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# Exploring the Mediating Effect of Academic Engagement on Math and Reading Achievement for Students who have Experienced Maltreatment

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## Abstract

**Background—**Students who experience maltreatment tend to underperform academically relative to their peers, requiring an understanding of academically-related mechanisms that are potential intervention targets. Academic engagement, a multidimensional construct that is influential in students' investment in learning and the school context, is one such mechanism that has been associated with positive academic outcomes and develops through interactions between students and their environment.

**Objective—**The purpose of this study was to examine how maltreatment experiences and trauma symptoms were indirectly associated with academic achievement in adolescence through academic engagement.

**Participants and Setting—**The study was conducting on a subsample of 583 youths from the National Study of Child and Adolescent Wellbeing II (NSCAW II) cohort.

**Methods—**Structural equation modeling was used to examine the indirect effect engagement on the relationship between maltreatment and trauma symptomology and academic achievement.

**Results—**Academic engagement significantly mediated trauma symptoms and later standardized reading ($\beta = -.02$; 95% CI [$-.04, -.0004$]) and math ($\beta = -.02$; 95% CI [$-.05, -.0003$]) achievement test scores. However, similar mediating effects were not found for engagement on maltreatment and later standardized reading ($\beta = -.01$; 95% CI [$-.03, .01$]) and math ($\beta = -.01$; 95% CI [$-.03, .01$]) achievement test scores.

**Conclusions—**These findings suggest that variability in academic outcomes was indirectly associated with engagement but only for students who exhibited trauma symptoms rather than experiencing maltreatment alone. The findings suggest future researchers should consider

engagement should as an academically-related mechanism to help students who were maltreated succeed academically.

## Keywords

Childhood maltreatment is of great public health concern across the U.S. given that in 2018, victimization rates were at 9.2 victims per 1,000 children (U.S. Department of Health & Human Services, 2020). Such adverse experiences often result in long term negative academic consequences such as low peer acceptance (Kim & Cicchetti, 2010), low graduation rates (Lemkin et al., 2018), and low standardized tests scores (Crozier & Barth, 2005). Historically, researchers have attributed such negative academic outcomes to psychological and behavorial issues that are often associated with the developmental sequelae of maltreatment. For example, difficulties with behavioral and emotional regulation (Éthier et al., 2004, Johnson et al., 2002), higher rates of psychopathology (Leonard et al, 2016), and higher rates of delinquent behaviors (Bender, 2012; Tyler et al., 2008).

Given the need to address maltreated students' academic outcomes, however, sole reliance on addressing psychological and behavioral challenges in the classroom leave teachers severely unprepared to address quality instruction to support student learning (Panlilio, Ferrara, & MacNeill, 2019). Therefore, inclusion of more academically-related constructs or mechanisms must be further considered in education-related research that are more easily translated into classroom pedagogy. Academic engagement, a multidimensional construct that is influential in students' active participation in learning and the school context (Fredricks et al., 2004; Skinner et al., 2009; Skinner & Pritzer, 2012), is one such mechanism that is associated with positive academic outcomes.

## Conceptualizing Academic Engagement

Academic engagement (hereon referred to as engagement) is comprised of the following dimensions: *behavioral*, which refers to students' overt actions or participation in school; *emotional*, which includes students' affective reactions such as positive and negative emotions; and *cognitive*, which consists of students' strategy use, preference for challenges, and persistence (Skinner & Pritzer, 2012). Engagement has been predictive of several positive outcomes that include more consistent school attendance, higher grade point averages, and higher standardized test scores (Appleton et al., 2008; Wang & Holcombe, 2010). Further, engagement has been associated with decreased problem behaviors such as smoking, alcohol use, physical aggression, and truancy (Griffiths et al., 2012; Li & Lerner, 2011). As part of a host of developmental processes given its multidimensional structure, engagement is not a static or trait-related construct. Rather, engagement is malleable throughout students' development and learning over time and across different contexts (Fredricks et al., 2004; Fredricks & McCloskey, 2012; Skinner et al., 2009), making it an ideal target for school-based interventions.

For example, school-wide policies and practice can be introduced to promote increased engagement by giving students a voice in school policy, providing choice in school

participation, and providing clear and consistent expectations (Newmann, 1981). In terms of class-wide approaches, the central role of teachers can be maximized by cultivating a positive classroom climate with clear and consistent expectations and feedback (Connell & Welborn, 1991; Fredricks et al., 2002) and offering students choice and a sense of control (Grolnick & Ryan, 1987; Ryan & Grolnick, 1986). Further, teachers' academic and socioemotional support in the classroom are shown to have a strong positive effect on students' engagement (Battistich et al., 1997; Skinner & Belmont, 1993; Valeski & Stipek, 2001). Indeed, given the important role of engagement, several evidence-based interventions at the classroom level have been developed to promote student engagement in preschool (e.g., Van Craeyevelt et al., 2017), elementary (e.g., Bunch-Crump & Lo, 2017; Radley et al., 2016), middle school (e.g., Dart et al., 2016; Turner et al., 2014), and high school (e.g., Martin, 2008).

Despite the burgeoning evidence of the association between engagement and positive academic outcomes in the general student population, however, there remains a limited amount of evidence in how engagement is affected by complex traumatic events such as maltreatment. Specifically, there remains a need to examine how variability in engagement levels may be affected by maltreatment, which in turn may be associated with later variability in academic outcomes.

## Maltreatment and Engagement

Within the limited corpus that examines maltreatment and engagement together, it has been shown that an inverse relationship exists between engagement and behavioral problems. For example, higher levels of engagement were found to be related to lower levels of delinquency, even when controlling for peer deviance, closeness to caregiver, and a diagnosis of attention deficit hyperactivity disorder (ADHD; Bender, 2012; Snyder & Smith, 2015; Tyler et al., 2008). Engagement has also been found to be a protective factor against depression (McNeil et al., 2020; Tyler et al., 2008) and cognitive and behavioral issues (Haight et al., 2013) for students who have experienced maltreatment. With regard to academic outcomes, Leonard et al. (2016) found that higher levels of engagement were associated with better performance in both reading and math for children referred to Child Protective Services (CPS)., Engagement was also found to mediate the relationship between experiencing maltreatment and academic competence (Pears et al., 2013; Shonk & Cicchetti, 2001), supporting the hypothesis that engagement is an academically-related mechanism that could mitigate some of the negative outcomes experienced by students who have experienced maltreatment.

Unfortunately, students who have experienced maltreatment tend to demonstrate low levels of engagement. For example, Pears et al. (2013) found that students who had experienced maltreatment exhibited lower cognitive and emotional engagement than non- maltreated, low- income comparison groups. Moreover, students who were maltreated but remained in their families of origin showed lower levels of cognitive engagement compared to children who were maltreated but placed in foster care (Font & Maguire-Jack, 2013). In addition, experiencing physical abuse and corporal punishment was associated with low levels of school engagement (Font & Cage, 2018).

Taken together, engagement can be considered an important mechanism to shift students' academic trajectories toward a positive direction. However, the literature to date shows the negative impact of experiencing maltreatment on engagement. The limitation of looking at the event rather than the person-specific process that might account for this variability. Trauma-related symptoms, resulting from maltreatment events, are potentially important factors to consider.

## Trauma Symptoms, Academic Achievement, and Engagement

Childhood maltreatment, as a form of early life stress, has been linked to children exhibiting trauma-related symptoms (Scott et al., 2003). For example, a study by Ackerman et al. (1998) found that one-third of the children in their sample who had been previously abused developed post-traumatic stress symptoms alongside comorbid mental health issues. There is evidence that such comorbidity may also be associated by maltreatment type such that children who have experienced sexual abuse may be at higher risk of developing trauma symptoms compared to other types of abuse (Deblinger et al., 1989). Similar to maltreatment experiences, exhibiting trauma symptoms have been associated with poor academic outcomes that include high school retention (Perzow et al., 2013; Rumsey & Milsom, 2017), lower standardized achievement test scores (Goodman et al., 2012), and engagement (Bethell et al., 2014; Borofsky et al., 2013; Rumsey & Milsom, 2019).

