ABSTRACT

Title of Thesis: ASSESSMENT OF PERCEIVED STRESS AMONG SCHOOL-AGE CHILDREN: RELATIONS WITH EMOTIONAL ENGAGEMENT AND LITERACY ACHIEVEMENT

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This short-term longitudinal quantitative study is the first to examine the psychometric properties of the PSS-10 among elementary-age students and the impact of stress on school-related outcomes, including emotional engagement and literacy achievement. Participants included upper elementary students (N = 396, M_{age} = 9.62; 55% female; 56% dual language learners; 6% Asian, 12% Black, 28% Latino/a, and 40% White students). Emotional engagement was assessed using self- and teacher-reported questionnaires. Literacy achievement was assessed using a literacy performance task. A CFA revealed a two-factor structure for the PSS-10, including a coping factor and distress factor. The PSS-10 had adequate internal consistency but did not demonstrate adequate test-retest reliability between time points two to four months apart. Path analyses revealed that the coping factor was a significant predictor of later literacy achievement. The distress factor predicted later emotional engagement when the coping factor was removed from the model.

ASSESSMENT OF PERCEIVED STRESS AMONG SCHOOL-AGE CHILDREN: RELATIONS WITH EMOTIONAL ENGAGEMENT AND LITERACY ACHIEVEMENT

by

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Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of the
Master of the Arts
2020

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Chapter I: Introduction

Stress has long been a focus for researchers attempting to understand environmental and psychological influences on a variety of medical, educational, and mental-health outcomes. Researchers have proposed various models of stress and grappled with how to accurately measure stress responses. According to the psychological model, stress is conceptualized as the cognitive, emotional, and behavioral interpretation of an individual's physiological response to environmental demands (Cohen, Kessler, & Underwood Gordon, 1997). According to this model, stress has further been operationalized as being perceived by an individual when the environmental demands exceeds one's ability to cope with them (Cohen & Williamson, 1988). Similarly, this study operationalizes stress as an individual's appraisal of how uncontrollable, overwhelming, or emotionally upsetting situations in one's life are. This study contributes to the ongoing discourse of accurate stress assessment by evaluating the measurement of psychological stress among a diverse sample of elementary-age individuals; a population that is largely neglected in the psychological-model stress literature. Analyzing the accurate measurement of psychological stress in this understudied population is an important contribution to the field's ongoing endeavor to accurately represent and study the contentious construct of stress.

The 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) is a widely used and extensively researched measure that aims to capture this internally appraised perception of psychological stress (Lee, 2012). Despite the measure's extensive use in stress research among adolescents and adults, there is limited research on the psychometric qualities of the PSS-10 in children. To date, there have been no published

studies using the PSS-10 among individuals younger than the age of 11, with the exception of one study from our lab (O'Neal, 2018). Aside from a confirmatory factor analysis among exclusively Dual Language Learner (DLL) elementary-age students at one school in the aforementioned study, the psychometrics of the PSS-10 have not been examined in this age-group (O'Neal, 2018). Given that children perceive, interpret, and respond to their world differently than adults, it is important to confirm that this measure accurately captures perceived stress in the childhood population. Furthermore, considering the differences in child versus adult populations, it should be determined whether children's responses to the PSS-10 items load onto the same factor structure as adults. It is expected that the PSS-10 will be a valuable measure for this age group in that it is designed to capture internal feelings and reactions to stress in any setting, without the context of specific life events. Furthermore, the generic wording of the items of the PSS-10 is sensitive to the diverse contextual factors (e.g., age, family dynamics, socioeconomic status, etc.) that influence what children perceive to be stressful. Considering these advantageous properties of the PSS-10, the psychometric and predictive strength of this scale deserves to be examined to confirm the validity of the use of this measure in school-age populations.

It is germane, in evaluating the use of the PSS-10 among elementary-age children, to consider the measure's connection to outcomes pertinent to elementary-age individuals, namely school-based outcomes. The implications of perceived stress on mental health outcomes have been extensively researched, ranging from depression (Kuiper, Olinger, & Lyons, 1986) to cognitive decline with aging (Jiang et al., 2017; Katz et al., 2016). However, in considering the unique experience of elementary-age students,

it is essential that the implications of perceived stress are reflected in age- and school-relevant outcomes. School-based measures of emotional and educational well-being are appropriate outcomes to consider for this population. Early- and middle-childhood is a time in which critical emotional (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011), social (e.g., Ladd, Buhs, & Troop, 2002), and educational (e.g., Kern & Friedman, 2008) milestones are reached, and the school community is a primary setting in which these milestones are shaped (Wentzel, 2015). Considering the fact that elementary-age children spend a considerable amount of their time at school, and that many cognitive and developmental milestones are education-based, school-based outcome measures are appropriate to consider in the evaluation of the PSS-10 in this age group (Bauwens & Hourcade, 1992; Wentzel, 2015). This study examines the relationship between perceived stress and later literacy achievement and later emotional engagement in the school setting.

One of the most important school outcomes is academic achievement, which has been shown to be greatly impacted by the effects of stress. Research has consistently demonstrated that elementary-age children who experience higher levels of stress as measured by biological outputs or life-event scales are at risk for a number of negative outcomes, including academic underachievement (Evans & Schamberg, 2009; Gautam & Pradhan, 2018; Schraml, Perski, Grossi, & Makower, 2012). Despite the well documented relationship between biological stress reaction and academic achievement, as well as event-based stress measures and academic underachievement among high school students, there has been little investigation into the construct of perceived stress and academic achievement, specifically using the PSS-10. Furthermore, the preponderance of

existing stress research does not explore the relationship between stress and achievement among elementary-age children (Husain, Kumar, & Husain, 2008; Schmeelk-Cone & Zimmerman, 2003; Schraml, Perski, Grossi, & Simonsson-Sarnecki Margareta, 2011; Suldo, Shaunessy, & Hardesty, 2008). This age group deserves greater investigation considering the achievement gap begins to widen in the upper elementary school years (Burchinal et al., 2011). Of particular importance is the narrow construct of literacy achievement. To date, there has been only one article, by our lab, examining the indirect relationship between the PSS-10 and literacy achievement via grit and engagement among DLL students; this sample is a subsample in my study (O'Neal, 2018). There has been no research to date examining the direct relationship between perceived stress and literacy achievement.

Literacy achievement is a valuable construct to measure as it is the foundation of learning in upper-elementary grades as students transition from learning to read to reading to learn (Caponera, Sestito, & Russo, 2016; Carlo et al., 2004; Purpura, Hume, Sims, & Lonigan, 2011). Literacy achievement predicts achievement in other school-content areas (e.g., mathematics and science; Caponera et al., 2016). If students are unable to read at grade level, their overall academic functioning is impaired. Further investigation is warranted into the role that stress may play in literacy and subsequent general academic underachievement. This study bridges this gap by investigating the relationship between perceived stress and literacy achievement among an elementary-school age sample. This contributes to research of stress and literacy achievement for an age-group that would benefit greatly from a more comprehensive understanding of the relationship.

This study additionally aims to investigate the relationship between perceived stress and emotional engagement – a component of the meta-construct of student engagement. Student engagement refers to the extent of a student's active involvement in a learning activity, classroom instruction, and school experience (Veiga, Reeve, Wentzel, & Robu, 2014). Emotional engagement, specifically, refers to enthusiasm, enjoyment, interest, and involvement in school. Emotional engagement was selected due to its potential overlap with the PSS-10. Both the emotional engagement measure and the PSS-10 have an emotions-focus, as discussed further below. While engagement is a heavily researched educational construct, there is a paucity of research exploring the effects of stress on students' educational engagement (Wang & Degol, 2014). It would be expected, considering the findings of research examining engagement and stress-proxies (e.g., anxiety), that stress would negatively impact school emotional engagement. The negative emotions of stress may diminish the positive emotions experienced in emotional engagement. Furthermore, stress may reduce working memory, energy, and attention in learning activities, subsequently reducing engagement (Pekrun, Goetz, Titz, & Perry, 2002).

This study aims to review the research that has been conducted on perceived stress using the PSS, as well as literature on stress, generally, in school-age children. In this study, the PSS-10 was adapted for younger children by adding clarification for terms that might be challenging. Using a sample of 396 racially, ethnically, and socioeconomically diverse third, fourth, and fifth grade students, I tested the psychometric functioning of an adapted version of the 10-item Perceived Stress Scale. I conducted a confirmatory factor analysis to examine the fit of the data to the expected

theoretical model and compared its fit to that of a single factor stress model. Furthermore, I assessed the measure's test-retest reliability and internal consistency in a school-age sample. Additionally, I examined the relationship between the adapted PSS-10 and literacy achievement and emotional engagement in school-age children.

Chapter II: Literature Review

The following literature review details the use of the Perceived Stress Scale (PSS) among youth and summarizes the psychometric findings of the scale to date. I provided rationale for the present study by reviewing research regarding the relationship between stress and literacy achievement and summarize the current state of the literature regarding the relationship between stress and emotional engagement in school.

Theoretical Framework

This study utilizes Lazarus & Folkman's (1984) theoretical framework of the appraisal process in stress in conjunction with Izard's Differential Emotions Theory (DET; 1977, 1991). Stress researchers agree that the impact of stressful events is determined by one's perception of the event's stressfulness and its influence on one's functioning (e.g., Lazarus, 1966; Lazarus & Folkman, 1984). While commonly accepted, this theoretical perspective was not accompanied by psychometrically valid measures of perceived stress until the development of the Perceived Stress Scale in 1983 (Cohen, Kamarc, & Mermelstein, 1983). The PSS was born out of a need for a measure that captures this important appraisal element of stress, rather than event-specific measures (e.g., job loss, death of a family member), in accordance with Lazarus & Folkman's (1984) theoretical model. Though Lazarus & Folkman (1984) is cited as the theoretical model in the creation of the PSS, there is an emotion-specific element of the items in the scale that is neglected in this framework. While the stress appraisal framework is a necessary component of the theoretical orientation of the PSS-10, it is lacking the emotional element reflected in the scale's items (e.g., upset, anger, irritation, frustration). Therefore, DET, combined with the stress-appraisal model, is a theoretical framework

that more accurately reflects the items of the PSS-10 rather than exclusively utilizing the stress-appraisal model. Both the stress-appraisal and differential emotions models are reviewed below.

