The Role of Metacognition in Explaining the Relationship between Early Adversity and Reading Comprehension

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Abstract

The present study investigated the relationship between adverse childhood experiences and reading comprehension as well as the relationship between current trauma symptoms and reading comprehension. Each of these relationships were investigated as being mediated by academic metacognition (i.e., knowledge and regulation of cognition while completing learning tasks) and maladaptive metacognition (i.e., a lack of confidence in cognitions, positive beliefs about worry, cognitive self-consciousness, negative beliefs about the uncontrollability of thoughts, and beliefs about the need to control thoughts). A self-report survey asked undergraduate students ($N = 179$) about their adverse experiences prior to age 18, current trauma symptoms, academic metacognition, and maladaptive metacognition. In addition, students completed a reading comprehension task. Results from a path analysis indicated adverse experiences were not directly or indirectly related to reading comprehension. However, trauma symptomology was indirectly related to reading comprehension. Specifically, this relationship was mediated by maladaptive metacognition, but not academic metacognition. Taken together, results suggest that students' trauma symptoms may be more important in predicting academic achievement than simply their exposure to adversity. In particular, students who demonstrate trauma symptoms may be more likely to engage in maladaptive metacognition, leading to lower performance on reading comprehension tasks. This study suggests that practitioners working with students demonstrating trauma symptoms should be aware of students' use of maladaptive metacognition, which may impede their academic achievement.

Keywords: adverse childhood experiences, metacognition, reading comprehension, self-regulated learning

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1. Introduction

Adverse childhood experiences, or traumatic events, are conceptualized as events that overwhelm a child's capacity to cope (Lieberman & Knorr, 2007). These adverse events include, but are not limited to, child maltreatment (i.e., physical, sexual, or emotional abuse and physical or emotional neglect), interpersonal violence in the home, and living with an adult with substance abuse problems. Often, these adverse experiences have long-lasting effects on children's behavior, emotion, and cognitive self-regulation (e.g., Cicchetti, 2016; Rosen, Handley, Cicchetti, & Rogosch, 2018; Teicher, Samson, Anderson, & Ohashi, 2016). Effects of early traumatic events also negatively affect students' academic achievement in primary (Rouse & Fantuzzo, 2009; Schatz, Smith, Borkowski, Whitman, & Keogh, 2008) as well as secondary (Crozier & Barth, 2005; Schelble, Franks, & Miller, 2010) school. Although at a reduced rate compared to their peers, evidence suggests many students who have suffered trauma are admitted to four-year colleges (Okpych & Courtney, 2017; Pecora et al., 2006). However, at the collegiate level, students who experience adverse events, particularly with accompanying trauma symptomology, continue to demonstrate lower academic achievement in college compared to their peers (Boyraz, Horne, Owens, & Armstrong, 2013; Jordan, Combs, & Smith, 2014). More specifically, a greater number of cumulative traumatic events has been associated with more negative academic and personal-emotional adjustment during students' first semester of college (Banyard & Cantor, 2004). In addition, students who experienced early adversity and show symptoms of posttraumatic stress disorder (PTSD) earned lower grades during their freshman year when compared with non-victimized peers (Jordan et al., 2014). Further, students who

experienced early adversity were also more likely to leave college prior to the end of their second year (Boyraz et al., 2013). These negative outcomes were found to be more pronounced for former foster youth (Day, Dworsky, Fogarty, & Damashek, 2011; Okpych & Courtney, 2018; Unrau, Font, & Rawls, 2012). Taken together, these studies show that students with histories of early adversity require support to achieve in college at the level of their peers.

Efforts have been made to help mitigate the detrimental effects of early adversity on the academic performance of undergraduate students. For example, Unrau and colleagues (2017) found that a college support program providing financial aid, housing, and adult guidance allowed for students coming from foster care to exceed the national average of college completion for students from foster care. Despite these necessary and important efforts, however, students' completion rates were still below that of first-generation college students (Unrau et al., 2017). While it seems that college support programs (e.g., academic counseling, social enrichment, and personal counselling) can promote post-secondary success despite early adversity, college students who have faced traumatic events continue to fall behind in academic performance relative to their peers (Day et al., 2011; Jordan et al., 2014). This achievement gap signals the need to consider other potential pathways that might allow for increased academic achievement. That is, the specific academic-related mechanisms bridging early adverse experiences to learning processes remain unclear.