Taken together, these studies show that maltreatment experiences affect individual student factors such as the development of trauma-related symptoms, whose negative effects may also be mitigated by higher levels of engagement. However, to our knowledge, no studies have explored the extent to which engagement mediates maltreatment, trauma-related symptoms, and later academic outcomes. Understanding such a longitudinal pathway will provide further information on a malleable mechanism that could potentially be an intervention target to help improve classroom pedagogy and support student learning (Panlilio & Corr, 2020).

## The Present Study

The main purpose of the present study was to explore the relationships between maltreatment, trauma symptoms, engagement, and academic achievement in a sample of students who have been maltreated. Specifically, our study was guided by the following research questions: (1) To what degree can engagement be represented as a multidimensional construct in our sample? (2) To what extent does engagement mediate the relationship between maltreatment and trauma symptoms and later math and reading achievement?

## Method

The research questions were answered using extant data from the second cohort of the National Survey of Child and Adolescent Well-Being II (NSCAW II), which was a longitudinal, nationally representative investigation of children and families who had been involved with Child Protective Services (CPS). The present study's final analytic sample

included 583 youths who were mostly female (56.3%), white (49.6%), and aged 11 to 15 years at wave one, 13 to 16 years at wave two, and 14 to 19 years at wave three. See Table 1 for more demographic information.

### Measures

**Maltreatment.**—A survey developed from the Parent-Child Conflict Tactics Scales was used to measure childhood maltreatment chronicity when participants were 11 to 15 years old. The survey assessed the rate at which a specific maltreatment event ever occurred in the participant's life. The items asked about experiences such as being hit, slapped with a belt, yelled at, kicked out of the house, and being burned. The items were scored on a scale from one (*one time*) to six *(More than 20 times)*, with *never happened* scored as an eight. To obtain a sum score of how many maltreatment events had occurred, items were first dichotomized so that a score of one to six was recoded to a one (*Yes, has occurred*) and a score of eight was recoded as zero (*No, has not occurred*). Affirmative responses (i.e., score of one) were then summed across to derive a total composite score. The maltreatment measure demonstrated good reliability ($\alpha$ = .84).

**Trauma symptoms.**—The Trauma Symptom Checklist for Children (TSCC) (Briere, 1996) was used to assess traumatic symptoms in participants when they were 11 to 15 years old. The TSCC assess six domains of symptoms: anxiety, depression, post-traumatic stress, sexual concerns, dissociation, and anger. The validity of the TSCC is supported by a high, positive association with the Child Behavior Checklist and other post-traumatic stress measures (Lanktree et al., 1991). In the present sample, the TSCC had good reliability ($\alpha$ = .94). TSCC total scores were used in analysis.

**Academic Engagement.**—Following the recommendations of Font and Cage (2018), eleven items from the Drug Free Schools Outcome Study (U.S. Department of Education, Office of the Under Secretary, n.d.) were used to measure engagement when participants were 12 to 16 years old. The items assessed the students' experiences in school and their feelings towards school; for example, "How often do you get sent to the office, or stay after school, because you misbehaved" or "How often do you get along with your teachers?" The items were scored on a scale from one(*never*) to four (*almost always*); negatively phrased items were reverse coded so that a higher score indicated a higher level of engagement. The internal consistency of this engagement measure was very low ($\alpha$ = .26). Given the low internal consistency, the factor structure of engagement was examined using confirmatory factor analysis (CFA) to potentially account for measurement error. Coefficient H was used to determine the construct reliability post hoc because it is not affected by number of indicators or by negatively loaded indicators (Gagné & Hancock, 2006). The engagement measure demonstrated good construct reliability (H = .83). No prior studies have examined its psychometric properties.

**Academic achievement.**—The Woodcock-Johnson III Tests of Achievement (WJ-III; Woodcock et al., 2001) were used to measure math and reading achievement when participants were 14 to 19 years old. The WJ-III is a collection of 22 norm-referenced measures used to assess reading, math, writing, and oral language abilities. In the present

study, reading was measured using the letter-word identification scale, which assess the participants' ability to detect, analyze, and pronounce letters and words, and math was measured using the applied problems scale, which assesses the participants' ability to use mathematical knowledge and reasoning. Both the reading and math measures demonstrated decent internal consistency in the NSCAW sample with alpha values of .74 and .61, respectively.

### Analytic Strategy

Structural equation modeling (SEM) was used to investigate the potential indirect effects of early maltreatment on academic outcomes through engagement for adolescents. Using two-step modeling (Anderson & Gerbing, 1988), a CFA model was first specified to examine the factor structure for engagement using the study's available measures. Second, the full path model was specified wherein maltreatment and trauma symptoms were included as the exogenous variables, engagement as a mediating endogenous variable, and reading and math standardized test scores as the distal endogenous variables. See Figure 1 for a visual depiction of the full SEM model.

**Mediation.**—A *mediation effect*, also called an *indirect effect*, is one in which an independent variable affects a dependent variable through a third variable often referred to as a mediator (Preacher et al., 2007). Relevant to the present study, engagement was included as the mediating path between maltreatment, trauma symptoms, and later math and reading achievement. As seen in Figure 1, path $a_1$ indicates the slope coefficient of engagement regressed on maltreatment, $a_2$ indicates the slope coefficient of engagement regressed on trauma symptoms and $b_1$, $b_2$, $c'_1$, $c'_2$ $c'_3$ and $c'_4$ indicate the conditional regression coefficients of the W-J III reading and math scores regressed on engagement, maltreatment and trauma symptoms (Preacher et al. 2007).

The strength and significance of the indirect effect is determined using $a_1$, $a_2$, $b_1$ and $b_2$ coefficient estimates (Preacher et al. 2007). In this model, there were four estimated indirect effects, $(a_1)(b_1)$, $(a_1)(b_2)$, $(a_2)(b_1)$, and $(a_2)(b_2)$; there are also four estimated direct effects, $c'_1$, $c'_2$ $c'_3$ and $c'_4$. The total effects of maltreatment and trauma symptoms on W-J III reading and math scores (not shown) were also estimated. In lieu of the Sobel test, which assumes normality, bootstrapped confidence intervals were used to determine the significance of the indirect effects (Hayes et al. 2011; Preacher & Hayes, 2004).

**Estimation and model fit.**—Models were estimated using full information maximum likelihood (FIML) with all available data to account for missingness. Analyses were conducted using Mplus v.8.3. The following criteria were selected to assess model fit and quality: model chi-square ($\chi^2$), Comparative Fit Index (CFI; 0.95), Tucker-Lewis index (TLI; 0.95), Root- Mean-Square Error of Approximation with its 95% confidence interval (RMSEA; 0.06), and the Standardized Root Mean Square Residual (SRMR; 0.08) (Hu & Bentler, 1999).