Stress appraisal. Lazarus & Folkman's (1984) framework posits that stress is experienced and managed through the process of primary and secondary appraisal, in addition to coping. The exposure of an external stimulus or event evokes the cognitive process of primary appraisal through which an individual determines if the stimulus or situation is threatening or benign. When a situation is appraised as threatening, the cognitive process of secondary appraisal occurs, through which an individual evaluates their available resources and determines their ability to cope with the threatening situation. Coping has been defined as the process of eliminating or lessening the negative effects of the stressful stimulus (Lazarus & Folkman, 1984). Coping can involve direct alteration to the threatening environment (e.g., fight or flight response), or it can involve evoking thoughts or actions to relieve the emotional stress response. The stress-appraisal model posits that if one perceives that coping resources are adequately available to them to respond to the environmental demand, no stress response will occur. Alternatively, if one is uncertain of their ability to cope with a situation that has been appraised as demanding or threatening, stress is experienced. This appraisal process occurs not only at the onset of a stressful event but is consistently reevaluated and reappraised throughout the duration of the stressful situation (Lazarus & Folkman, 1984).

This framework is appropriate for the current study because it theorizes stress as a cognitively mediated response to an external event, not the event itself. This conceptualization is valuable because it allows for personal differences and contextual

factors that inform what is considered a stressful experience to an individual person, instead of assuming a particular life-event will be perceived as stressful across all individuals. Measuring stress through this lens provides necessary flexibility in understanding what is stressful for each individual. Research suggests that unlike adults, children and adolescents are more likely to report daily hassles as stressful, whereas adults are more likely to report major life events as stressful (Compas, 1987). Furthermore, it has been stated that among children, "individual perception [of a stressful event] is more significant statistically and clinically than scores on an objective stress event scale" (Ryan, 1988). Certain life events, for example parental divorce, have the potential to have both positive and negative implications for a child. The child's interpretation of the event is an essential mediator of how it will be experienced and whether, or to what degree, stress will be felt (Smith & Carlson, 1997). Considering that there is greater individual differences among stress experience (e.g. Ryan, 1988), and that daily hassles are more stressful to children than major life events (e.g. Compas, 1987), a framework of stress that places an emphasis on appraising events as stressful or benign when working with a childhood population is appropriate. The PSS-10 captures the stress of day-to-day life and a wide variety of events, situations, or stimuli that evoke stress regardless of the specifics of the child's age, family dynamics, socioeconomic status, and other contextual factors. The measure, therefore, allows researchers to capture how an individual appraises their life to be stressful free of any contextual parameters of life-event scales and will more appropriately capture children's perception of stress

Differential emotions theory. Although Lazarus and Folkman's (1984) model was cited in the initial creation of the PSS, I argue that there is an element of the PSS that

is not captured entirely by this framework; namely emotion specific components of stress as reflected in the scale's items. The PSS relies on emotion-specific terms to capture the construct of stress, including terms such as "upset", "nervous", "irritation", and "anger" in items one, three, seven and nine, respectively (see Table 1). Although stress is not typically discussed through the lens of emotion, the construct of stress captured by the PSS may fall under the larger umbrella of emotions and affect theory, especially the theoretical framework of the Differential Emotions Theory (DET; Izard, 1977, 1991).

DET posits that there are discrete emotions and emotional responses that serve adaptive evolutionary and developmental functions. For example, the emotion of fear, serves as a reaction to a threat and an impulse to escape danger. Emotions are evoked by stimuli from the environment and are rapidly and automatically activated by cognitive processes (Izard, 1993). While the DET framework may appear disparate from Lazarus and Folkman's (1984) stress appraisal framework, they are in fact, harmonious. According to DET, emotions are elicited through cognitive processes in response to external stimuli. This process resembles the stress appraisal process outlined above: environmental stimuli elicit cognitive processes that result in a discrete emotion, according to DET, or a stress response according to Lazarus and Folkman (1984). These two frameworks, while distinct in many domains, overlap in emotional reactions and stress response, and the PSS lies at their intersection.

DET in elementary-age children. Conceptualizing the PSS-10 through the theoretical framework of DET in addition to Lazarus and Folkman's appraisal model is particularly valuable for its use in an elementary-age population. DET acknowledges the important developmental role of emotions during this age. Abe & Izard (1999) posit that

the ages of middle childhood (6-12 years old) are transformative for emotional development as well as stress-eliciting situations. Middle childhood is the developmental period in which self-evaluative emotions emerge to induce cognitive and interpersonal maturity. During middle childhood, children are increasingly introduced to critical feedback about their performance socially and academically. This feedback elicits emotions that serve to advance their social and academic development and inform what situations will elicit stress reactions (Abe & Izard, 1999). For example, children may begin to experience stress or anxiety when asked a question in a classroom setting, whereas the same situation was not stressful for that child at a younger age (Ruble, Eisenberg, & Higgins, 2014). Stress and emotional reactions work together, and overlap with each other, to evoke the cognitive, academic and social shifts of this developmental period. Therefore, when considered together, DET and stress-appraisal theory more completely capture the experience of stress among elementary-age children, and more accurately reflect the elements of the stress construct captured by the PSS-10.

Operationalization of Stress

Stress research has developed from multiple diverse disciplines including psychology, epidemiology, sociology, biology, and anthropology, resulting in different and conflicting approaches to the conceptualization and measurement of stress (Hobfoll, 1989). From these disciplines, three broad conceptualizations of stress have emerged. The biological framework focuses on the activation and maintenance of physical systems that are mediated by psychologically and physically demanding conditions (McEwen, 2000). The environmental framework assesses stress in terms of environmental events or experiences that are normally associated with increased adaptive demands (Compas,

1987). Finally, the psychological framework focuses on an individual's subjective evaluation of their ability to manage demands posed by events or experiences (Cohen et al., 1997). This study conceptualizes stress through the lens of the psychological model.

Perceived stress. This study conceptualizes stress in alignment with the psychological framework: emphasizing the emotional, cognitive, and behavioral responses to environmental demands. In accordance with the psychological framework and Lazarus & Folkman's (1984) model, perceived stress (henceforth "stress") is operationalized as the degree to which situations in one's life are judged as uncontrollable, emotionally upsetting, or overwhelming (Cohen et al., 1997). As detailed above, this conceptualization places an emphasis on the individual's perception and evaluation of potential harm or overexertion that is posed by environmental demands. Stress occurs when an individual perceives environmental demands as exceeding their available coping resources (Lazarus & Folkman, 1984). Some individuals experience a stressful event, but their functioning is not compromised as they have adequate coping resources. Other individuals may experience the same event and, due to their lack of available coping resources, have a negative reaction that compromises their functioning (Cohen, Kamarc, & Mermelstein, 1983; Cohen et al., 1997; Cohen & Williamson, 1988; Lazarus & Folkman, 1984).

Stress Measurement

In alignment with the diverse origins of stress research (e.g., psychology, epidemiology, sociology, biology, and anthropology), there are various measures of stress that reflect the discipline from which they originated (Hobfoll, 1989). Biological stress is measured by products of the stress response systems (e.g., the hypothalamic-pituitary axis

and the sympathetic-adrenal medullary system; Evans & Schamberg, 2009; McEwen, 2000; McEwen & Seeman, 1999). Biological indicators of stress include blood pressure, heart rate, and hormone levels including cortisol, epinephrine, norepinephrine, and endorphin (Cohen et al., 1997; McEwen, 2000). Environmental stress is generally measured by scales or interviews designed to capture stressful events or situations external to the individual (Scully, Tosi, & Banning, 2000). Prior to the development of the PSS, event-specific scales based on the environmental stress framework were viewed as a measure of psychological stress. Event-based stress remains a prominent component of stress research; however, there were a number of limitations in measuring psychological stress through event-specific scales, detailed below. A scale specifically designed to capture cognitively appraised stress is necessary to more completely capture the experience of psychological stress (Cohen et al., 1997).

Approaches to measuring perceived stress. Prior to the development of the original Perceived Stress Scale in 1983, attempts were made to measure psychological stress (Cohen & Williamson, 1988). Most commonly, life-event scales were modified in an attempt to capture perceived stress. Unlike the current measure of perceived stress, these adaptations asked respondents to rate the stressfulness or impact of particular life events. Studies have found that modified event scales (asking individuals to rate the impact of stressful events) were better predictors of health-related outcomes than the unmodified life-event scales (e.g., Sarason, Johnson, & Siegel, 1978). These findings suggest that evaluating whether an event was stressful to the individual or not contributed valuable information to the prediction of later physical- and mental-health outcomes. In other words, event-specific scales were missing an evaluative component important to the

soundness of the stress construct. This missing evaluative component was important to the predictive validity and power of stress. Modified event scales attempting to capture psychological stress remained insensitive to measuring chronic stress from ongoing life circumstances, chronic stress from events occurring in the lives of close others, expectations concerning future events and events not explicitly listed on the scale, all of which are captured by the PSS (Cohen & Williamson, 1988). While modified life-event scales were one step closer to capturing perceived stress, there remained limitations in using them as a measure of psychological stress.

An alternative method to measuring perceived stress prior to the PSS included using subjective measures designed for specific stressors (e.g., measures of perceived occupational stress; Gomes & Teixeira, 2016; Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964). Situation-specific stress scales have a number of limitations to capturing perceived stress. There are innumerable sources of stress which individuals encounter, and it is impractical to develop and psychometrically validate individual measures for each specific stressor. Moreover, there is an increased risk of attribution error for source-specific stress measures. Individuals commonly misattribute sources of negative arousal. Misattribution leads to incorrectly identifying the source of negative emotions and stress (Croyle & Cooper, 1983; Marshall & Zimbardo, 1979). Subjective source-specific stress measures are insensitive to the potential of misattribution error (Cohen & Williamson, 1988). Furthermore, source-specific scales imply that there is a particular stress origin that independently caused a health-related outcome. This assumption may incorrectly over-assume the stressors' influence on an individual's mental or physical well-being (Cohen & Williamson, 1988). Subjective stressor-specific scales succeeded in capturing

the essential cognitive-appraisal element of psychological stress but neglected the importance of considering the combined effect of multiple sources of stress in an individuals' life. The Perceived Stress Scale, conversely, both complements and captures the elements of stress absent in the aforementioned measures.