Prior literature suggests that younger students' poor academic achievement is associated with decreased self-regulation capacities (Hanson et al., 2017; Panlilio et al., 2018; Schatz et al., 2008; Schelble et al., 2010). In addition, in prior studies of college students and adults, experiences of childhood adversity have been associated with problems with cognitive and emotion self-regulation (Allen, 2011; Carvalho Fernando et al., 2014; Daly, Hildenbrand,

Turner, Berkowitz, & Tarazi, 2017; Dvir, Ford, Hill, & Frazier, 2014; Lilly, London, & Bridgett, 2014). Therefore, learning theories that not only focus on the outcomes of learning, but also the self-regulation of learning, may help explain why students with adverse backgrounds often fail to academically perform at a similar level as their peers.

1.1. Self-Regulated Learning

Self-regulated learning (SRL) is a cyclical and organized learning process that refers to a learner's active regulation of behavior, emotions/motivation, and cognition to achieve a goal (Pintrich, 2000; Zimmerman, 1989; Boekaerts, 2011; Winne & Hadwin, 1998; Wolters, 2003). Within the field of educational psychology, SRL has been found to be an important learning process for successful academic performance (Boekaerts, 1999b; Panadero, 2017; Puustinen & Pulkkinen, 2001; Zimmerman, 2008). Given its importance in explaining academic performance, SRL may help explain differences in achievement between students who have faced adverse experiences and those who have not. SRL is important for increasing academic achievement across domain-specific outcomes such as math or language arts (Nota, Soresi, & Zimmerman, 2004) and domain-general outcomes such as reading comprehension or achievement (Yusuf, 2011; Zimmerman, Moylan, Hudesman, White, & Flugman, 2011). More specifically, SRL is important in the process of reading to learn (Weir & Khalifa, 2008), which is critical to college success. Reading to learn is often referred to as reading comprehension, or a deep understanding of written content material such that a learner can use the information acquired from the text in a novel environment (Kintsch, 1994). In prior studies, course-relevant reading comprehension performance positively predicted performance in the course (Royer, Abranovic, & Sinatra, 1987; Royer, Marchant, Sinatra, & Lovejoy, 1990). In addition, college students who reported using more reading comprehension strategies also demonstrated higher ACT scores as well as college

GPAs (Taraban, Rynearson, & Kerr, 2000). Unfortunately, college students with adverse experiences are likely to struggle with reading comprehension, as younger students and adolescents with adverse experiences have demonstrated decreased reading comprehension compared to their peers (Coohey, Renner, Hua, Zhang, & Whitney, 2011; Crozier & Barth, 2005; Jimenez, Wade, Lin, Morrow, & Reichman, 2016). These decreases in reading comprehension may be a result of poor self-regulated learning.

SRL involves activating and coordinating motivation beliefs, task analysis, attention, self-observation, strategy use, metacognition, self-evaluations, and affect (Pintrich, 2000; Zimmerman, 1989; Boekaerts, 2011; Winne & Hadwin, 1998; Wolters, 2003). However, metacognition, or the knowledge and regulation of one's own cognition (Brown, 1978; Flavell, 1979), is integral to self-regulated reading for learning. In an academic context, metacognition includes knowledge of cognition (i.e., declarative, procedural, and conditional knowledge) and regulation of cognition (i.e., planning, monitoring, and evaluation) while completing learning tasks (Schraw & Dennison, 1994; Schraw & Moshman, 1995; Zimmerman, 2008). In short, academic metacognition allows readers to keep track of where they are in a text and how well they have understood the text thus far. For college students, knowledge of cognition has been shown to mediate the relationship between prior knowledge and reading comprehension (Wang & Chen, 2013), and regulation of cognition was found to be related to higher reading comprehension scores (Bernacki, Byrnes, & Cromley, 2012). Schooler, Reichle, and Halpern (2004) suggest that "metaconsciousness," or the awareness that one's attention has wandered from reading the text (i.e., "zoning out"), is necessary to reading for comprehension.