# Results

## Preliminary Analyses

Based on the descriptive statistics, the participants demonstrated high variability in their maltreatment scores, trauma symptoms scores and both their reading and math scores (see Table 2). Participants did not demonstrate much variability in their academic engagement scores and appeared to perform better on reading compared to math. Bivariate correlations in Table 3 indicate that maltreatment and trauma scores were significantly and positively correlated ($r = .23$; $p < .05$), with more maltreatment experiences being associated with increased trauma symptoms. Engagement scores were significantly and positively correlated with both reading ($r = .13$; $p < .01$) and math scores ($r = .14$; $p < .01$), indicating that higher engagement is associated with better achievement. Interestingly, both maltreatment scores and trauma symptoms were not significantly correlated with engagement scores, however the direction of associations were both negative ($r = -.07$ and $r = -.04$, respectively) and consistent with our hypotheses. These correlations were calculated using the engagement composite score, not the latent score created by the CFA, which was used in the SEM model. The lack of significant correlations could be due to the measurement error present in the engagement measure. This measurement error should not affect our full model results because it was accounted by using the latent score from the CFA.

## Path Model Results

Prior to the mediation model, we examined the structure of the engagement measure using CFA models to account for measurement error and structural specification evident by the low internal consistency of the measure ($a = .26$). Because 2-factor and 3-factor models did not converge, we specified engagement as unidimensional while correlating errors based on theoretically-derived modification indices for the respective items. Although following modification indices recommendations are typically seen as more data-driven post-hoc techniques, allowing errors to correlate can result in more accurate representation of the construct, particularly if informed by theory (Cole et al., 2007). By correlating errors in the measurement model, we accounted for the potential shared variance between the items that were not captured by the single factor. This, in turn, accounts for the multidimensional structure of engagement. See Figure 2 for visual depiction of the CFA model with significant standardized loadings. Given that the CFA model fit the data well ($\chi^2(39, N = 535) = 105.04$, $p < .001$ CFI = .97, TLI= .95, SRMR = .04), we then proceeded with the full SEM model.

The full SEM model fit the data well ($\chi^2(79, N = 535) = 142.08$, $p < .001$ CFI = .97, TLI= .96, RMSEA = .04, 90% CI [.03, .05], SRMR = .05), pointing to a significant overall mediation effect. Specifically, engagement significantly mediated the effect of trauma symptoms on both reading and math scores. See Figure 3 for a visual depiction of the full model with path coefficients and Table 4 for unstandardized and standardized path coefficients.

**Maltreatment to reading and math via engagement.**—Following the recommendation from Baron and Kenny (1986), individual path coefficients were estimated

for the relationship between maltreatment and reading and math scores. The total effect of reading scores regressed on maltreatment ($c_1$) was not significant ($p = .17$). The direct effect (path $c_1'$) of reading scores regressed on maltreatment, with all other variables held constant, was also not significant ($p = .14$). Maltreatment did not significantly predict engagement (path $a_1$; $p = .41$), however, engagement scores did significantly predict reading scores recognition scores (path $b_1$; $p < .01$). Taken together, the mediation conditions set by Baron and Kenny (1986), were not met. However, other researchers suggest that a mediation effect can still be detected by examining the indirect effect using bootstrapping techniques (Hayes et al., 2011; Mackinnon et al., 2002; Preacher et al., 2007). Unfortunately, the indirect effect (path $a_1b_1$) was also not significant (95% CI[−0.03, 0.01]) given that the bootstrapped confidence interval contained zero. Thus, there was no evidence to suggest that engagement mediated the relationship between maltreatment and reading scores.

The total effect of math scores regressed on maltreatment ($c_3$) was significant ($p = .04$). The direct effect (path $c_3'$) of math scores regressed on maltreatment, with all other variables held constant, was not significant ($p = .09$). Again, maltreatment did not significantly predict engagement (path $a_1$; $p = .41$), but, engagement scores did significantly predict math scores (path $b_2$; $p < .001$). Just as with the letter and word identification scores, the mediation conditions set by Baron and Kenny (1986) were not met. Similar to the previous procedures, the indirect effect (path $a_1b_2$) was not significant (95% CI[−0.03, 0.01]) given that the bootstrapped confidence interval contained zero. Thus, there was no evidence to suggest that engagement mediated the relationship between maltreatment and math scores.

**Trauma symptoms to reading and math via engagement.**—Following the recommendation from Barron and Kenny (1986), individual path coefficients were estimated for the relationship between trauma symptoms and reading and math scores. The total effect of reading scores recognition regressed on trauma symptoms ($c_2$) was not significant ($p = .31$). The direct effect (path $c_2'$) of reading scores regressed on trauma symptoms, with all other variables held constant, was also not significant ($p = .46$). Trauma symptoms did significantly predict engagement (path $a_2$; $p = .04$), and engagement scores did significantly predict reading scores (path $b_1$; $p < .01$). Although paths $a_2$ and $b_1$ are both significant, the mediation conditions set by Baron and Kenny (1986), were not met. The indirect effect (path $a_2b_1$) was also examined using bootstrapping methods and was found to be significant (95% CI[−0.04, −0.004]) given that the bootstrapped confidence interval did not contain zero. Thus, there was evidence to suggest that engagement mediated the relationship between trauma symptoms and reading scores.

The total effect of math scores regressed on trauma symptoms ($c_4$) was significant ($p = .04$). The direct effect (path $c_4'$) of math scores regressed on trauma symptoms, with engagement held constant, was not significant ($p = .11$). Again, trauma symptoms did significantly predict engagement (path $a_2$; $p = .04$), and engagement scores did significantly predict math scores (path $b_2$; $p < .001$). Once again, although paths $a_2$ and $b_2$ are significant, the mediation conditions set by Baron and Kenny (1986), were not met. The indirect effect (path $a_2b_2$) was examined using bootstrapping methods and found to be significant (95% CI[−0.05, −0.003]) since the bootstrapped confidence interval did not contain zero. Thus,

there was evidence to suggest that engagement mediated the relationship between trauma symptoms and math scores.

## Discussion

The main aim of the present study was to examine the mediation effect of engagement on the relationship between maltreatment and trauma symptoms and math and reading achievement for adolescents. Because of low internal consistency and concerns about measurement, the necessary first step to this investigation was to examine the structure of the engagement measure, which was followed by the SEM model to examine how engagement mediated maltreatment, trauma, and later reading and math achievement.

### Structure of Engagement

Guided by our selected theoretical framework (Skinner et al., 2009), the engagement measure was hypothesized to be multidimensional within a population of students who experienced maltreatment. Contrary to this hypothesized structure, however, the results of our study did not yield evidence for this multidimensional structure and instead indicated a unidimensional model. Although the multidimensionality structure of engagement was not supported using our selected measure, there was evidence based on theoretically-driven modification indices that some shared error variance between items were present. For example, items that asked about students' feelings about school and classes (i.e., *How often do you enjoy being in school? How often do you hate being in school? How often do you find your classes interesting?*) appeared to indicate some semblance of emotional dimension due to correlated errors.

Similarly, items about how the student goes above and beyond classroom expectations (i.e., *How often do you try to do your best work in school? How often do you listen carefully or pay attention in school? How often do you fail to complete or turn in your assignments? How often do you get your homework done?*) had shared error variance that appeared to represent the cognitive dimension. By allowing the errors of these items to correlate, however, we are able to minimally represent the hypothesized multidimensionality despite employing a unidimensional model (Cole et al., 2007). By doing so, our final model with correlated errors partially supported the theoretically-driven construct of engagement within our analytic sample using the selected measure. Despite partial support, however, these shared error variance and lack of model convergence on the theoretically-derived factor structures suggest the need for further validation studies to examine instrument development or refinement in order to more accurately represent engagement as a construct for students who experienced maltreatment.

Although measurement concerns are present in our maltreatment samples, these problems are pervasive even across educational science literature. For example, Fredricks and McClosky (2012) found that inconsistencies around conceptualization and measurement of engagement plagued many of the studies they included in their literature review. Specifically, there was no consensus on the dimensional specification of engagement as a construct, with some studies citing a unidimensional structure, while others included more than three. Such discrepancies were also evident in the selected measurement protocol of

engagement (Fredricks & McClosky, 2012). These inconsistencies have led to difficulties in comparing results across studies and in making valid conclusions about engagement.