Perceived Stress Scale

The Perceived Stress Scale was designed to address the aforementioned limitations to assessing overall life psychological stress and fill the gaps of psychological stress measurement. Unlike the life-event scales, the PSS does not tie stress appraisal to particular situations. Furthermore, the PSS is sensitive to the nonoccurrence of events that may be causing stress (e.g., not finding a job) as the items inquire about one's experience of stress rather than the cause of those feelings. Unlike life-event scales, the PSS can capture stress from ongoing (not event-specific) stressful life circumstances (e.g., chronic illness or poverty) and stress felt from events occurring in the lives of close friends and family. Finally, the PSS is able to capture stress from events that have not happened yet, namely stress around expectations of future events or uncertainties. The PSS avoids the previously mentioned risk of attribution error in that the source of stress is not relevant to the measure. Rather, through the general nature of its items, the PSS assesses an individual's experience of stress in any domain of their life (Cohen & Williamson, 1988). These assets contribute to the superiority of the PSS over event- and source-specific scales to measure the experience of psychological stress.

The structure of the PSS was designed with the intention for broad adaptations for numerous uses, as it is not bound to any stressor. The PSS asks respondents questions about their feelings and thoughts during the last month, and how often they felt a certain

way (e.g., nervous, upset). The questions are free of situational context specific to any subpopulation groups, such as referencing natural disasters that only occur in certain regions. This quality allows for diverse and wide-scale use. The PSS has grown in popularity since its conception and has been found to be a useful measure in its ability to predict many outcomes among adults, such as depression (Hewitt, Flett, & Mosher, 1992), anxiety (Leung, Lam, & Chan, 2010), and life satisfaction (Cohen & Williamson, 1988; Monroe, 2008).

The PSS is robust and popular measure of stress. Since the development of the PSS, the measure has been cited in over 4,000 papers and translated into 25 languages other than English (Cohen, 2015; Lee, 2012). Despite the popularity of the measure, and its demonstrated psychometric quality (detailed below), the measure has been used almost exclusively with adult samples. To my knowledge, there have been a total of 10 publications utilizing the PSS with adolescents; participant's ages ranged from 10 - 19 and grades 6 – 12th (Abolghasemi & Taklavi Varaniyab, 2010; Goodman, McEwen, Dolan, Schafer-Kalkhoff, & Adler, 2005; Hampel & Petermann, 2006; Martin, Kazarian, & Breiter, 1995; Schmeelk-Cone & Zimmerman, 2003; Schraml et al., 2011; Sellers, Caldwell, Schmeelk-Cone, & Zimmerman, 2003; Suldo et al., 2008; Yildiz, 2017). Of the 10 studies using the PSS with an adolescent population, only one (Martin et al., 1995) examined its psychometric qualities, and only using the PSS-14, in this population, detailed below. The lack of research of this popular stress measure with non-adult populations is a gap in the literature that warrants further inspection.

To my knowledge, there has been only one study that examined psychometric properties of the PSS in a non-adult population. Martin et al. (1995) conducted a factor

analysis of the 14-item PSS among a sample of 203 of adolescent psychiatric inpatients ages 12-17. This study aimed to investigate the contribution of perceived stress, life events, and dysfunctional attitudes in predicting psychological and behavioral difficulties. Additionally, the study was designed to replicate and extend upon previous work that has examined the factor structure of the PSS-14 among an adult psychiatric sample (Hewitt et al., 1992). Hewitt et al. (1992), found in the adult sample that one factor comprises items of general distress while the other includes reverse keyed items reflecting coping abilities. Hewitt et al. (1992) posit that the factors reflect two different aspects of stress appraisal and that this distinction has theoretical and clinical relevance. Similar to Hewitt et al.'s (1992) adult study, Martin et al. (1995) found a two-factor structure of general distress and coping abilities in an adolescent psychiatric population. However, Martin et al., (1995), found that there is more shared variance between the two factors in the adolescent sample than the adult sample. The correlation between the two factors in the adolescent sample was $r = .53$ for males and $r = .39$ for females, a higher correlation compared to a correlation of $r = .26$ in the adult sample. Still, the utility of the PSS in an adolescent population was supported by findings of internal consistency (Factor 1 "Distress" *alpha* = .81, Factor 2 "Coping" *alpha* = .78) and significant correlations ($r = .48$-$.55$, $p < .001$) with the Children's Depression Inventory (CDI; (Kovacs, 1981; Martin et al., 1995). While both Hewitt et al. (1992) and Martin et al. (1995) utilized the PSS-14 rather than the PSS-10, the two-factor content analysis has also been replicated in adult populations of the 10-item PSS, detailed below. This study contributes to the growing research on the use of the PSS-10 by confirming the validity of the measure's use within an elementary-age sample.

Psychometric research on the PSS. The psychometric properties of the different versions of the Perceived Stress Scale have been studied extensively in adult populations. The PSS-10 has been found to be a valid and reliable self-report measure of perceived stress among adults. This section will review the research conducted on the construct validity, reliability, and the factor structure of the PSS. Additionally, I will consider variables that may cause the current study to result in a different factor structure than has been previously found.

Construct validity. This study has discussed the theoretical divergence of psychological stress (measured by the PSS) versus the construct of environmental stress (measured by life-event scales). This section will detail the psychometric evidence supporting the distinction between psychological stress measured by the PSS versus environmental stress measured by life-event scales. The PSS has shown discriminative validity from life-event measures of stress, suggesting that the PSS captures a different element of stress than previously developed scales (Monroe, 2008; Monroe & Kelley, 1995). Additionally, researchers have found significant evidence supporting the perceived stress construct through assessment of convergent validity. Roberti, Harrington, & Storch (2006) found a strong correlation between the PSS-10 and the State-Trait Anxiety Inventory–Trait version (STAI-T), a measure designed to capture people's tendency to experience general anxiety and view situations as threatening (r = .70) (Roberti et al., 2006).

Reliability. Test-retest reliability has been evaluated for the PSS-10 in English (Jiang et al., 2018) as well as translated versions of the scale (e.g., Chaaya, Osman, Naassan, & Mahfoud, 2010; Reis, Hino, & Rodriguez Añez, 2010; Remor, 2006;

Wongpakaran & Wongpakaran, 2010) samples. Test-retest reliability was evaluated using a correlation coefficient such as Pearson's, Spearman's, or the intraclass correlation coefficient (ICC). The interval from the first to the second administration ranged from two days to one year. The PSS-10 has consistently met the recommended criterion of >.70, indicating the measure's adequate test-retest reliability (Lee, 2012).

***Factor structure*.** The original 14-item version of the PSS was developed in a population of college students and a community smoking-cessation program (Cohen et al., 1983). Using exploratory factor analysis, the 14-item scale was found to have a two-factor structure reflecting adaptational symptoms and coping strategies among a sample of 2,387 U.S. adults (Cohen & Williamson, 1988). The two-factor structure of the PSS-14 has been replicated using both exploratory and confirmatory factor analyses in five studies (Almadi, Cathers, Mansour, & Chow, 2012; Andreou et al., 2011; Lesage, Berjot, & Deschamps, 2012; Leung et al., 2010; Martin et al., 1995; Ramírez & Hernández, 2007). The original 14-item scale was revised by the authors in 1988 and reduced to a 10-item and 4-item version of the scale. The 10-item version of the PSS (PSS-10) was derived by dropping the 4 items with relatively low factor loading (Cohen & Williamson, 1988). Exploratory factor analyses of the PSS-10 from a sample of 2,387 adult U.S. residents revealed a two-factor structure; one factor grouped by negative wording of items of perceived helplessness or negative stress (i.e., distress), the second factor grouped by positively worded items of perceived self-efficacy or positive stress (i.e., coping; Cohen & Williamson, 1988). The PSS-10 was found to be more psychometrically sound than the 14- or 4-item version. The PSS-10 showed improvement in explained variance (Factor 1 "Distress" = 34.4%, Factor 2 "Coping" = 14.5%, total explained

variance = 48.9%) compared to the explained variance of the PSS-14 (Factor 1 "Distress" = 25.9%, Factor 2 "Coping" = 15.7%, total explained variance = 41.6%; Cohen & Williamson, 1988). Since the publication of the PSS-10, multiple studies have conducted exploratory and confirmatory factor analyses among different adult populations and confirmed previous work's findings of a two-factor structure (e.g., Barbosa-Leiker et al., 2013; Roberti et al., 2006).

A two-factor structure has been consistently demonstrated, one with the positively coded items and one with negatively coded items. These factors have been labeled differently by different authors. Factor 1, which is comprised of the six positively coded items has been given a number of labels in addition to "distress" (e.g., "Perceived Helplessness"; Roberti et al., 2006, "Negative Perception"; Mimura & Griffiths, 2003, "Stress Emotions/Feelings"; Golden-Kreutz, Brown, Frierson, & Andersen, 2004). Similarly, Factor 2 consisting of the four negatively worded items has been given labels other than "coping" (e.g., "Perceived Self-Efficacy"; Roberti et al., 2006, "Positive Perception"; Mimura & Griffiths, 2003, "Counter Stress Emotions/ Feelings"; Golden-Kreutz, Brown, Frierson, & Andersen, 2004). Indeed, some of the reverse-coded items could be argued to better reflect the concept of self-efficacy (e.g., In the last week, how often did you feel like you could make your problems better?). However, the majority of publications reviewed have used the factor labels of "distress" and "coping". Furthermore, these labels mirror the theoretical orientation of the measure which posits that individuals react first to a threatening event (primary appraisal; "distress"), and then judge their ability to cope (secondary appraisal; "coping"). Therefore, for this study the two factors will be labeled as such.