In a non-academic context, metacognition can be maladaptive, and is defined as a lack of confidence in cognitions, positive beliefs about worry (i.e., worrying helps one cope), cognitive

self-consciousness (i.e., a tendency to monitor cognitions), negative beliefs about the uncontrollability of thoughts, and beliefs about the need to control thoughts (Wells & Cartwright-Hatton, 2004). This maladaptive metacognition, or over-regulation and general distrust of thought, contributes to perceived stress, anxiety, and depression (Spada, Mohiyeddini, & Wells, 2008; Spada, Nikcevic, Moneta, & Wells, 2008). College students with adverse experiences or trauma symptomology may be more likely to engage in maladaptive metacognition, as they are often more likely to demonstrate anxiety and depression (Karatekin, 2017). By engaging in maladaptive metacognition, they may not have the cognitive capacity to also engage in academic metacognition, which may contribute to poor reading comprehension outcomes.

1.2. Boekaerts' Dual Processing Self-Regulation Model

Although there are several models of SRL that differ in how they prioritize and explain the effects of self-regulated behavior, motivation, and emotion (Panadero, 2017), the current study is guided by Boekaerts' Dual Processing self-regulation model (Boekaerts, 2011). This model posits three purposes of self-regulated learning (SRL): expanding one's knowledge and skills, preventing threat to oneself or loss of resources, and protecting one's commitment to learning (Boekaerts, 2007a; Panadero, 2017). These three purposes are triggered by task appraisal, which is determined by an internal working model of the task based upon (1) perceptions of the task and the physical, social, and instructional context; (2) domain-specific prior knowledge and cognitive and metacognitive strategies related to the task; and (3) motivational beliefs (i.e., domain-specific capacity, self-efficacy, interest, and effort; Boekaerts, 2007b). For example, students may positively appraise a task if the context is perceived as favorable, they have prior knowledge relevant to the task and a strategy to complete the task, or

high self-efficacy for or interest in the task. However, students may negatively appraise a task if the context is perceived as threatening, their prior knowledge is lacking or they do not have a strategy related to completing the task, or their self-efficacy or interest is low. Students may also have a combination of positive and negative features informing their appraisals, such as a perception of favorable contexts and high prior knowledge but low strategy knowledge and low task interest. Students' internal working models of the task take these features into account and determine an overall positive or negative appraisal.

If students positively appraise the task, judging it to be congruent with their goals, positive emotions and cognitions will arise. They then will pursue the first purpose of SRL: expanding knowledge and skills. Boekaerts (2007a) calls this a "top-down" purpose, which leads students on the growth/mastery pathway. Students on the growth/mastery pathway use cognitive and metacognitive strategies to guide their learning experiences. Their assessment of the learning episode then feeds back to their domain-specific prior knowledge and cognitive and metacognitive strategies related to the task to inform future appraisals (Boekaerts & Niemivirta, 2000). Due to increased prior knowledge and strategies, students are likely to continue to appraise similar tasks positively, seeking to expand their knowledge and skills on the growth/mastery pathway.

When students perceive the task to be incongruent with their goals, they negatively appraise a task and pursue the second purpose of SRL: preventing threat to oneself. This is a "bottom-up" purpose, which leads students on the well-being pathway. Students on the well-being pathway are primarily concerned with protecting their safety or avoiding embarrassment or shame. Their assessment of the learning episode then feeds back to inform their motivational beliefs, typically decreasing domain-specific capacity, self-efficacy, interest, and effort in the

task (Boekaerts & Niemivirta, 2000). Due to decreased motivation for the task, students may continue to appraise similar tasks negatively, continuing on the well-being pathway. Students may also redirect themselves from the well-being pathway to the growth/mastery pathway (via internal or external motivation) and engage in the third purpose of SRL: protecting one's commitment to learning. Students who have redirected are primarily concerned with seeing a learning task through despite feeling that the task is threatening to oneself.

Typically, this model is investigated in the context of a specific learning task such as mathematics homework or a reading comprehension task. Much of the research has focused on identifying students' cognitive and emotional appraisals (Crombach, Boekaerts, & Voeten, 2003), individual and situational differences resulting in differing appraisals (Seegers & Boekaerts, 1993, 1996; Boekaerts, 1999a), and the effects of appraisals on students' evaluations of their learning outcomes (Boekaerts, Otten, & Voeten, 2003; Boekaerts, 2007a). However, Boekaerts (2000, 2007) posits that over years of learning situations, some students have efficiently learned to cope with learning obstacles with problem-focused strategies such as metacognitive strategies (e.g., monitoring progress toward a goal, evaluating strategy use), while other students use emotion-focused coping strategies, such as giving up or taking a deep breath. Further, Boekaerts (2007a) says that these reactions are likely to be quasi-automatic when engaging in familiar tasks such as reading for comprehension. Thus, students who typically meet academic obstacles with problem-focused strategies may be more likely to automatically engage in the growth/mastery pathway, while those who typically meet academic obstacles with emotion-focuses strategies may be more likely to automatically engage in the well-being pathway.