Despite similar measurement concerns, however, our study contributes to the literature by illustrating the need to incorporate a measurement model (i.e., CFA) that provides an understanding of the internal structure of the employed measure to represent engagement for students with maltreatment experiences. Given the lack of psychometric studies examining engagement measures for this population of students at risk of academic problems due to maltreatment, it may be problematic to simply aggregate items in a measure purported to tap into the construct of engagement. Rather, creating the measurement model to account for measurement errors prior to subsequent analyses is advisable in order to control for possible bias in the interpretation of the composite scores.

### Differential Pathways from Maltreatment and Trauma Symptoms to Achievement

The main hypothesis was that engagement would mediate the effect of maltreatment and trauma symptoms on later math and reading scores. These relationships were tested using a full SEM path model. The results, broken down by each path, are discussed here.

**Maltreatment to math via engagement.—**There was a significant total effect of maltreatment predicting math scores, but the direct effect was not significant. This means that when engagement was entered into the model as a mediator, the effect of maltreatment on math scores disappeared. These results would usually support a mediation effect of engagement (Hayes, 2017); however, maltreatment did not significantly predict engagement and the indirect effect was not significant. These results are surprising and suggest that there may be another unaccounted-for variable that may explain these relationships. It is also possible that the measurement error present in the engagement measure hindered our ability to detect the indirect effect. If so, future researchers may want to reexamine the possible indirect effect of engagement on the relationship between maltreatment and math scores with a more reliable and valid engagement measure.

**Maltreatment to reading via engagement.—**The total and direct effects of maltreatment predicting reading scores were non-significant. This means that when engagement was entered into the model as a mediator, it had no effect on the relationship between maltreatment and reading scores. Maltreatment did not significantly predict engagement and the indirect effect of engagement was also not significant. These results suggest that engagement does not significantly mediate the effect of experiencing maltreatment on math achievement. The dearth of significant findings on both maltreatment pathways may be due in part to the lack of specificity in the measurement of maltreatment. The survey used only measured chronicity abuse and did not assess frequency, severity, and type. These dimensions have been shown to have differing effects on outcomes (English et al., 2005; Manly et al., 1994), which were not captured in this model. Future researchers should consider these dimensions when examining the mediating effect of engagement on the relationship between maltreatment and math and reading achievement.

**Trauma symptoms to math via engagement.—**There was a significant total effect of trauma symptoms predicting math scores and the direct effect was not significant. This means that when engagement was entered into the model as a mediator, the effect of trauma symptoms on math scores disappeared. These results support a mediation effect of engagement (Hayes, 2017); additionally, trauma symptoms did significantly predict engagement scores and the indirect effect was significant. These results suggest that engagement level indeed mediates the effect of experiencing trauma symptoms on math achievement. These findings provide support for Skinner et al. (2009)'s framework by demonstrating that engagement can explain lower standard math achievement scores for students who have fewer motivational resources (i.e., students who exhibit trauma symptoms) and that these students are placed at a disadvantage when they enter school, initiating a vicious cycle of engagement development.

**Trauma symptoms to reading via engagement.—**There was a significant total effect of trauma symptoms predicting reading scores and the direct effect was not significant. This means that when engagement was entered into the model as a mediator, the effect of trauma symptoms on reading scores disappeared. These results support a mediation effect of engagement (Hayes, 2017); additionally, trauma symptoms did significantly predict engagement scores and the indirect effect was significant. These results suggest that engagement level does mediate the effect of experiencing trauma symptoms on reading achievement. These findings provide further support for Skinner et al. (2009)'s framework by demonstrating that engagement is important in explaining why students with fewer motivational resources result in lower standard reading achievement scores. Again, such impoverished motivational resources place students at a disadvantage and thus initiating a vicious cycle where engagement cascades negatively.

Trauma symptoms had a unique effect on engagement and subsequent math and reading achievement, providing support for developmental psychopathology theory by illustrating the variability of effects that different factors have on engagement development. Given the principles of equifinality and multifinality, we know that experiencing maltreatment can lead to a variety of outcomes for different individuals. The results of the present study show that experiencing trauma symptoms as a result of maltreatment has an effect on a student's ability to engage in school, which in turn has an effect on their academic achievement. Specifically, experiencing trauma symptoms takes a larger toll on students' motivational resources above and beyond experiencing maltreatment alone. In this study, trauma symptoms were defined as having six domains, including anxiety, depression, dissociation, anger, and post-traumatic stress (Briere, 1996). The finding that these symptoms would have a strong effect on academic outcomes aligns with previous literature which has attributed negative outcomes of students who have experienced maltreatment on mental health issues (Leonard et al., 2016) and behavioral and emotional issues (Éither et al., 2004, Johnson et al., 2002).

## Engagement as an Important Mechanism

The finding that engagement significantly mediates the effect of trauma symptoms on academic achievement points to engagement as a viable academically-related mechanism

requiring further consideration. For example, the extant literature demonstrates that engagement is indeed a mediator between environmental characteristics and academic outcomes. In fact, a recent review of 1,843 articles on peer relationships and academic performance found engagement to be an important mediator between these constructs (Li et al., 2020). Engagement has also been found to mediate the relationship between career aspirations, parental and teacher support and academic performance in school (Perry et al., 2010) and relationship between classroom emotional climate and academic achievement (Reyes et al., 2012). However, these studies failed to examine how these engagement processes work for students who have experienced maltreatment, especially given the long-term effects on academic achievement. In terms of personal characteristics, engagement and academic achievement have been found to be associated with psychological capital resources (Martinez et al., 2019), a sense of relatedness (Furrer & Skinner, 2003), and achievement motivation (Wang & Eccles, 2013). However, engagement is conceptualized as an outcome or predictor in these studies .

The present study contributes to the literature by exploring the mediating effect of engagement on the relationship between personal characteristics of the student and academic achievement in a sample of students who have experienced maltreatment and trauma symptoms. By framing engagement as a process, the present study was able to identify engagement as a potential target for intervention that is academically-related and can help to improve outcomes for students who have experienced maltreatment.

### Limitations

This study is not without limitations. First, the engagement measure had very low reliability and did not fit the hypothesized structure when its structural validity was assessed. These issues suggest that the students' engagement may not have been totally captured by this measure. These measurement issues may have also brought error into the model and may have had an influence on the results of the study. For example, maltreatment may have been related to engagement and we may have found a significant indirect effect had the engagement measure been better. This further underlines the need for better, more valid, and more reliable measures on engagement for this population. Researchers should continue to take a critical eye to the measures being used to assess these students' engagement, while also working toward building better measures for the future. Second, the trauma symptoms, maltreatment, and engagement measures were all self-report, which may have introduced some bias to the model. Future researchers should examine these constructs from multiple points of view by collecting data from caregivers and teachers. Third, the maltreatment variable used was a chronicity count and did not have information about severity frequency, and type. These dimensions of maltreatment have been found to produce differing outcomes (English et al., 2005; Manly et al., 1994). Future researchers should examine the potential differing effects of severity, frequency, and type on engagement. This lack of specificity in the data may have also contributed to the results.