The PSS-10 has continuously demonstrated a two-factor structure (e.g., Barbosa-Leiker et al., 2013; Hewitt et al., 1992; Roberti et al., 2006), however it is possible that there may be a one-factor structure in a child sample. As detailed above, there has only been one study examining the factor structure of the PSS-14 among a psychiatric sample of adolescents (ages 12-17; Martin et al., 1995). This study did argue for a two-factor structure for the PSS-14, however the authors did not systematically test one- versus two-factor fit. Furthermore, the correlation between the two factors appeared to be higher in a younger sample (r = .53 for adolescent males, r = .39 for adolescent females), compared to r = .26 for adults. This finding suggests that, among younger populations, there may be an increase in shared variance among factors than in adults. This trend may continue as the factors are assessed in an even younger population of elementary-age students impacting the factor loading in this sample. The current study is the first to systematically examine the 10-item PSS factor structure in a non-adult sample. While the PSS-10 has replicated the two-factor structure of the PSS-14 I will be comparing the fit of the two-factor structure to that of a one-factor structure for a number of reasons detailed below.

There are a number of considerations that could potentially influence the factor loading of the PSS-10 in this study compared to previous studies. As detailed above, the one study that examined factor loading in a non-adult sample found that there was in increase in shared variance among the factors than in an adult sample. It is possible that younger children may not distinguish between the distinction of the two factors: distress vs. coping. Potentially, at an earlier developmental age these "sub-conceptualizations" of stress may be too advanced for elementary-age children's conception of stress. Furthermore, the present study is utilizing an adapted version of the PSS-10 (see Table 1)

in which the wording is simplified to make the scale more accessible to younger children. Simplifying the scale wording may similarly detract from the distinction between the coping and distress factor. While I expect the factor structure in this study to resemble the two-factor structure that a plethora of research has confirmed, there is reason to consider a potential one-factor solution.

Literacy Achievement

Academic achievement is an important construct to study in the elementary-school age as it strongly influences students' later educational and occupational opportunities (Schraml et al., 2012). Additionally, elementary school years is the time in which the achievement gap begins to widen, setting a trajectory for later school achievement (Burchinal et al., 2011). Researchers have consistently shown that elementary-age children who experience higher levels of stress as measured by biological indicators or life-event scales are at risk for academic underachievement (Evans & Schamberg, 2009; Gautam & Pradhan, 2018; Schraml et al., 2012). However, the connection between stress and achievement has not been examined using the construct of perceived stress in this population. Furthermore, the preponderance of research examining academic achievement measures the construct using global outcomes such as general achievement test scores or GPA (e.g., Schmeelk-Cone & Zimmerman, 2003; Schraml et al., 2012; Suldo et al., 2008). This study focuses on literacy achievement, specifically, in relationship to perceived stress. Unlike GPA, literacy ability is of the utmost importance during upper elementary-school years and, therefore, is an appropriate outcome for this study. This study will contribute to the gap in the literature on stress and its relationship to domain-specific achievement.

The proposed study focuses on the relationship between perceived stress on literacy achievement, specifically. Literacy achievement is operationalized as reading decoding, fluency, and comprehension. Literacy proficiency plays an integral role in educational success across all subjects (Caponera et al., 2016; Purpura et al., 2011). Literacy skills have been shown to predict not only reading and writing achievement, but also mathematical and science proficiency and success as well (Caponera et al., 2016; Purpura et al., 2011). As children enter the upper elementary years the role of reading becomes increasingly important in all subjects. Gaining access to the informational material taught in other subjects requires adequate reading comprehension ability. Without this ability students are unable to efficiently understand grade-level content knowledge (Carlo et al., 2004). The vocabulary demand of their texts is more academic and domain-specific in content. This shift makes the role of vocabulary, reading efficiency and comprehension increasingly important for academic success (Cain, Lemmon, & Oakhill, 2004).

Stress has been shown to negatively impact academic achievement, generally. This study examines the relationship between perceived stress and the narrower academic outcome of literacy achievement. As discussed above, if students are unable to read at grade-level, their overall academic functioning is impaired. Researchers and educators should better understand if stress undermines students' progress towards this important developmental expectation.

Literacy achievement was further selected for this study due to its particular relevance for diverse populations, including Latino/a Dual Language Learning (DLL) students. Fifty-six percent of the sample in this study are DLL. Latino/a DLL students

tend to struggle with literacy skills, particularly if their language spoken at home is not English, compared to their non-DLL peers. Latino/a students that arrive in U.S. classrooms without exposure to English vocabulary may acquire oral English quickly, however their English literacy skills remain behind children who have been exposed to oral and written English since birth (Carlo et al., 2004). There is a significant gap in literacy achievement between Latino/a DLL students and their non-DLL students; 32% of DLL 4th graders are at grade reading level compared to 72% of non-DLL 4th graders (National Center for Education Statistics, 2017). This gap justifies the continued study of factors contributing to the literacy achievement gap in this age group and diverse population.

Achievement and stress. Researchers previously demonstrated the negative relationship between stress and academic achievement using life-event or biological conceptualizations of stress (Evans & Schamberg, 2009; Gautam & Pradhan, 2018; Schraml et al., 2012). Studies using life-event scales established that students who have been exposed to major life stressors (e.g., parental divorce, changing schools, parental unemployment) are at risk for academic maladjustment (Dubow & Tisak, 1989; Dubow, Tisak, Causey, & Hryshko, 1991). Students who have experienced traumatic stress are three times more likely to have and IEP, and lower scores on reading, mathematics, and science cognitive achievement assessments, compared to their peers who have not experienced traumatic stress. These findings suggest that stress exposure may put kids at risk for being labeled with a learning or behavior disorder. While these diagnoses may be accurate for some students, others may be mislabeled and consequently not receive appropriate services (Goodman, Miller, & West-Olatunji, 2012).

Biological indicators used to measure stress, as detailed above, have also been considered in educational outcomes. Higher levels of stress measured by biological indicators is linked to worse self-regulation and executive functioning. Adequate self-regulation and executive functioning is pertinent to success in American classrooms and has been linked to poor performance in educational settings (Blair, 2010; Braun, Lange, Metzger, & Poeggel, 1999; Eisenberg, Valiente, & Eggum, 2010; Holmes & Wellman, 2009; Liu, Diorio, Day, Francis, & Meaney, 2000). Despite the indirect connection between biological indicators, self-regulation, executive functioning and academic success, there has been no research directly linking biological measures of stress and academic achievement. The link between stress and educational success has been considered across conceptualizations of stress, however there are still significant gaps in the literature connecting these two constructs.

PSS and achievement. To my knowledge, there have been a total of three publications examining academic achievement in which the PSS was used. All of these publications used high school populations in the U.S., Sweden and Iran. Schmeelk-Cone & Zimmerman (2003) examined the effects of stress over time (five years in five waves) in relation to psychosocial outcomes including academic achievement. 681 African American youths (all in ninth grade at the onset) participated in this study. Using the PSS-10, the authors grouped participants into low-, high-, increasing- and decreasing-stress groups. Two (sex) by four (stress group) MANOVAs were run on the academic success variables at Wave 5. The authors found that students in the low-stress group were more likely to have a higher GPA and to have gone further with higher education

(e.g., graduate high school, pursued higher education or training) than those in the group that had experienced more stress.

Suldo et al., (2008) studied stress, using the PSS-14, among high-achieving high school students in an International Baccalaureate (IB) program compared to general education students. 307 students (139 in the IB program and 168 in the general education program) age 14 to 17, majority Caucasian, female, and high socioeconomic status participated in this study. Suldo et al., (2008) found that students in the IB program were more stressed than students in the general education program, but also performed superior in academic functioning measured by GPA. It is important to note the IB students are usually higher performing, and it is unlikely they the higher stress caused higher performance. However, this finding may indicate a bell curve relationship between stress and academic performance, or that optimal level of stress can enhance learning ability (Gautam & Pradhan, 2018; Kumari & Gartia, 2012). Despite the IB student's superior academic performance, higher perceived stress among this group also co-occurred with compromised mental health and coping strategies (Suldo et al., 2008). Finally, Abolghasemi & Taklavi Varaniyab (2010) used the PSS-14 to study the relationship between perceived stress and educational success among a sample of Iranian high school students. The researchers found that higher scores on the PSS-14, indicating higher levels of stress were negatively correlated with educational success.

The majority of the research conducted on the concept of stress and academic achievement has considered stress from an alternative theoretical model from this study (e.g., biological or environmental framework). The preponderance of research on stress and academic performance considers stress from an event-specific perspective, and

almost exclusively examining academic-related stress, specifically, and academic performance. Moreover, the majority of research on stress and academic achievement has been conducted with adolescent, or older, populations. These research findings generally support the negative relationship between stress and academic achievement among adolescent, high school and college-age students (Dubois et al., 1992; Gautam & Pradhan, 2018; Husain et al., 2008). However, some contradictory studies have reported a significant positive relationship between stress and academic performance among college students or that optimal level of stress can enhance learning ability (Gautam & Pradhan, 2018; Kumari & Gartia, 2012).

The little research that has been conducted with elementary-age students has been consistent with the preponderance of the findings of older age groups, that stress contributes to worse academic outcomes (e.g., Brabeck, Sibley, Taubin, & Murcia, 2016; Guerra & Morales, 2006). There are a limited number of studies examining stress and achievement among elementary-age students, a limited number of studies examining achievement and the construct of perceived stress, specifically, and no studies linking perceived stress and achievement in the elementary school years. The paucity of research in this area is startling considering the importance of the elementary school years on the academic trajectory, and furthermore considering the advantages of conceptualizing stress from the global model outlined above in this study.

Emotional Engagement

School engagement is recognized as an important element of student success in academic settings (Fredricks, Blumenfeld, & Paris, 2004; Skinner, Furrer, Marchand, & Kindermann, 2008). When students are engaged, they focus their energy and attention on

mastering learning tasks and persist despite difficulties. School engagement has been found to predict students' learning, grades, and achievement test scores in the short term, as well as long term attendance patterns, retention, graduation and academic resilience (Jimerson, Campos, & Greif, 2003). Engagement is a multidimensional meta-construct with multiple components. The theoretical and research literature on engagement demonstrates diverse opinions regarding the components and measurement of engagement (Appleton, Christenson, Furlong, & Appleton, 2008). Researchers have suggested a number of elements of academic engagement, including behavioral, emotional, cognitive, and agentic (Fredricks & McColskey, 2012; Reeve & Tseng, 2011). Across differing models of engagement, two elements are continuously agreed upon: behavioral (e.g., participation, effort) and emotional (e.g., interest, identification, belonging, positive attitude about learning; Appleton et al., 2008).