Students with adverse experiences may be more likely to automatically appraise learning situations negatively, with interest in protecting their safety and well-being over learning. Thus, they may be less likely to engage in academic metacognition (a problem-focused strategy, part of the growth pathway) and more likely to engage in maladaptive metacognition (an emotion-focused strategy, part of the well-being pathway), resulting in poor academic outcomes. That is, students may be engaging in maladaptive metacognition as a coping strategy to protect their well-being.

1.3. The Present Study

The present study investigated the potential mediation of academic and maladaptive metacognition on the relationship between adverse experiences and reading comprehension as well as the relationship between trauma symptoms and reading comprehension (see Figure 1 for the conceptual path model). The present study hypothesized that adverse childhood experiences as well as trauma symptoms would be negatively predictive of reading comprehension. In addition, the present study hypothesized that the relationship between adverse childhood experiences and reading comprehension would be mediated by academic and maladaptive metacognition such that lower academic metacognition and higher maladaptive metacognition could help explain the negative effects of adversity on reading comprehension. Similarly, it was hypothesized that the relationship between trauma symptoms and reading comprehension would be mediated by academic and maladaptive metacognition such that lower academic metacognition and higher maladaptive metacognition could help explain the negative effects of trauma symptoms on reading comprehension.

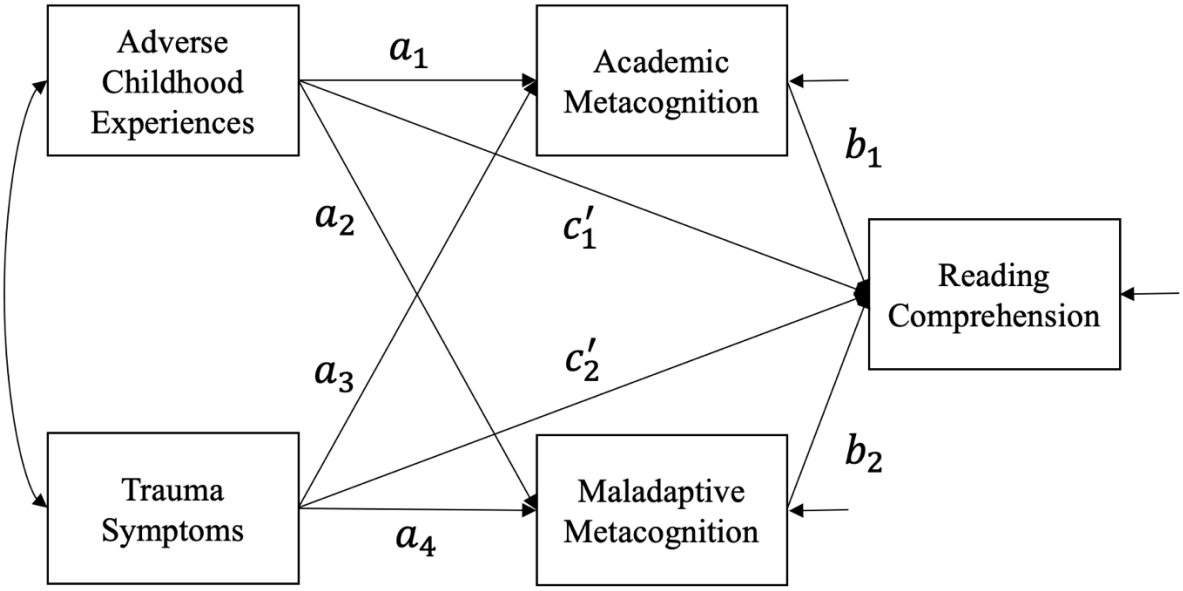

Figure 1. Conceptual path model.

2. Methods

2.1. Participants

Participants were 179 undergraduate students enrolled in an introductory educational psychology course at a mid-Atlantic university. Participants were mostly female (*n* = 152; 85%), freshman (*n* = 97; 54%), and White/Caucasian (*n* = 153; 86%). Participants' age ranged from 18 to 22 and the mean age was 18.71 (*SD* = 0.87). The majority of participants (*n* = 173; 97%) reported English as their native language. On a four-point scale, participants' mean college grade point average was 3.31 (*SD* = 0.44), with a range of 1.64 to 4.0. See Table 1 for further demographic information. Participants earned 2% of extra credit toward their course grade. Students who were not interested in participating in the study were offered an alternative assignment.