### Future Directions and Implications

Given the support these findings give to engagement as a source of intervention, researchers, policy makers, and practioners should develop trauma-informed interventions, policy, and

practices that can help mitigate some of the negative effects of maltreatment for these students. Future researchers should examine the antecedents of engagement with the goal of understanding how to best support its development in students. Previous research has determined that engagement is supported best in schools and classrooms that offer students choices, provide transparency in rule making, invite student participation in school policy, support a sense of control, and encourage positive relationships with teachers (Battistich et al., 1997; Connell & Welborn, 1991; Fredricks et al., 2002; Grolnick & Ryan, 1987; Newmann, 1981; Ryan & Grolnick, 1986; Skinner & Belmont, 1993; Valeski & Stipek, 2001). However, it is unclear how these practices would support engagement in a population of students who have experienced trauma-related symptoms. Thus, future research should explore these relationships to best meet the need for better trauma inform practices in schools (Panlilio & Tirrell-Corbin, 2017)..

Focusing on supporting engagement in schools may help alleviate the potential lack of support present in an unstable home environment. This could be specifically important for students who have experienced maltreatment, because they may not be getting much support at home (Stith et al., 2009), this may be especially true if the perpetrator of their maltreatment is one of their caregivers. Along those lines, researchers should also examine the potential effects that foster care and placement instability have on the development of engagement for these students. The instability of their home placement may be a product of poor relationships with foster parents at home (Smith et al. 2001), thus, it is important for researchers focus on how to support these students' engagement in school despite the inconsistency they may be facing.

Previous research on engagement with students who have experienced maltreatment and trauma symptoms focuses largely on engagement as an academic outcome. For example, based on the results of the present study, intervention efforts should focus on treating trauma symptoms exhibited by these students with the goal of improving student engagement and academic achievement. Future researchers should further explore other risk and protective factors; including personal characteristics, such as temperament, and environmental factors, such as parent-child and teacher-student relationships; and the effects they have on engagement development and later outcomes for these students. Thus, more research is needed understand the psychometric properties of how engagement is measured in this population with the goal of securing a reliable and valid way of measuring engagement for these students.

## Conclusion

The main purpose of this study was to examine engagement as a potential academically related mechanism which teachers and schools could use to improve the outcomes of students who have experienced maltreatment and trauma symptoms. We did this by exploring the mediation effect of engagement on the relationship between maltreatment and trauma symptoms and math and reading achievement. We found that engagement does mediate the effect of trauma symptoms on math and reading achievement, pointing to engagement as a source of intervention. Future research should focus on figuring out how to leverage these findings into effective interventions by identifying how to support these

students' engagement in the classroom. We also examined the validity and reliability of the engagement measure used in this study and found it to have poor validity and reliability. Future researchers should continue to explore the measurement of engagement in this population and work to build better measures.

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## References

Ackerman PT, Newton JEO, McPherson WB, Jones JG, & Dykman RA (1998). Prevalence of post traumatic stress disorder and other psychiatric diagnoses in three groups of abused children (sexual, physical, and both). Child Abuse & Neglect, 22(8), 759–774. 10.1016/S0145-2134(98)00062-3 [PubMed: 9717613]

Anderson JC, & Gerbing DW (1988). Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 103(3), 411–423.

Appleton JJ, Christenson SL, & Furlong MJ (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. Psychology in the Schools, 24(5), 369–386.

Baron R, & Kenny D (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51(6), 1173–1182. [PubMed: 3806354]

Battistich V, Solomon D, Watson M, & Schaps E (1997). Caring school communities. Educational Psychologist, 32, 137–151. 10.1207/s1536985ep3203_1

Bender K (2012). The mediating effect of school engagement in the relationship between youth maltreatment and juvenile delinquency. Children and Schools, 34(1), 37–48. 10.1093/cs/cdr001

Bethell CD, Newacheck P, Hawes E, & Halfon N (2014). Adverse childhood experiences: Assessing the impact on health and school engagement and the mitigating role of resilience. Health Affairs, 33(12), 2106–2115. 10.1377/hlthaff.2014.0914 [PubMed: 25489028]

Borofsky LA, Kellerman I, Baucom B, Oliver PH, & Margolin G (2013). Community violence exposure and adolescents' school engagement and academic achievement over time. Psychology of Violence, 3(4), 381–395. 10.1037/a0034121 [PubMed: 24163782]

Briere J (1989). Trauma symptom checklist for children (TSCC), professional manual. Odessa, FL: Psychological Assessment Resources.

Bunch-Crump KR, & Lo Y (2017). An investigation of multitiered behavioral interventions on disruptive behavior and academic engagement of elementary students. Journal of Positive Behavior Interventions, 19(4), 216–227. 10.1177/1098300717696939

Cole DA, Ciesla JA, & Steiger JH (2007). The insidious effects of failing to include design-driven correlated residuals in latent-variable covariance structure analysis. Psychological Methods, 12(4), 381–398. 10.1037/1082-989X.12.4.381 [PubMed: 18179350]

Connell JP, & Wellborn JG (1991). Competence, autonomy, and relatedness: A motivational analysis of self-system processes. In Gunnar M, & Sroufe LA (Eds.), Minnesota Symposium on Child Psychology (Vol. 23).

Cro., & Barth RP (2005). Cognitive and academic functioning in maltreated children. Children and Schools, 27(4), 197–206. 10.1093/cs/27.4.197

Dart EH, Radley KC, Battaglia AA, Dadakhodjaeva K, Bates KE, & Wright SJ (2016). The classroom password: A class-wide intervention to increase academic engagement. Psychology in the Schools, 53(4), 416–431. 10.1002/pits.21911

Deblinger E, McLeer SV, Atkins MS, Ralphe D, & Foa E (1989). Post-traumatic stress in sexually abused, physically abused, and nonabused children. Child Abuse and Neglect, 13(3), 403–408. 10.1016/0145-2134(89)90080-X [PubMed: 2776048]

English DJ, Upadhyaya MP, Litrownik AJ, Marshall JM, Runyan DK, Graham JC, et al. (2005). Maltreatment's wake: The relationships of maltreatment dimensions to child outcomes. Child Abuse & Neglect, 29, 597–619. 10.1016/j.chiabu.2004.12.008 [PubMed: 15970327]

Éthier LS, Lemelin JP, & Lacharité C (2004). A longitudinal study of the effects of chronic maltreatment on children's behavioral and emotional problems. Child Abuse and Neglect, 28(12), 1265–1278. 10.1016/j.chiabu.2004.07.006 [PubMed: 15607769]

Font SA, & Cage J (2018). Dimensions of physical punishment and their associations with children's cognitive performance and school adjustment. Child Abuse & Neglect, 75, 29–40. 10.1016/j.chiabu.2017.06.008 [PubMed: 28743493]

Font S, & Maguire-Jack K (2013). Academic engagement and performance : Estimating the impact of out-of-home care for maltreated children. Children and Youth Services Review, 35(5), 856–864. 10.1016/j.childyouth.2013.02.010

Fredricks JA, & McCloskey W (2012). The measurement of student engagement: A comparative analysis of various methods and student self-report instruments. Handbook of research on student engagement (pp. 763–804).

Fredricks JA, Blumenfeld PB, Friedel J, & Paris A (2002). Increasing engagement in urban settings: An analysis of the influence of the social and aca- demic context on student engagement. Paper Presented at the Annual Meeting of the American Educational Research Association.

Fredricks JA, Blumenfeld PC, & Paris AH (2004). School engagement: Potential of the concept, state of the evidence. Review of Educational Research, 74(1), 59–109. 10.3102/00346543074001059

Furrer C, & Skinner E (2003). Sense of relatedness as a factor in children's academic engagement and performance. Journal of Educational Psychology, 95(1), 148–162. 10.1037/0022-0663.95.1.148

Gagné PE, & Hancock GR (2006). Measurement model quality, sample size, and solution propriety in confirmatory factor models. Multivariate Behavioral Research, 41, 65–83. [PubMed: 26788895]

Goodman RD, Miller MD, & West-Olatunji CA (2012). Traumatic stress, socioeconmic status, and academic achievement among primary school students. Psychological Trauma: Theory, Research, Practice, and Policy, 4(3), 252–259. 10.1037/a0024912

Griffiths A, Lilles E, Furlong M, & Sidhwa J (2012). The relations of adolescent of student engagement with troubling and high-risk behaviors. Handbook of research on student engagement (pp. 563–584).