This study focuses on academic emotional engagement, conceptualized as students' affective involvement, interest, enthusiasm, and enjoyment in school (Skinner & Belmont, 1993; Skinner et al., 2008). The emotion subscale of engagement is appropriate for this study because it is an academic-specific measure that mirrors the emotion-focused conceptualization of the PSS-10. The measure of emotional engagement and the PSS-10 both ask students to reflect on their feelings. The emotion-focused items of the emotional engagement scale are positively worded (e.g., "good", "interested"), whereas the emotion-focused items of the PSS-10 are negatively worded (e.g., "angry", "upset"). Despite the difference in the valence of emotions, it is expected that how one responds to the PSS-10 would predict their emotional engagement in school. It is valuable to examine the relationship between the PSS-10 and other emotion-focused

measures. Furthermore, due to the academic-focus and population of the study, it is valuable to compare the PSS-10 to an emotion focused and school-specific construct.

Emotional engagement was further selected as an outcome due to the paucity of research examining the relationship between academic emotional engagement and stress. There is increasing withdrawal of academic engagement and lack of motivation among students today (Babcock & Marks, 2011). It is important to understand the role that stress may play in the withdrawal of engagement seen today. Moreover, the preponderance of research looking at the relationship between stress and emotional engagement was with college-age students. It is of particular importance to investigate academic emotional engagement and stress among an upper elementary-age sample. Research has found that engagement declines across grade levels (Peetsma, Hascher, Van Veen, & Roede, 2005; Wigfield, Eccles, & Rodriguez, 1998), specifically as students transition from upper elementary to middle school (Anderman & Maehr, 2008). Gottfried, Fleming, & Gottfried (2001) found that enjoyment of school and persistence in the classroom substantially decline from ages nine to 16. The importance of academic emotional engagement is recognized by educators and researchers (Appleton et al., 2008) and it is important to understand what factors, such as stress, may be contributing to the decline in investment in school as students progress through the school system.

Perceived stress and emotional engagement. To my knowledge, there have been a total of three studies that examined the relationship between the Perceived Stress Scale and academic engagement. Two of the three studies researched the relationship among college-age students. Thomas & Borrayo (2016) examined the relationship of the PSS-10 and school engagement, measured through class and work absenteeism, among a

sample of 303 college students. The authors found that perceived stress was negatively related to academic engagement. Furthermore, Thomas & Borrayo (2016) found that decreased social support and avoidant coping strategies moderated the relationship between perceived stress and academic engagement. Stoliker & Lafreniere (2014) studied if feelings of loneliness and learning burnout predicted stress (measured by the PSS-10) and educational engagement (assessed by the Utrech Work Engagement Scale for Students; Schaufeli, Martínez, Pinto, Salanova, & Barker, 2002) among a sample of 150 undergraduate students.

The third study that researched the PSS-10 and emotional engagement looked at the relationship in a sample of 1088 seventh- and eighth-grade students in Germany (Raufelder et al., 2014). Raufelder et al. (2014) examined the relationship between perceived stress (measured by the German-version of the Perceived Stress Scale), self-determination, and emotional engagement and behavioral engagement (using items based from the English-version of the Engagement versus Disaffection with Learning Scale; EvsD; (Skinner, Kindermann, & Furrer, 2009). Raufelder et al. (2014) found that perceived stress was negatively correlated with emotional engagement. Furthermore, the authors found that self-determination mediated the negative effects of perceived stress on emotional engagement. Aside from the aforementioned three studies, the relationship between emotional engagement and perceived stress has not been researched in the literature. This study contributes to the understanding of these two constructs in an age group where emotional engagement is beginning to decline and is of particular significance.

The Present Study

The present study aims to systematically examine the psychometric properties of the PSS-10 among a diverse sample of third, fourth, and fifth grade elementary school children. The present study is the first to evaluate the PSS-10 in this age group. I first compared a one- and two-factor fit of the PSS-10. I compared the factor fit at two time points to explore if the structure is consistent with similar loadings across time. I additionally explored the test-retest reliability and internal consistency of the PSS-10 in this age group. Secondly, I aimed to evaluate the relationship between perceived stress and literacy achievement among upper-elementary age students. This study is the first to look at the relationship between stress and academic achievement using the Perceived Stress Scale in this age group. Furthermore, this is the first study to examine the relationship between the PSS-10 and the outcome of literacy achievement among all age groups. I analyzed the predictive validity of perceived stress on later literacy achievement and emotional engagement in school. This is the first study to examine the relationship of the PSS-10 with literacy and emotional engagement among elementary-age students.

Finally, I explored differences in the relationship between perceived stress between males and females as well as between schools. It has been found that girls and boys experience and manage stress differently (Matud, 2004; Rudolph, 2002). Therefore, this study explored if stress impacts emotional engagement or literacy achievement differently across gender. Furthermore, the schools in this sample differ on important demographic variables such as racial makeup, proportion of second-language learners, and socioeconomic status. As demographic such as socioeconomic status, racial identification, and immigration status has been linked to increased experiences of stress

(e.g., Finkelstein, Kubzansky, Capitman, et al., 2007; Prelow & Guarnaccia, 1997; Rogers-Siren, Ryce & Sirin, 2014), it is important to see if those trends align in the current study. Exploring differences in the relationship of stress, engagement, and achievement between schools may shed light on the impact of these demographic variables.

Hypotheses. I hypothesize that a two-factor structure of the PSS-10 will result in better model fit of the data compared to a one-factor structure (see Figure 1). I expect that the PSS-10 will be a negative predictor of later literacy achievement and emotional engagement in school (see Figure 3).

Chapter III: Methods

Design

This study used existing data from two short-term longitudinal datasets. The two datasets were collected over three time points from January to June 2014 and March to June 2015, respectively. The data for this study was collected as part of a larger study with other socio-emotional variables and time points that will not be used for the present study. At each time point, students completed self-report measures for stress and engagement and a literacy achievement performance task. Teachers completed questionnaires on engagement for each of their students at each time point as well. This study utilized multimethod assessment including self-report data, teacher-report data, and a literacy performance task. The analysis was longitudinal, examining the stress, engagement, and literacy data from Time 1 and Time 3, while controlling for demographic variables such as participants' age, sex, DLL status, and school placement.

Participants

A total of 396 third, fourth, and fifth grade students participated in the study (M_{age} = 9.62; 55% female, 6% Asian, 12% Black, 30% Latino/a, 7% Multiethnic and 43% White students; see Table 3). Participants were recruited from three public elementary schools in Maryland. The participating students' demographics aligned with that of the school's total student body. Fifty-six percent of students were further identified by researchers as Dual Language Learners (DLL). Students were considered to be DLL if they spoke a non-English language with at least one parent or primary caregiver, based on student- and parent-report. Thirty percent of the sample was in third grade, 29% were in fourth grade, and 35% were in fifth grade.

The school district did not give us permission to ask about income or immigration status, but school-level statistics of received free or reduced lunch (FARMS) are provided. One of the schools was a Title I elementary school in which 95% of the students at the school received free or reduced meals. This school served primarily low-income, dual language families and the students in this study's sample identified as ethnic minority. The second and third schools were comparable on demographics, with about 14% of students receiving free or reduced meals in each school. These two schools were located in a more affluent area. Less than 7% of Black students, 5% of White students, and 6% of Latino/a students were eligible for free and reduced meals. This suggests that only a small minority of the White and ethnic minority groups from the second and third schools came from low-income families.

In the current study, 36 teachers (78% female) of third, fourth and fifth grade completed engagement questionnaires for the students participating in the study at each timepoint. In one of the schools, the third-grade teachers declined participation in the study due to a demanding new workload, so the art teacher completed all third-grade questionnaires. Given that only the third-grade art teacher completed third-grade teacher-reported data, analyses were conducted to rule out teacher cluster effects.

Procedure

The current study utilized data from Time 1 and Time 3 (January to June 2014, March to June 2015) of a short-term longitudinal study over three months. The research was approved by the University of Maryland's Institutional Review Board (IRB) and the participating schools' district IRB. Parent consent and student assent were obtained for all participants. Time 1 data for each participant were collected in one session during a

designated school day. Demographics data were collected, including participants' age, race, gender and language spoken at home. Students first completed the self-report measure of emotional engagement, followed by a self-report measure of perceived stress. Researchers read the surveys aloud one-on-one to each participant. However, due to time constraints at School 1, surveys were administered in groups for a total of 55 participants at Time 1 and eight participants at Time 3. Answers were presented on a printed scale to allow students the opportunity to point out their answer if desired. Following the surveys, students completed a three-minute English reading performance task. Students with limited or no English language skills (N = 6) were interviewed by Spanish- and French-speaking researchers at School 1. Teacher-reported data were collected immediately after student-reported data for the School 1. The Time 1 teacher reports were collected a mean of 60 days (SD = 31 days) after Time 1 student reports were collected in Schools 2 and 3. There were approximately three months between students' Time 1 and Time 3 interviews, on average.

Measures

Perceived stress. The overarching construct of perceived stress, as reviewed above, is to assess global, non-specific, life stress. The 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) was used to measure this construct at Time 1. Students were asked to rate how often their lives felt uncontrollable, unpredictable or upsetting in the last month (1= Never, 5 = Very Often). Questions focused on global perceived life stress (e.g. "How often did you feel like you could not do anything to change the way things were going?"). Scores were obtained by reverse coding responses for the positively stated items and averaging across all scale items. Four items (items 6, 7,

9 and 10) were reverse coded to obtain the total score. Please note that for these reversely coded items the results of the path analyses should be inversely interpreted (e.g., a negative relationship should be interpreted positively). The original PSS-10 was designed for individuals with a junior high school education or above, so minor adaptations in item vocabulary and phrasing were made to make the scale more accessible to our sample of elementary schoolers (see Table 1). Additionally, the adapted version of the PSS-10 asked students to reflect on stressful experiences over the past week rather than the past month. This change was made because the researchers expected it would be easier for younger students to accurately reflect on their stressful experiences in a shorter time frame. Researchers have factor analyzed the PSS-10 among different populations and have consistently demonstrated a two-factor structure (Lee, 2012). The PSS-10 has repeatedly demonstrated adequate internal consistency reliability with a Cronbach's alpha of .74 - .91 (Lee, 2012). Test-retest reliability of the PSS-10 has been conducted in multiple studies and has been found to be adequate (r = .74 - .77; Lee, 2012).