Table 1

Demographic Characteristics

Characteristic	*n*	%
Gender		
Male	26	14.5
Female	152	84.9
Do not wish to specify	1	0.6
Semester standing		
Freshmen (semesters 1-2)	97	54.2
Sophomores (semesters 3-4)	70	39.1
Juniors (semesters 5-6)	6	3.4
Seniors (semesters 7-8)	6	3.4
Race/Ethnicity		
American Indian/Alaskan Native	2	1.1
White/Caucasian	153	85.5
Black/African American	3	1.7
Asian/Pacific Islander	5	2.8
Hispanic/Latino(a)	4	2.2
Two or more	10	5.6
Other	1	0.6
Prefer not to specify	1	0.6

2.2. Procedure

Participants provided informed consent prior to participating in the study, which was approved by the Institutional Review Board. Participants completed all study tasks within a Qualtrics survey. First, students were asked to respond to two self-report measures focused on metacognition. Next, students completed a prior knowledge assessment for a reading comprehension task, read the passage, and answered 10 multiple-choice questions based on the text. Finally, students completed a questionnaire about their experiences with early adversity, a trauma symptoms checklist, and demographics survey.

2.3. Measures

2.3.1. Academic metacognition

The Metacognitive Awareness Inventory (MAI; Schraw & Dennison, 1994) is an empirically validated and reliable scale and was administered to assess participants' academic metacognition. This 52-item Likert scale comprises two subscales (i.e., knowledge of cognition and regulation of cognition) and asked students to items (e.g., "I ask myself periodically if I am meeting my goals," "I understand my intellectual strengths and weaknesses") on a scale from 1 (*do not agree*) to 5 (*agree very much*). The overall internal consistency reliability was $\alpha = .92$.

2.3.2. Maladaptive metacognition

The Metacognitions Questionnaire (MCQ-30; Wells & Cartwright-Hatton, 2004) is a valid and reliable short form and was given to assess participants' engagement in maladaptive, coping metacognition. This 30-item questionnaire asked students to rate the degree to which they agree with statements (e.g., "Worrying helps me to avoid problems in the future," "My memory can mislead me at times") on a Likert scale from 1 (*do not agree*) to 4 (*agree very much*). In the current study, the overall internal consistency reliability was $\alpha = .91$.

2.3.3. Adverse childhood experiences

Students were asked to respond "yes" or "no" to 10 questions about their traumatic experiences (i.e., emotional, physical, and sexual abuse; emotional and physical neglect; parental separation/divorce; emotional and physical abuse of mother; household member with alcohol/drug abuse; household member with mental illness or suicide ideation; household member incarcerated) prior to the age of 18 on the Adverse Childhood Experiences (ACEs) Study Questionnaire (Felitti et al., 1998). These questions have been shown to be indicators of

adult risk behaviors (e.g., drug abuse, suicide attempts, depression) and diseases (e.g., heart disease, cancer, chronic lung disease; Felitti et al., 1998).

2.3.4. Trauma symptoms

To capture students' current trauma symptoms, students were asked to respond to the Trauma Symptom Checklist-40 (TSC-40; Briere & Runtz, 1989). This 40-item measure asked participants to rate how often they experienced each of the symptoms of trauma (e.g., headaches, insomnia, nightmares, memory problems) in the last month on a scale from 0 (*never*) to 3 (*often*). Used as an overall factor, it has been shown to be reliable ($\alpha = .90$) and predictive of self-reported traumatic events (Elliott & Briere, 1992). In the current sample, the internal consistency reliability was $\alpha = .91$.

2.3.5. Reading comprehension

Reading comprehension was assessed by replicating methods from Kang, McDermott, and Roediger (2007). Students were asked to read an article published in Current Directions in Psychological Science (Treiman, 2000), which discusses the foundations of literacy. Before reading, students were asked to respond to the open-ended question, "What do you know about the foundations of literacy and the alphabetic principle?" to control for prior knowledge. After reading, they responded to 10 multiple-choice reading comprehension questions.