Grolnick WS, & Ryan RM (1987). Autonomy in children's learning: An experimental and individual difference investigation. Journal of Personality and Social Psychology, 52, 890–898. https://doi.org/0022-3514/87/$00.75. [PubMed: 3585701]

Haight W, Kayama M, Kincaid T, Evans K, & Kim NK (2013). The elementary-school functioning of children with maltreatment histories cognitive or behavioral diabilities: A mixed methods inquiry. Children and Youth Services Review, 35, 420–428. 10.1016/j.childyouth.2012.12.010 Publications, Inc.

Hayes AF, Preacher KJ, & Myers TA (2011). Mediation and the estimation of communication research. In Bucy EP, & Lance Holbert R (Eds.), The sourcebook for political communication research: Methods, measures, and analytical techniques (pp. 434–465). New York, NY: Taylor & Francis Group.

Hu L, & Bentler PM (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6(1), 1–55. 10.1080/10705519909540118

Johnson RM, Kotch JB, Catellier DJ, Winsor JR, Dufort V, Hunter W, et al. (2002). Adverse behavioral and emotional outcomes from child abuse and witnessed violence. Child Maltreatment, 7(3), 179–186. 10.1177/1077559502007003001 [PubMed: 12139186]

Kim J, & Cicchetti D (2010). Longitudinal pathways linking child maltreatment, emotion regulation, peer relations, and psychopathology. Journal of Child Psychology and Psychiatry and Allied Disciplines, 51(6), 706–716. 10.1111/j.1469-7610.2009.02202.x

Lanktree CB, Briere J, & Hernandez P (1991). Further data on the trauma symptom checklist for children (TSC-C): Reliability, validity and sensitivity to treatment. Paper Presented at the Annual Meeting of the American Psychological Association;.

Lemkin A, Kistin CJ, Cabral HJ, Aschengrau A, & Bair-Merritt M (2018). School connectedness and high school graduation among maltreated youth. Child Abuse and Neglect, 75(May 2017), 130–138. 10.1016/j.chiabu.2017.04.023 [PubMed: 28483290]

Leonard S, Stiles AA, & Gudiño OG (2016). School engagement of youth investigated by child welfare services: Associations with academic achievement and mental health. School Mental Health, 8(3), 386–398. 10.1007/s12310-016-9186-z

Li Y, & Lerner RM (2011). Trajectories of school engagement during adolescence: Implications for grades, depression, delinquency, and substance use. Developmental Psychology, 47(1), 233–247. 10.1037/a0021307. [PubMed: 21244162]

Li Y, Qiu L, & Sun B (2020). School engagement as a mediator in students' social relationships and academic performance: A survey based on CiteSpace. International Journal of Crowd Science. 10.1108/IJCS-02-2020-0005.

Mackinnon DP, Lockwood CM, Hoffman JM, West SG, & Sheets V (2002). A comparison of methods to test mediation and other intervening variable effects. Psychological Methods, 7(1), 1–35.

Manly JT, Cicchetti D, & Barnett D (1994). The impact of subtype, frequency, chronicity, and severity of child maltreatment on social competence and behavior problems. Development and Psychopathology, 6(1), 121–143.

Martin AJ (2008). Enhancing student motivation and engagement: The effects of a multidimensional intervention. Contemporary Educational Psychology, 33(2), 239–269. 10.1016/j.cedpsych.2006.11.003

Martinez IM, Youssef-Morgan CM, Chambel MJ, & Marques-Pinto A (2019). Antecedents of academic performance of university students: Academic engagement and psychological capital resources. Educational Psychology, 39(8), 1047–1067. 10.1080/01443410.2019.1623382

McNeil SL, Andrews AR, & Cohen JR (2020). Emotional maltreatment and adolescent depression: Mediating mechanism and demographic considerations in child welfare sample. Child Development, 91(5), 1681–1697. https://doi.org/10.1111.dev.13366. [PubMed: 32232849]

Newmann F (1981). Reducing student alienation in high schools: Implications of theory. Harvard Educational Review, 51, 546–564. 10.17763/haer.51.4xj67887u8l5t66t

Panlilio C, & Corr C (2020). Child maltreatment: Pathways to educational achievement through self-regulation and self-regulated learning. In Martin A, Sperling R, & Newton KJ (Eds.), Handbook of Educational Psychology and Students with Special Needs (pp. 197–219). New York, NY: Routledge.

Panlilio C, Ferrara A, & MacNeill L (2019). Trauma, self-regulation, and learning. In Panlilio C (Ed.), Trauma informed schools: How child maltreatment prevention, detection, and intervention can be integrated into the school setting (pp. 61–78). New York, NY: Springer Publishing.

Panlilio C, & Tirrell-Corbin C (2017). Trauma sensitive pedagogy for young children. In Svaricek R (Ed.), The International Council on Education for Teaching 61st World Assembly: Re-Thinking Teacher Professional Education: Using Research Findings for Better Learning (pp. 245–257). Czech Republic: Brno. Available online: https://icet4u.org/docs/ICET_Yearbook_of_Teacher_Education_2018.pdf#page=246.

Pears KC, Kim HK, Fisher PA, & Yoerger K (2013). Early school engagement and late elementary outcomes for maltreated children in foster care. Developmental Psychology, 49(12), 2201–2211. 10.1037/a0032218 [PubMed: 23477532]

Perry JC, Liu X, & Pabin Y (2010). School engagement as a mediator of academic performance among urban youth: The role of career preparation, parental support, and teacher support. The Counseling Psychologist, 38(2), 269–295. 10.1177/0011000009349272

Perzow SED, Petrenko CLM, Garrido EF, Combs MD, Cullhane SE, & Taussig HN (2013). Dissociative symptoms and academic functioning in maltreated children: A preliminary study. Journal of Trauma and Dissociation, 14(3), 302–311. 10.1080/15299732.2012.736928 [PubMed: 23627479]

Preacher KJ, & Hayes AF (2004). SPSS and SAS procedures for estimation indirect effects in simple mediation models. Behavior Research Methods, Instruments, & Computers, 36(4), 717–731.

Preacher KJ, Rucker DD, & Hayes AF (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. Multivariate Behavioral Research, 42(1), 185–227. [PubMed: 26821081]

Radley KC, Dart EH, & O'Handley RD (2016). The quiet classroom game: A class-wide intervention to increase academic engagement and reduce disruptive behavior. School Psychology Review, 45(1), 93–108. 10.17105/SPR45-1.93-108

Reyes M, Brackett MA, Rivers SE, White M, & Salovey P (2012). Classroom emotional climate, student engagment, and academic achievement. Journal of Educational Psychology, 1–13. 10.1037/a0027268

Rumsey AD, & Milsom A (2017). Supporting school engagement and high school completion through trauma-informed school counseling. Professional School Counseling, 22(1), 1–10. https://10.1177/215659X19867254.

Ryan RM, & Grolnick WS (1986). Origins and pawns in the classroom: Self- reports and projective assessments of individual differences in children's perceptions. Journal of Personality and Social Psychology, 50, 550–558. https://doi.org/0022-3514/86/$00.75.

Scott KL, Wolfe DA, & Wekerle C (2003). Maltreatment and trauma: Tracking the connections in adolescence. Child and Adolescense Psychiatric Clinics of North America, 12, 211–230. https://10.1016/S1056-4993(02)00101-3.