Emotional engagement. Emotional engagement is conceptualized as students' emotional involvement, interest, enthusiasm and enjoyment in school. Emotional engagement was assessed via self- and teacher-report at Time 1 using the five-item emotional engagement subscale of the Engagement versus Disaffection with Learning Scale (EvsD; Skinner et al., 2008). The self-report measure was designed to capture students' emotional participation in learning activities in school on a five-point scale (1 = Not at all, 5 = Very Much). Emotional engagement was measured using five items that address emotions indicating student's interest and enthusiasm during school (e.g., "I enjoy learning new things in class"). The self-report measure has shown adequate internal

consistency in elementary-age samples (α = .73 - .82) as well as adequate test-retest interrater reliability (*r* = .53 - .86; Fredricks & McColskey, 2012; Skinner et al., 2009). In addition to student self-report, teachers also rated each student's emotional engagement using the EvsD on a five-point scale (1 = Not at all, 5 = Very Much; sample item: "When we start something new in class, the student is interested"). Mean scores were created for the teacher- and student report engagement items. The teacher-report use of the EvsD has shown adequate internal consistency (α = .84 - .94; O'Neal, 2018).

Literacy achievement. Literacy achievement was assessed through the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner, Torgesen, Rashotte, & Pearson, 2010). The TOSREC is a standardized reading performance task designed to test students' silent reading decoding (accuracy), fluency (speed), and comprehension. Students have three minutes to read as many sentences as they can to themselves and mark whether each sentence was true or false (e.g., "An apple is blue."). Incorrect responses are scored as -1 to correct for guessing. The average correlation coefficient with several measures of reading comprehension was greater than .70 (Wagner et al., 2010). The TOSREC has strong reliability and convergent validity with other measures of literacy achievement. Reliability coefficients with the Woodcock-Johnson Tests of Academic Achievement, 3rd ed. and the Group Reading Assessment and Diagnostic Evaluation (GRADE) exceed .70 (WJ-III; Wagner et al., 2010). Previous studies have found that the TOSREC alternate-form reliability coefficients exceed .85 in third through fifth grades (Wagner et al., 2010).

Analytic Procedure

Prior to any model testing, descriptive statistics and internal reliability (i.e., alpha coefficients, means, ranges, standard deviations) were assessed using IBM SPSS Statistics Version 26. If less than 70% of scale items were completed, the case was removed from analyses. Test-retest reliability of the PSS-10 was assessed using bivariate Pearson's correlation coefficient.

A confirmatory factor analysis (CFA) was conducted using MPlus Version 8 modeling software to determine if the PSS-10 data fit the expected factor structure (Muthén & Muthén, 1998-2018). Items were considered to load sufficiently onto a factor when loadings measured ≥ .40 on the primary factor. Model fit of the Time 1 and Time 3 factor structures were compared using AIC Indices, with lower AIC indices indicating better model fit (Wagenmakers & Farrell, 2004). Analysis accounted for class clusters to factor in potential similar patterns within classes.

Subsequent path analyses were conducted to examine the relation between perceived stress and later literacy achievement and emotional engagement, again using MPlus Version 8 modeling software (Muthén & Muthén, 1998-2018). All analyses controlled for age, gender, DLL status, and school. A latent variable path analysis (LVPA) was run with Time 1 latent scores of the PSS-10 predicting latent Time 3 student- and teacher-reported emotional engagement in addition to observed Time 3 TOSREC summary scores. Post-hoc, the path analyses were rerun grouping by gender and school placement to explore possible group differences.

In all models, fit indices were examined to evaluate model fit, including Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and

Standardized Root Mean Squared Residual (SRMR). Model fit was assessed with cutoffs used in previous studies; RMSEA values of less than 0.06, SRMR values of less than 0.08, and CFI values of greater than 0.95 are viewed as evidence of good model-data fit (e.g., Hu & Bentler, 1999; Sass, 2011).

There were 396 participants at Time 1 and 333 participants at Time 3, indicating a total attrition of 63 participants. The majority of the attrition was in Schools 1 and 2. Some participant loss was due to students dropping out of the study or moving schools, however, due to time constraints during Time 3 data collection, there was significant missing data in School 1. A maximum likelihood standard error estimation approach was used (i.e., MLR).

Chapter IV: Results

Descriptives

Table 4 presents the means, standard deviations, alpha coefficients, and ranges for stress, emotional engagement, and achievement outcomes.

Perceived stress. The mean PSS-10 score at Time 1 was *M* = 2.47 (*SD* = .60). The mean score of the distress factor at Time 1 was *M* = 2.67 (*SD* = .71). The mean score of the coping factor at Time 1 was *M* = 2.18 (*SD* = .67). The average PSS-10 scores at Time 3 were similar to those at Time 1 for the full scale (*M* = 2.50, *SD* = .59), distress factor (*M* = 2.73, *SD* = .71) and coping factor (*M* = 2.16, *SD* = .71).

To compare the level of stress in our sample to other publications, the total sum score was used. The total PSS-10 score at Time 1 was 24.73 (*SD* = 5.99). The total score for the distress factor at Time 1 was 15.94 (*SD* = 4.23). The total score for the coping factor was 8.67 (*SD* = 2.70). The total scores at Time 3 were similar to those at Time 1 for the full scale (24.95, *SD* = 5.97), distress factor (16.34, *SD* = 4.27) and coping factor (8.59, *SD* = 2.83). The total scores found in this sample were somewhat higher than previously reported adult samples for the full 10-item scale (e.g., 13.02, *SD* = 6.35; Cohen & Williamson, 1988), the distress factor (e.g., 12.09, *SD* = 4.72; Roberti, Harrington & Storch, 2006) and the coping factor (e.g., 6.06, *SD* = 2.20; Roberti et al., 2006). The interscale correlation between Time 1 distress and coping was (r = .46, p < .01), indicating moderate overlap between the two factors.

The PSS-10 had adequate internal consistency at Time 1 both for the full scale (α = .76) as well as the distress factor (α = .71). The coping factor at Time 1 did not have adequate internal consistency (α = .61), according to the suggested cutoff of .65

(DeVellis, 2003). The PSS-10 had marginally improved internal consistency at Time 3: full scale (α = .78), distress (α = .76) and coping (α = .68). Although the coping alpha was lower at Time 1 than ideal, the alpha was adequate at Time 3.

Emotional engagement. The single factor model fit of the five-item student-reported emotional engagement (SR-EE) scale was adequate (RMSEA = 0.02, CFI = 0.99, SMR = 0.02). The SR-EE at Time 1 (*M* = 4.17, *SD* = .66) and Time 3 (*M* = 4.10, *SD* = .69) was slightly higher compared to a previous sample of predominantly Caucasian, lower- and middle-SES third through sixth graders (*M* = 3.12, *SD* = .58; Skinner, Kindermann & Furrer, 2009). SR-EE had adequate internal consistency at both Time 1 (α = .77) and Time 3 (α = .80).

The five-item teacher-reported emotional engagement (TR-EE) scale was adequate (RMSEA = 0.04, CFI = 0.99, SMR = 0.01). The average TR-EE at Time 1 was 4.13 (*SD* = .88) and 4.23 (*SD* = .84) at Time 3. This average score is higher than previously reported TR-EE from a sample of lower- and middle-SES third, fourth, fifth, and sixth grade students (e.g., *M* = 3.24, *SD* = .68; Skinner, Kindermann & Furrer, 2009). TR-EE also had adequate internal consistency at Time 1 (α = .94) and Time 3 (α = .95).

Literacy achievement. There was a wide range in literacy achievement across the sample ranging from scores in the 1st percentile to the 99th percentile. The mean percentile for the TOSREC across all schools at Time 1 was in the 52nd percentile. The mean percentile for the TOSREC at Time 3 was in the 53rd percentile. The literacy achievement scores differed significantly between schools. The standardized literacy scores were significantly lower at School 3 (*M* = 83.82, *SD* = 17.28) compared to School 1 (*M* = 108.93, *SD* = 14.18), $t(261) = 12.71$, $p > .00$, and School 2 (*M* = 114.97, *SD* =

17.20), $t(267) = 14.78$, $p > .00$. While not as drastic, there was still a significant difference between literacy scores in School 1 and School 2, $t(242) = -2.98$, $p = .003$.

Test-Retest Reliability

Test-retest reliability was assessed through Pearson's correlation. The PSS-10 had low test-retest reliability from Time 1 to Time 3 using the PSS-10 average score ($r = .05$). These results were consistent when the test-retest reliability was split by school and when examining the test-retest reliability of solely the distress or the coping factor. The very low test-retest reliability may speak to the state-based nature of the PSS-10, since it asks for stress over the past week. Therefore, experiences of stress may vary significantly week-to-week resulting in less consistency when the measure is administered two to four months later.

Factor Structure

Confirmatory factor analyses (CFAs) were conducted to compare the factor structure of one- and two-factor models for the PSS-10 at Time 1. The two-factor structure had a somewhat lower AIC Index (AIC = 10779.67) compared to one-factor (AIC = 10784.83) indicating better model fit. The factor loadings were also higher for the two-factor structure than the one-factor structure. All of the expected items loaded well onto their respective factors (e.g., all items loadings were ≥ .43; see Tables 7 and 8). The two-factor model fit was adequate based on fit indices of RMSEA = 0.03, CFI = 0.97, and SRMR = 0.04 (see Figure 2).

A CFA was run again at Time 3 to assess the factor structure stability. The two-factor model fit well at Time 3. The items loaded well onto their respective factors (e.g., all item loadings were ≥ .54; see Tables 8 and 9). The Time 3 CFA measurement model

fit was adequate based on the fit indices of RMSEA = 0.05, CFI = 0.95, and SRMR = 0.04. For the remainder of the analyses the two-factor structure was used.