2.4. Analytic strategy

Participants' answers to the prior knowledge question were read and no students demonstrated prior knowledge of the reading topic (i.e., all answers said "nothing," or something similar). Participants' multiple-choice responses were coded as correct or incorrect. Little's (1988) missing completely at random (MCAR) test revealed that data were missing completely at random, $\chi^2(3520, N = 179) = 3508.11$, $p = .55$. Due to the very low rate of missing data on

self-report measures (i.e., less than 1% of all data points missing across the entire data set) and a missing completely at random assumption, missing data were imputed using the expectation-maximization method (Gold & Bentler, 2000) in SPSS Statistics Version 25. Total scores for each of the self-report measures were computed (i.e., MAI, MCQ-30, ACEs, TSC-40) as well as a total reading comprehension score. Path analyses were conducted with Mplus (Muthén, & Muthén, 1998-2017; Version 8.3) using the ML estimator. Adverse childhood experiences and trauma symptoms were used as exogenous variables, and academic metacognition, maladaptive metacognition, and reading comprehension were used as endogenous variables (see Figure 1). According to current recommendations for mediation analyses (Hayes, Preacher, & Myers, 2011; Mackinnon, Lockwood, Hoffman, West, & Sheets, 2002), bootstrapping confidence intervals (1000 bootstrap resamples) were used to determine the significance of the indirect effects. In addition, according to the recommendation of Hu and Bentler (1998, 1999) for small sample sizes, the chi-square (χ^2) test, Comparative Fit Index (CFI; ≥ 0.95 for good, ≥ 0.90 for acceptable), and the Standardized Root Mean Square Residual (SRMR; ≤ 0.08 for good; Brown, 2015; Hu & Bentler, 1999) were calculated to assess the global fit of the mode.

3. Results

Frequencies of students' self-reported adverse experiences are presented in Table 2. Descriptive statistics and the correlation matrix are presented in Table 3. The path model demonstrated overall good fit, $\chi^2(1, N = 179) = 3.44$, $p = .06$, CFI = .96, SRMR = .03. The model effect sizes were medium for the reading comprehension posttest ($R^2 = .10$, $p = .03$) and large for the MCQ-30 ($R^2 = .27$, $p < .001$; Cohen, 1988). Results indicated that the MAI did not add further variance in the model ($R^2 = .01$, $p = .68$). Unstandardized and standardized path coefficients, indirect effects, and 95% bootstrapping confidence intervals are shown in Table 4.

Table 2

Self-Reported Adverse Childhood Experiences

Adverse Childhood Experiences Types and Frequencies	*n*	%
Types of adverse experiences		
Emotional abuse	37	20.7
Physical abuse	17	9.5
Sexual abuse	12	6.7
Emotional neglect	35	19.6
Physical neglect	3	1.7
Parental separation/divorce	46	25.7
Emotional and physical abuse of mother	5	2.8
Household member with alcohol/drug abuse	22	12.3
Household member with mental illness or suicide ideation	41	22.9
Household member incarcerated	12	6.7
Cumulative number of reported adverse experiences		
0	78	43.6
1	45	25.1
2	25	14.0
3	13	7.3
4	6	3.4
5	3	1.7
6	7	3.9
7	1	0.6
8	1	0.6

Table 3

Pearson Correlations between Main Variables

Measure	1	2	3	4	5	*M*	*SD*
1. ACEs	–					1.28	1.68
2. TSC-40	.33**	–				27.38	15.62
3. MAI	.07	-.02	–			194.60	20.82

4. MCQ-30	.17*	.52**	.11	–		63.94	15.37
5. Posttest	.06	-.19*	.07	-.26**	–	4.83	1.80

* $p < .05$ ** $p < .01$

Table 4

Unstandardized and Standardized Path Coefficients, Indirect Effects, and Bootstrapping CIs Predicting Posttest