Shonk SM, & Cicchetti D (2001). Maltreatment, competency deficits, and risk for academic and behavioral maladjustment. Developmental Psychology, 37(1), 3–17. 10.1037/0012-1649.37.1.3 [PubMed: 11206431]

Skinner EA, & Belmont MJ (1993). Motivation in the classroom: Reciprocal effect of teacher behavior and student engagement across the school year. Journal of Educational Psychology, 85, 571–581. https://doi.org/0022-0663/93/$3.00.

Skinner EA, & Pitzer JR (2012). Developmentl dynamics of student engagement, coping, and everyday resilience. Handbook of Research on Student Engageemnt, 21–44.

Skinner EA, Kindermann TA, Connell JP, & Wellborn JG (2009). Engagement and disaffection as organizational constructs in the dynamics of motivational development. Handbook of motivation at school (pp. 223–245). 10.1016/j.biomaterials.2010.08.030 (January 2009).

Smith D, Stormshak E, Chamberlain P, & Whaley R (2001). Placement disruption in treatment foster care. Journal of Emotional and Behavioral Disorders, 9(3), 200–205.

Snyder SM, & Smith RE (2015). The influence of school engagement on counts of delinquent behaviors among maltreated youths. Children and Schools, 37(4), 199–206. 10.1093/cs/cdv015

Stith SM, Liu T, Davies C, Boykin EL, Alder MC, Harris JM, et al. (2009). Risk factors in child maltreatment: A meta-analysis review of the literature. Aggression and Violent Behavior, 14(1), 13–29. 10.1016/j.avb.2006/03/006

Turner JC, Christensen A, Kackar-Cam HZ, Trucano M, & Fulmer SM (2014). Enhancing students' engagement: Report of a 3-year intervention with middle school teachers. American Educational Research Journal, 51(6), 1195–1226. 10.3102/0002831214532515

Tyler KA, Johnson KA, & Brownridge DA (2008). A longitudinal study of the effects of child maltreatment on later outcomes among high-risk adolescents. Journal of Youth and Adolescence, 37(5), 506–521. 10.1007/s10964-007-9250-y

U.S. Department of Education, Office of the Under Secretary, (n.d.), Drug-Free Schools outcome study.

U.S. Department of Health & Human Services, & Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2020). Child maltreatment 2018. Available from https://www.acf.hhs.gov/cb/research-data-technology/statistics-research/child-maltreatment.

Valeski TN, & Stipek D (2001). Young children's feelings about school. Child Development, 73, 1198–2013. https://doi.org/0009-3920/2001/7204-0016.

Van Craeyevelt S, Verschueren K, Vancraeyveldt C, Wouters S, & Colpin H (2017). The role of preschool teacher–child interactions in academic adjustment: An intervention study with Playing-2-gether. British Journal of Educational Psychology, 87(3), 345–364. 10.1111/bjep.12153

Wang MT, & Eccles JS (2013). School context, achievement motivation, and academic engagment: A longitudinal study of school engagement using a multidimensional perspective. Learning and Instruction, 28, 12–23. 10.1016/j.learninstruc.2013.04.002

Wang M-T, & Holcombe R (2010). Adolescents' perceptions of school environment, engagement, and academic achievement in middle school. American Educational Research Journal, 47(3), 633–662. 10.3102/0002831209361209

Woodcock RW, McGrew KS, & Mather N (2001). Woodcock-Johnson III tests of achievement. Rolling Meadows, IL: Riverside.
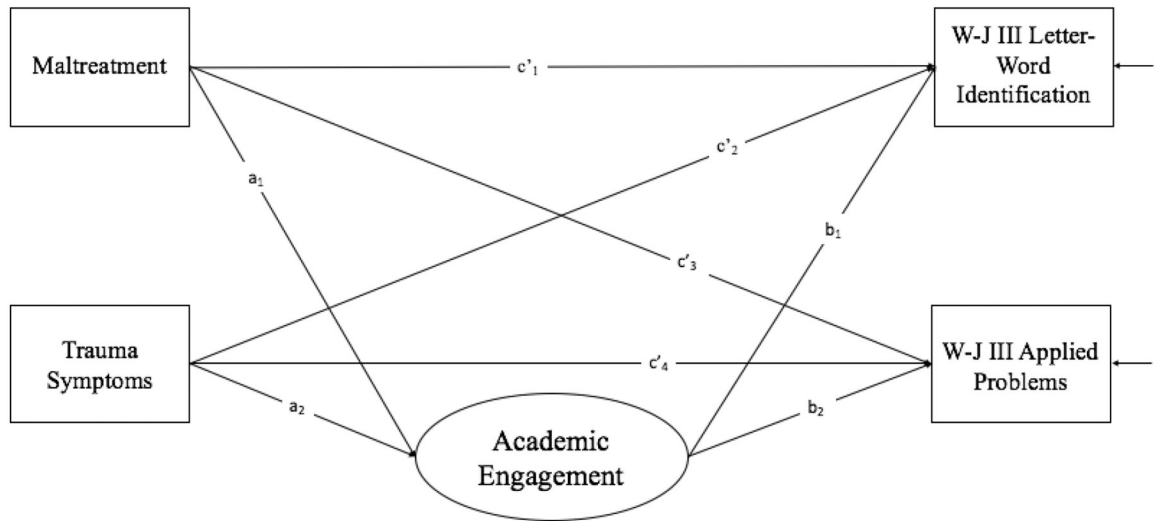
**Figure 1.**
Full SEM mediation model.

Academic
Engagement

| Enjoy school | Hate school | Do Best Work | School work too hard | Classes interesting | Don't turn in assignments | Misbehave | Get along with teachers | Pay attention | Do homework | Get along with students |