Path Analyses

The goal of the path analyses was to test if the PSS-10 at Time 1 (using separate latent distress and coping factors) is a significant predictor of literacy achievement and emotional engagement at Time 3. The full model included the predictors of Time 1 latent distress and Time 1 latent coping, and the outcomes of Time 3 latent student- and teacher-reported emotional engagement, Time 3 observed literacy achievement, and Time 1 control variables (age, gender, DLL status, school). The full model demonstrated adequate model fit (RMSEA = 0.03, CFI = 0.97, SRMR = 0.04; see Figure 4). As expected, analyses revealed that coping was negatively related to Time 3 literacy achievement (Estimate = -15.26(7.63), $p < .05$, 95% CI = [-30.22, -0.31]). As the coping factor was reverse coded, coping actually was a positive predictor of literacy. This finding is consistent with the hypothesis that stress would predict academic outcomes; however, note that a specific hypothesis was not made about whether distress and/or coping would be significant predictors of academic outcomes. Interestingly, the Time 1 distress factor of the PSS-10 was not found to be a significant predictor of literacy achievement (Estimate = 11.28(1.84), $p = 0.07$, 95% CI = [-0.77, -23.32]). This finding is not consistent with Hypothesis 2, which was that stress would be negatively related to literacy achievement. Perhaps distress cannot be a significant predictor when coping is also a predictor in the same model.

When Time 1 literacy achievement was added in as a control, the model fit was not adequate (CFI = 0.89). Moreover, when Time 1 literacy achievement was included in

the model there was no longer a significant relationship between Time 1 coping and Time 3 literacy achievement. It is likely that this is due to the fact that the Time 1 TOSREC and Time 3 TOSREC outcomes were administered within a short time period (e.g., 2-4 months apart). Therefore, the Time 1 TOSREC scores were excluded as a control variable from the model.

Since the coping factor of the PSS-10 explained most of the variance in predicting outcomes, a second variation of the path analysis was run in which coping was removed from the model and the distress factor was the sole predictor. This variation had adequate model fit (RMSEA = 0.03, CFI = 0.97, SRMR = 0.04) and the distress factor was found to be a negative predictor of later emotional engagement (Estimate = -0.20(0.09), $p < .05$, 95% CI = [-0.38, -0.02]), but not literacy. This finding is consistent with hypothesis 3, which is that stress is negatively related to emotional engagement. This also confirms the speculation that distress cannot be a significant predictor when coping is also a predictor in the same model, but distress is still a meaningful predictor of engagement, by itself.

Post-hoc Analyses

Post-hoc, exploratory analyses were run to further investigate the relationship between stress, emotional engagement, and literacy achievement by testing differences between gender and across schools. When the model was run to test differences between schools, the Time 1 distress factor was found to be negatively related with Time 3 student engagement in School 1 (Estimate = -0.87(0.34), $p = .01$, 95% CI = [-1.52, -0.21]). Interestingly, for School 1, Time 1 coping was found to have a significant relationship with Time 3 student-reported emotional engagement in the opposite direction of what was expected (Estimate = 0.70(0.31), $p < .05$, 95% CI = [0.09, 1.30]). For this particular

school, coping was negatively related with student-reported emotional engagement. Additionally, in School 3 only, Time 1 distress was found to be a negative predictor of teacher-reported emotional engagement at Time 3 (Estimate = -0.46(0.22), $p < .05$, 95% CI = [-0.89, -0.04]). This finding is consistent with the expected relationship of stress negatively predicting emotional engagement in school. When the analyses were grouped by school, perceived stress did not have a significant relationship with Time 3 literacy achievement for any school. Additionally, School 2 did not emerge with any significant findings.

Further preliminary post-hoc analyses were run by gender. Time 1 coping was found to be a significant predictor of Time 3 teacher-reported emotional engagement for females but not for males (Estimate = -0.29(0.15), $p < .05$, 95% CI = [-0.58, 0.00]). This result indicates that positive coping was a predictor of positive teacher-reported emotional engagement for female students only. Distress was not a significant predictor of either outcome for either group, when both distress and coping were in the same model. When coping was removed from the model, and the data was grouped by gender, distress was not found to be significant predictor of any outcome for boys or girls alone.

Chapter V: Discussion

This short-term longitudinal study has contributed new findings regarding the psychometric validity of the PSS-10 with the novel population of elementary-age students. Additionally, this study was the first to assess the impact of stress on the important school-based, academic outcomes of emotional engagement and literacy achievement. The results indicated, as expected, that the PSS-10 has a two-factor structure with a distress and a coping factor, and the coping factor of the PSS-10 predicts later literacy achievement. The distress factor negatively predicted student-reported emotional engagement once coping was removed from the model. These findings, based on a sample of elementary-age students, are consistent with the previous literature on the psychometric properties of the PSS-10 among adolescents and adults. The results were also consistent with the empirically- and theoretically-expected relationship of distress and coping with educational outcomes such as emotional engagement and literacy achievement.

PSS-10 Psychometrics in an Elementary-age Sample

Test-Retest Reliability. This study was the first to test the psychometric properties, including the factor structure, test-retest reliability, and internal consistency, of an adapted version of the PSS-10 for elementary-age individuals. The test-retest reliability of the PSS-10 in this sample was very low. Test-retest reliability for the PSS-10 has been previously assessed in adult samples and met the recommended criterion of >.70 (Lee, 2012). Interestingly, in an elementary-age sample, the test-retest reliability from Time 1 to Time 3 did not meet that criterion (r = .05).

The adapted PSS-10 items asked respondents to evaluate how often they felt stressed in the last week, rather than in the last month like the original wording of the PSS-10. As experiences of stress vary more week to week compared to month to month, the adapted wording lends itself to increased variability in answers each time the measure is administered (Van Eck et al., 1996). Therefore, the low test-retest reliability may be due to the fact that a respondent is less likely to have consistent levels of stress from one administration of the adapted PSS-10 to the next. Future research should investigate if the test-retest reliability is higher in a childhood sample if the original wording of one month, rather than one week, is used with this population.

Finally, this finding may speak to the state-based nature of the adapted version of the PSS-10 among elementary-age students. Perhaps, stressful experiences in childhood may be more transient compared to adulthood. For example, children may be stressed about an upcoming quiz or getting into an argument with a friend. These kinds of stressors are more temporary than the stressors that adults may be experiencing such as mortgage payments or job insecurity. Future research should more systematically assess the duration of stressful experiences for children and adults using the PSS-10.

Internal Consistency. The PSS-10 had adequate internal consistency at Time 1 both for the full scale (α = .76) as well as the distress factor (α = .71). This finding suggests that elementary-age children are capable of responding consistently across items in the PSS-10. Some might imagine that there would be developmental instability in internal consistency from childhood to adulthood, with younger children having lower internal consistency; however, the adequate internal consistency speaks to the strength of using this measure for younger audiences. It is possible that the responses were consistent

because the items were read aloud to the students. Students could also look at the questions and read along silently, if they wished. Reading the scale items aloud was an important first step to developing the PSS-10 for this age group, especially with a large subpopulation of English Learners in the sample, but future research should investigate if the internal consistency remains adequate when the items are not read aloud to the students. Still, the findings of this study demonstrated that, at least when read aloud, participants responded to the scale items in a concordant manner indicating understanding of the scale and adequate internal consistency.

The coping factor at Time 1, however, did not have adequate internal consistency (α = .61), according to the suggested cutoff of .65 (DeVellis, 2003). The internal consistency of the full-scale PSS-10, as well as the two factors, differed drastically when the data was split by school. The internal consistency for the coping factor, which was not adequate with all schools together, was adequate for both School 1 (α = .71) and School 2 (α = .73) but was low for School 3 (α = .39). This same pattern was also true for both the distress factor and the full-scale PSS-10 alpha. However, it was only the coping factor that was compromised when analyzing the full sample. It is more difficult for a scale to achieve adequate internal consistency if there are few items in the scale; the internal consistency reliability coefficient is based not only on the average correlation among the items but also the number of items in the scale (Nunnally, 1978). With fewer items, the wording of each question makes more of an impact on the reliability coefficient. Consequently, shorter scales need to display more evidence of homogeneity than longer scales (Nunnally, 1978). This is relevant for the internal consistency results of the PSS-10. The coping factor consists of only four items, resulting in increased

difficulty to demonstrate adequate internal consistency compared to the distress factor (six items) and the full scale (ten items).

It appears as though inconsistent responses in School 3 led to low internal consistency for the full sample. School 3 is a Title 1 elementary school in which 95% of the students are eligible for free or reduced meals. All of the students in the sample from this largely DLL school are DLL, primarily from low-income, ethnic minority families. The standardized literacy scores were significantly lower at School 3 (M = 83.82, SD = 17.28) compared to School 1 (M = 108.93, SD = 14.18) and School 2 (M = 114.97, SD = 17.20). Therefore, the low alpha level for the PSS-10 factors may be due to poor comprehension of the items. It is more difficult to achieve adequate internal consistency if participants are responding to questions in a second language (Dörnyei & Taguchi, 2009). Internal consistency relies on the homogeneity of wording between items. The wording, especially in the coping scale, may be nuanced and rely on phrasing or references unfamiliar to those who primarily speak a non-English language at home. This issue of comprehension may lower the reliability of a scale. Future research should more vigorously investigate the level of English literacy necessary to fully access the items of the PSS-10.