				95% CI	
Path	*B*	*SE*	β	*LL*	*UL*
Adverse experiences to reading comprehension total effect (c_1)	0.15†	0.08	.14 †	.00	.29
Trauma symptoms to reading comprehension total effect (c_2)	-0.03**	0.01	-.24**	-.22	-.04
Direct effects					
Adverse experiences to reading comprehension (c_1')	0.14†	0.08	.13†	-.00	.30
Trauma symptoms to reading comprehension (c_2')	-0.13	0.01	-.11	-.27	.04
Adverse experiences to academic metacognition (a_1)	1.00	0.85	.08	-.05	.21
Adverse experiences to maladaptive metacognition (a_2)	-0.06	0.68	-.01	-.15	.13
Trauma symptoms to academic metacognition (a_3)	-0.06	0.11	-.04	-.20	.11
Trauma symptoms to maladaptive metacognition (a_4)	0.51***	0.07	.52***	.39	.63
Academic metacognition to reading comprehension (b_1)	0.01	0.01	.09	-.06	.23
Maladaptive metacognition to reading comprehension (b_2)	-0.03**	0.01	-.23**	-.38	-.08
Indirect effects					
Adverse experiences to reading comprehension total indirect effect	0.01	0.02	.01	-.03	.05
Trauma symptoms to reading comprehension total indirect effect	-0.01*	0.01	-.12*	-.22	-.04
Adverse experiences to reading comprehension via academic metacognition (a_1b_1)	0.01	0.01	.01	-.01	.03
Adverse experiences to reading comprehension via maladaptive metacognition (a_2b_2)	0.00	0.02	.00	-.03	.04
Trauma symptoms to reading comprehension via academic metacognition (a_3b_1)	0.00	0.00	-.00	-.03	.01
Trauma symptoms to reading comprehension via maladaptive metacognition (a_4b_2)	-0.01**	0.01	-.12**	-.21	-.04

† $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

The total effect of adverse experiences (path c_1) and the indirect effects of adversity remained nonsignificant (p = .05 and p = .65, respectively). However, the total effect (path c_2) and total indirect effects of trauma symptoms on reading comprehension were statistically significant in the negative direction (p < .01 and p = .01, respectively) as hypothesized. In addition, trauma symptoms positively predicted maladaptive metacognition (path a_4), whereas maladaptive metacognition negatively predicted reading comprehension (path b_2) as hypothesized (p < .001 and p < .01, respectively). Finally, there was a negative indirect effect from trauma symptoms to reading comprehension (posttest) via maladaptive metacognition (path a_4b_2) as hypothesized (p = .01). Taken together, these results suggest that maladaptive metacognition mediated the relationship between trauma symptoms and reading comprehension, as the direct effect (path c_2') was not statistically significant (p = .15) with maladaptive metacognition in the model (Hayes et al., 2011; Mackinnon et al., 2002). Trauma symptoms did not have a statistically significant direct effect on academic metacognition (path a_3, p = .61), nor did academic metacognition have a statistically significant direct effect on reading comprehension (path b_1, p = .24). Thus, the indirect path from trauma symptoms to reading comprehension (posttest) via academic metacognition (MAI), was not statistically significant (path a_3b_1, p = .72).

4. Discussion

The present study investigated the potential mediation of academic and maladaptive metacognition on the relationship between adverse childhood experiences and reading comprehension as well as the relationship between trauma symptoms and reading comprehension in a college student sample. Importantly, this study demonstrated that adverse childhood experiences were not directly or indirectly related to reading comprehension. However, trauma

symptomology indirectly and negatively predicted reading comprehension for college students, meaning the more trauma symptoms participants reported, the worse their performance on the reading comprehension posttest was. More specifically, the current model supports the indirect relationship between trauma symptoms and reading comprehension via maladaptive metacognition, but not academic metacognition.

Taking the lack of direct and indirect effects of adverse experiences on reading comprehension and the presence of indirect effects of current trauma symptoms on reading comprehension together, this study suggests that students' trauma symptoms may be more important in predicting their academic achievement. That is, students may have experienced prior trauma, but their current symptoms present a barrier to high academic achievement. This relationship reflects the DSM-V diagnostic criteria for trauma-related disorders, which necessitates the presence of several symptoms in addition to exposure to the traumatic event (American Psychiatric Association, 2013). This finding also supports the notion that individual functioning, particularly during academic-related activities, is impacted by prior traumatic events primarily through overwhelming one's capacity to cope and not the event itself (Lieberman & Knorr, 2007).

More specifically, the relationship between trauma symptoms and reading comprehension was mediated by maladaptive metacognition. These results support and extend Boekaerts' Dual Processing self-regulation model (Boekaerts, 2011), in that students with more trauma symptoms are likely to follow the well-being pathway and engage in more maladaptive metacognition, thus demonstrating lower reading comprehension posttest scores. Importantly, the present study found that the effects of trauma symptomology on reading comprehension were not mediated by academic metacognition. Often, studies find that adverse experiences result in decreased self-

regulation capacities for younger students (Cicchetti, 2016; Rosen et al., 2018; Teicher et al., 2016). However, the present study suggests otherwise, with trauma symptomology being unrelated to an important cognitive self-regulation skill, academic metacognition. This finding may indicate that at college level students are less likely to demonstrate effects of their prior traumatic experiences on academic metacognition due to academic resilience. However, students' prior experiences place them at an increased risk for maladaptive metacognition interfering with their academic endeavors.