.53    -.54    .54    -.26    .55    -.40    -.57    .69    .70    .54    .37

-.48    -.27

.29    .37

.30

**Figure 2.**
All loadings and error correlations are standardized. Straight lines represent significant
paths.

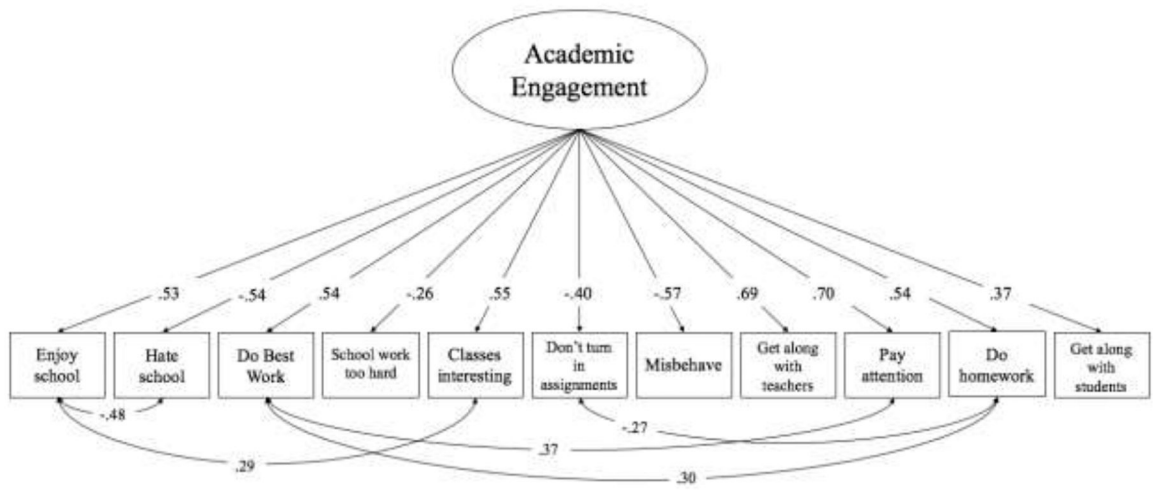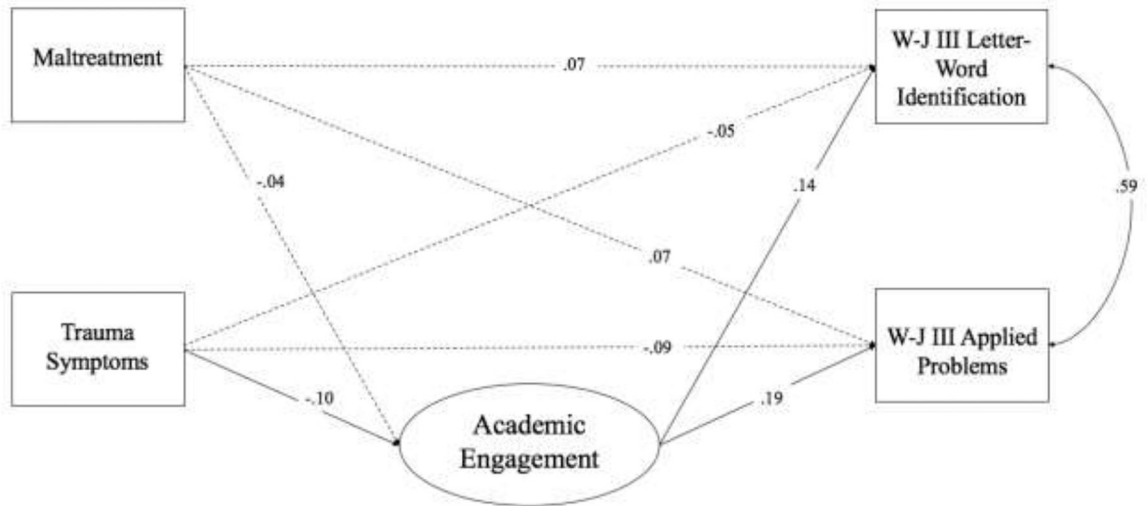**Figure 3.**
All path coefficients are standardized. Dotted lines represent insignificant paths. Straight lines represent significant paths.

**Table 1.**

Demographic Characteristics for the Final Analytic Sample

| Characteristic | *n* | *%* |
|---|---|---|
| Gender | | |
| Male | 255 | 43.7 |
| Female | 328 | 56.3 |
| Race | | |
| Refused/Don't Know | 23 | 3.9 |
| American Indian | 80 | 13.7 |
| Asian/Hawaiian/Pacific Islander | 33 | 5.7 |
| Black | 158 | 27.1 |
| White | 289 | 49.6 |
| Hispanic | 152 | 26.1 |
| Other | 68 | 11.7 |
| % Federal Poverty Level | | |
| <50% | 97 | 16.6 |
| 50% – <100% | 147 | 25.2 |
| 100% – 200% | 169 | 29.0 |
| >200% | 99 | 17.0 |
| Type of Abuse | | |
| Refused/Don't Know | 4 | 0.7 |
| Physical Maltreatment | 134 | 23.0 |
| Sexual Maltreatment | 74 | 12.7 |
| Emotional Maltreatment | 25 | 4.3 |
| Failure to Provide | 39 | 6.7 |
| Lack of Supervision | 81 | 13.9 |
| Abandonment | 11 | 1.9 |
| Educational Maltreatment | 12 | 2.1 |
| Exploitation | 1 | 0.2 |
| Other | 49 | 8.4 |
| Substance Exposure | 4 | 0.7 |
| Domestic Violence | 29 | 5.0 |
| Substance-abusing parent | 39 | 6.7 |
| Substantiated | | |
| Yes | 300 | 52.6 |
| No | 270 | 47.4 |
| Child Setting | | |
| In-Home: Biological Parent | 373 | 64.0 |
| In-Home: Adoptive Parent | 21 | 3.6 |
| Formal Kin Care | 39 | 6.7 |
| Informal Kin Care | 46 | 7.9 |
| Foster Care | 69 | 11.8 |

| Characteristic | *n* | *%* |
|---|---|---|
| Group Home/ Residential Program | 29 | 5.0 |
| Other Out of Home Placement | 6 | 1.0 |

**Table 2.**

Descriptive Statistics of Main Study Variables.

|  | **n** | **M** | **SD** | **Min** | **Max** |
|---|---|---|---|---|---|
| Maltreatment | 559 | 2.33 | 1.86 | 0 | 5 |
| TSCC | 578 | 50.1 | 10.8 | 33 | 91 |
| Academic Engagement | 518 | 29.2 | 3.21 | 16 | 37 |
| W-J III Letter-Word Identification | 448 | 90.2 | 18.6 | 1 | 135 |
| W-J III Applied Problems | 449 | 85.9 | 15.9 | 1 | 139 |

**Table 3.**

Pearson Correlations Between Main Variables

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. Maltreatment | - | | | | |
| 2. TSCC | .23* | - | | | |
| 3. Academic Engagement | −.07 | −.04 | - | | |
| 4. W-J III Letter-Word Identification | .03 | −.04 | .13** | - | |
| 5. W-J III Applied Problems | .03 | −.10* | .14** | .62** | - |

*
$p < .05$

**
$p < .01$

**Table 4.**

Unstandardized and Standardized Path Coefficients, Indirect Effects, and Bootstrapped CIs

| Path | $B$ | $SE$ | $\beta$ | 95% CI | |
|---|---|---|---|---|---|
| | | | | $LL$ | $UL$ |
| Maltreatment to letter-word identification total effect ($c_1$) | 0.56 | 0.41 | .06 | −.02 | .14 |
| Trauma symptoms to letter-word identification total effect ($c_2$) | −0.01 | 0.01 | −.06 | −.15 | .03 |
| Maltreatment to applied problems total effect ($c_3$) | −0.17** | .081 | −.11** | −.01 | .14 |
| Trauma symptoms to applied problems total effect ($c_4$) | 0.56 | 0.38 | .07 | −.81 | −.04 |
| Direct effects | | | | | |
| Maltreatment to letter-word identification ($c'_1$) | 0.61 | 0.41 | .07 | −.01 | .14 |
| Trauma symptoms to letter-word identification ($c'_2$) | −0.07 | 0.10 | −.05 | −.14 | .06 |
| Maltreatment to applied problems ($c'_3$) | 0.63 | 0.38 | 0.07 | −.01 | .15 |
| Trauma symptoms to applied problems ($c'_4$) | −0.14 | 0.09 | −0.02 | −.17 | −.01 |
| Maltreatment to academic engagement ($a_1$) | −0.01 | 0.01 | −.04 | −.12 | .05 |
| Trauma symptoms to academic engagement ($a_2$) | −0.01** | 0.00 | −.10** | −.19 | −.01 |
| Academic engagement to letter-word identification ($b_1$) | 5.63*** | 1.56 | .19*** | .07 | .25 |
| Academic engagement to applied problems ($b_2$) | 4.67*** | 1.39 | 14*** | .07 | .32 |
| Indirect effects | | | | | |
| Maltreatment to letter-word identification via academic engagement ($a_1 b_1$) | −0.05 | 0.07 | −.01 | −.03 | .01 |
| Maltreatment to applied problems via academic engagement ($a_1 b_2$) | −0.06 | 0.08 | −.01 | −.03 | .01 |
| Trauma symptoms to letter-word identification via academic engagement ($a_2 b_1$) | −0.02 | 0.01 | −.02** | −.04 | −.004 |
| Trauma symptoms to applied problems via academic engagement ($a_2 b_2$) | −0.03 | 0.02 | −.02** | −.05 | −.003 |

*
$p < .05$;

**
$p < .01$;

***
$p < .001$