different points of view that may affect (and bias) their perceptions. For example, Hughes (2011) found that student and teacher ratings of student-teacher relationship quality were not highly correlated; student ratings were more predictive of later feelings of school belonging and perceived competence, whereas teacher ratings were more predictive of student behavioral outcomes.

4.4. Implications and future directions

Accumulating research documenting the negative impact of adversity on children's school performance has fueled efforts to improve trauma-informed prevention and intervention supports in schools (Chafouleas et al., 2016; Thomas et al., 2019). This study suggests that early elementary school prevention efforts might be helpful to students exposed to ACEs when they: 1) promote a classroom context of warmth and acceptance, including efforts to strengthen positive student-teacher relationships and support, 2)

foster growth in social-emotional competencies that support social integration and enhance emotion regulation and coping skills, thereby reducing internalizing problems, and 3) include positive behavioral supports to help children develop stronger self-regulation skills and reduce externalizing problems.

Professional development efforts grounded in the trauma-informed approaches may help teachers understand the impact of ACEs on student adjustment in kindergarten and the importance and potential benefits of their efforts to reach out and connect with vulnerable students (Chafouleas et al., 2016). Evidence-based programs are available to help teachers implement classroom practices that enhance positive supports for all students (Reinke et al., 2013). In addition, more targeted interventions such as Banking Time can improve the quality of distanced or conflictual student-teacher relationships (Driscoll & Pianta, 2010). Banking Time guides teachers in strategies they can use to improve their relationships with young students who seem alienated, oppositional, or otherwise distant and has proven effective at improving student-teacher relationship quality and student classroom engagement (Alamos et al., 2018). Future research is needed to test the efficacy of these types of intervention approaches with children exposed to multiple ACEs as they enter kindergarten.

School-based efforts to promote social-emotional competencies and self-regulation skills are also warranted, given the elevated internalizing and externalizing problems associated with ACE exposure. Social-emotional learning (SEL) programs designed for universal classroom use have proven effective in the early elementary grades at promoting safe, caring, and inclusive classroom communities, and providing instructional support that facilitates growth in adaptive prosocial skills, emotion regulation, and self-regulatory coping skills (Dusenbury & Weissberg, 2017). One example is the PATHS (Promoting Alternative Thinking Strategies) Curriculum, which has demonstrated positive effects on self-regulatory skills (emotional understanding, social problem-solving skills) in randomized trials, with corresponding reductions in internalizing and externalizing problems (Kam et al., 2004). Another example is the Incredible Years teacher training program which promotes positive classroom management strategies with an emphasis on promoting child social-emotional regulation skills, with proven effects reducing externalizing behaviors (Chi-ching et al., 2020) and reducing internalizing problems (Herman et al., 2011). Additional research on these school-based intervention strategies is needed to evaluate the response of children with high levels of ACE exposure and determine whether intervention modifications are needed. In addition, the longer-term effects of these kinds of early elementary interventions are needed to determine whether early improvements in student-teacher relationship quality and reductions in children's internalizing problems lead to the expected benefits in school engagement and performance levels as children reach preadolescence and make the transition into middle school.

4.5. Conclusions

The current study showed that, among children from low-income families, exposure to early adverse experiences reduced children's ability to cultivate strong relationships with teachers at kindergarten entry, increasing levels of internalizing problems by third grade. These school difficulties were then linked with low levels of school involvement and school bonding by preadolescence, portending poor academic attainment in later school years. Early ACEs also led to elevated externalizing problems at kindergarten entry which remained high in the later elementary years. The findings suggest that as children growing up in poverty face challenging transitions into elementary and middle school, their early experiences can have long-term consequences on school adjustment. Supporting positive relationships between teachers and students in the early school years and building resilience by fostering growth in social-emotional, self-regulation, and coping skills might hold promise as prevention strategies to mitigate the risks for poor school adjustment associated with early ACEs.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2022.105572.

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