4.1. Implications for students

College students who have experiences early adversity are at risk for earning lower grade point averages and dropping out of college compared to their peers (Boyraz et al., 2013; Jordan et al., 2014). One important skill to college success is reading comprehension (Royer et al., 1987; Royer et al., 1990; Taraban et al., 2000). However, this study suggests that college students with trauma symptoms may be more likely to demonstrate decreased reading comprehension via maladaptive metacognition. This mechanism may help explain why students of adverse backgrounds suffer poor college academic outcomes. More specifically, this study may suggest that college students with trauma symptoms are more likely to perceive reading comprehension tasks to be incongruent with their goals. According to Boekaerts (2007a), this leads to a negative appraisal and engagement with the well-being pathway, preventing threat to oneself. As the well-being pathway is triggered by a bottom-up process and also negatively impacts students' motivational beliefs (Boekaerts & Niemivirta, 2000), it is likely this process has become quasi-automatic. That is, for students with trauma symptoms, negative appraisals of reading comprehension tasks may be internalized, leading students toward the well-being pathway in learning tasks involving reading comprehension.

4.2. Implications for practitioners

This study suggests that practitioners working with students should be mindful of students' current trauma symptoms, as these relate to reading comprehension. In particular, for students exhibiting trauma symptomology, practitioners should be aware that during academic tasks students' metacognitive focus may not be solely on the academic task. That is, students may be engaging in metacognition that is not relevant or useful to the task at hand. Further, students' negative appraisals of reading comprehension tasks may be automatic and they may require support in redirecting themselves from a negative, bottom-up appraisal (leading to the well-being pathway) to a positive, top-down appraisal (leading to the growth/mastery pathway). More specifically, educators, academic advisers, and others who work directly with students can encourage students to focus on the task at hand instead of maladaptively monitoring their thoughts as well as encouraging students to use deliberate top-down learning strategies (e.g., summarizing/paraphrasing text, underlining/highlighting, note taking, connecting prior knowledge). That is, they can provide resources to encourage that students continue on the growth/mastery pathway instead of the well-being pathway. Those who work at a supportive or programming levels may wish to consider supporting more direct academic interventions (e.g., tutoring, self-regulated learning strategy instruction) than typical college support programs (e.g., academic counseling, social enrichment, and personal counselling).

4.3. Limitations and future directions

Although prior research has found that participants are accurate in their reporting of adverse experiences (Hardt, Vellaisamy, Schoon, 2010), other studies have found bias in retrospective reports (Hardt & Rutter, 2004). In addition, the present study used an aggregate score of adverse experiences. Future research should further examine if particular adverse

experiences or trauma symptoms lead to poor reading comprehension. If so, it may be beneficial to identify students with these adverse experiences in order to better inform supports.

Similarly, participants' access to accurate judgments of their own metacognition may be limited or biased (Veenman, 2011). Further, although this study provides an important first attempt in connecting Boekaerts (2007a) theory to students' adverse backgrounds, it focuses on metacognition only. More research is needed on other components affecting students' appraisals (e.g., perceptions of the task and context, domain-specific prior knowledge, cognitive and metacognitive strategies related to the task, and motivational beliefs, Boekaerts, 2007b). Finally, the present study investigates trait-like metacognition informing appraisals instead of metacognition specific to the academic task. Research investigating SRL processes within a specific learning task (i.e., appraisal, assessment, motivation, and use of cognitive and metacognitive strategies) is warranted for students with adverse experiences.

5. Conclusion

This study represents an important first step to find mechanisms for college-level stakeholders to support students who have experienced early adversity or demonstrate trauma symptoms. This study suggests that practitioners working with students demonstrating trauma symptoms should be aware of students' use of maladaptive metacognition, which mediated the relationship between students' trauma symptoms and reading comprehension. Beyond typical college support (e.g., academic counseling, social enrichment, and personal counselling), this study may suggest that colleges should be offering academic support targeting self-regulated learning processes. Specifically, stakeholders may wish to consider how to better facilitate students' progress on the growth/mastery pathway instead of the well-being pathway.

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