PSS-10 Factor Structure. The PSS has consistently demonstrated a two factor structure for both the 14-item and 10-item version of the scale through both exploratory and confirmatory factor analyses (e.g., Almadi, Cathers, Mansour, & Chow, 2012; Andreou et al., 2011; Barbosa-Leiker et al., 2013; Cohen & Williamson, 1988; Hewitt et al., 1992; Lesage, Berjot, & Deschamps, 2012; Leung et al., 2010; Martin et al., 1995; Ramírez & Hernández, 2007; Roberti et al., 2006). However, the factor structure of the

PSS-10 had not previously been tested in children. This study systematically compared a one- versus two-factor structure of the PSS-10 among upper elementary-age students (9-12 years old). The two-factor solution emerged as the better model fit for the data, although a one-factor solution was also adequate. The two-factor had a slightly lower AIC index than the one-factor solution, indicating better model fit. Moreover, the factor loadings for the two-factor solution were superior to the one-factor solution for both Time 1 and Time 3 (Tables 5 - 9). This result indicates that, similar to adult and adolescent samples, elementary-age students differentiate a distress factor and coping factor in the PSS-10. These two factors reflect two different aspects of stress appraisal with distinct theoretical and clinical relevance. The first factor appears to capture global feelings of distress that arise from perceptions that one's experiences, in the past week, have been stressful, unpredictable, or overwhelming. The second factor consists of reverse coded items that capture perceptions of one's ability to cope with the stressors experienced in the past week. Given this factor structure has never before been tested with children, it is an important novel contribution that the two-factor structure fits for both children and adults.

The coping and distress factors found in the PSS-10 are consistent with Lazarus and Folkman's (1984) stress-appraisal model. Lazarus and Folkman (1984) posit that there are two distinct elements to a stress response. First, a situation must be appraised as threatening, this aligns well with the distress factor. Secondly, an individual determines their ability to cope with the threatening environment. This, of course, aligns well with the coping factor of the PSS-10. The two factors appear to be both theoretically and

psychometrically distinct. This theoretical distinction was further supported by finding that the two factors differentially predicted school-based outcomes.

Coping and Literacy Achievement

Results from this study contribute to an important body of literature that examines how stress impacts academic outcomes. A short-term longitudinal latent variable path model demonstrated that the coping factor of the PSS-10 at Time 1 predicted literacy achievement at Time 3. This result signifies that one's ability to cope with stress is a positive predictor of later literacy outcomes. Previous research has demonstrated that stress experienced by elementary-age students, measured by biological stress outputs or life-event scales, puts them at risk for academic underachievement (Evans & Schamberg, 2009; Gautam & Pradhan, 2018; Schraml, Perski, Grossi, & Makower, 2012). This result does not contradict previous findings, but perhaps indicates that one's ability to cope with stressful experiences does not lead to academic underachievement and, moreover, is predictive of positive literacy achievement outcomes. This finding is also consistent with Lazarus and Folkman's (1984) stress-appraisal model which posits that if coping resources are available to respond to the threatening situation, no stress response will occur (Lazarus & Folkman, 1984). Perhaps, despite exposure to distressing experiences, individuals who have higher self-rated coping ability captured in the PSS-10, do not actually experience a stress response as they are able to successfully cope with distressing situation. Future research should assess this through a moderation model in which coping moderates the relationship between distress and later academic outcomes among elementary-age students.

This speculation is supported by the literature on coping and academic outcomes. If a student experiences distress and does not have adequate resources to manage their distress, or if their response exacerbates distress, or provokes negative reactions from others, they may miss out on important learning opportunities. However, if students respond to distressing situations productively, for example through help seeking or problem solving, they are better able to take advantage of learning opportunities and deal more effectively with obstacles in the future (Skinner & Saxton, 2018). There are several pathways through which coping can play an essential role in academic success including: buffering students' performance from academic risks (e.g., stress), promoting persistence in school, and mediating the effects of personal or interpersonal resources. Previous studies have found links between students' coping and their educational performance including better grades and achievement test scores (e.g., Skinner & Saxton, 2018); however, the present study is the first to find that coping directly predicts the important outcome of literacy achievement. To my knowledge, there are no other studies that have found that one's coping ability predicts later literacy outcomes.

Understanding the effects of stress and coping on literacy achievement is of utmost importance for this age group. Literacy is an increasingly important outcome for elementary-age students as this is the age in which the school curriculum, across all school subjects, is increasingly dependent on reading ability (Caponera, Sestito, & Russo, 2016; Carlo et al., 2004; Purpura, Hume, Sims, & Lonigan, 2011). If one's coping abilities predict later literacy achievement, perhaps preventatively intervening upon stress by teaching and promoting coping abilities will result in improved literacy achievement, or achievement more generally. Future studies should more vigorously investigate the

relationship between coping and literacy achievement through process models (mediation and moderation) to better understand potential variables that explain, or are explained by, the relationship between coping and literacy achievement. Some stress research, particularly among college students and graduate students, has found that there is an optimal level of academic stress in which stress is motivating and increases academic performance (e.g., Kaplan & Sadock, 2000; Keeley, Zayac, & Correia, 2008; Sarid, Anson, Yaari, & Margalith, 2004). Future research should investigate if this curvilinear relationship is replicated among elementary-age students and, furthermore, if coping mediates that relationship. Moreover, since literacy is such an instrumental part of achievement across all domains at this age and older, it should be investigated if literacy mediates the relationship between coping and overall academic outcomes. Finally, future research should consider the aforementioned findings within the context of systemic level stressors. Factors such as poverty, exposure to violence, food scarcity, etc., are omnipresent and critical stressors for children (Blair & Raver, 2012). Research that investigates the effects of stress and coping on literacy outcomes must consider the role of systemic issues, and furthermore, interventions that would decrease the presence and effect of those systemic stressors.

Distress and Emotional Engagement

A novel contribution of this study is the finding that the distress factor of the PSS-10 at Time 1 negatively predicted student-reported emotional engagement at Time 3 when the coping factor was removed from the model. Additionally, in School 1, distress was a significant predictor of student-reported emotional engagement with coping still in

the model. These findings indicate that elevated experiences of distress are associated with diminished emotional engagement.

This finding supports the Differential Emotions Theory (DET) conceptualization of the PSS-10 outlined in the introduction. DET suggests that there are discrete emotional responses that serve adaptive evolutionary and developmental functions. Discrete emotions are the product of cognitive processes responding to environmental stimuli (Izard, 1977, 1991). Distress can be conceptualized as a functional emotional response from a DET perspective. The PSS-10 relies on emotion-specific terms to capture the construct of distress, including terms such as “upset”, “nervous”, “irritation”, and “anger”. The emotions that are assessed in the distress items are the product of exposure to stressful stimuli and a cognitive appraisal of the stimuli. In alignment with DET, distress, while uncomfortable, does serve an adaptive evolutionary function. Experiences of distress alert an organism that something is wrong and that the organism should marshal resources to solve a problem or escape a threatening situation (McEwen, 2000).

Distress can be viewed as a functional, adaptive, emotion response. However, this study, as well as much of the stress literature, found that stress negatively impacts prosocial or adaptive outcomes. Still, understanding the distress factor of the PSS-10 through the lens of DET explains why distress predicted the emotion-related outcome of emotional engagement. All of the emotion words mentioned above are central to items in the distress factor. It follows, then, that the distress factor is the more emotionally-laden component of the PSS-10 and is, understandably, connected to the emotional engagement outcome. There has been no research, to my knowledge, investigating the effects of stress on emotional engagement in school. Emotional engagement refers to the enjoyment,

enthusiasm, interest and involvement in school (Skinner et al., 2008). It appears that the negative experience of distress diminishes the positive emotions experienced with high emotional engagement. While the mechanisms through which distress impacts emotional engagement in school have not been investigated, and warrants thorough examination, it is likely that experiences of distress reduces emotional engagement on multiple levels.

One way in which distress may impact emotional engagement in school is through the effects of stress on the cognitive facilities that allow individuals to be successful in the classroom. It has been well documented that stress negatively influences important cognitive functioning essential to learning such as working memory, self-regulation, focus, energy, and attention in learning activities. (Blair, 2010; Evans & Schamberg, 2009; Pekrun, Goetz, Titz, & Perry, 2002; Vedhara et al., 2000). Subsequently, this negatively affects one's enjoyment and interest in school (Pekrun, Goetz, Titz, & Perry, 2002). In other words, children are less likely to find school to be engaging and interesting if they are unsuccessful or find instruction to be too difficult (Froiland & Oros, 2014; Wang & Eccles, 2013). Therefore, if stress is known to negatively impact important cognitive facilities necessary for success in school (e.g., working memory, attention, etc.), children are likely to be less enthusiastic and interested in learning school materials as a result.

Another mechanism through which distress may impact emotional engagement is through suppression of positive emotions. Enduring elevated levels of distress makes experiencing positive emotions more challenging (Folkman & Moskowitz, 2000). Experiences of distress are often so preoccupying and all-consuming that one does not have the mental bandwidth for positive emotions including enjoyment and excitement for

learning (Folkman & Moskowitz, 2000). Elevated levels of distress elicit the "fight or flight" system which activates the autonomic nervous system and depresses the functioning of brain areas associated with learning and school tasks (e.g., the frontal lobe; Boyce & Ellis, 2005). During experiences of acute distress, the amygdala is activated to process fear, one of the strongest biological responses. Amygdala activation suppresses other brain networks responsible for experiencing enjoyment or excitement for learning (Richter-Levin & Maroun, 2010). Previous research has demonstrated that individuals who experience symptoms of psychological distress, such as anxiety, have problems with engagement in school resulting in disinterest and inability to concentrate on classroom tasks (e.g., Frojd et al. 2008; Gumora and Arsenio 2002; Wentzel, 1998). Following this logic, it is likely that emotional engagement is a mediator between stress and other school-based outcomes. Future research should further investigate how stress influences academic outcomes through the mediator of emotional engagement. Moreover, future research should investigate if working to promote joy and other positive emotions serves as a source of resilience in the face of stress (Gloria & Steinhardt, 2016).

School and Gender Differences

This study explored the relationship between stress and the academic outcomes of emotional engagement and literacy achievement for each school separately, and by gender, post hoc. As addressed in the introduction, it is expected that there may be different outcomes for males and females, as it has been demonstrated that girls and boys experience and manage stress differently (Matud, 2004; Rudolph, 2002). Additionally, as the three schools differed on major demographic variables including racial makeup of the student population, percentage of second-language learners, and socio-economic status, it

is likely that these demographic differences contributed to different experiences or effects of stress. By exploring the variables relationship by gender and by school further significant results emerged.

In School 3 only, Time 1 distress negatively predicted teacher-reported emotional engagement. In this low-income, largely immigrant population school, distress had more of a negative or positive impact on engagement, based on engagement assessed from the teacher's point of view. The unique experience of stress among immigrant populations is well documented; research should continue to explore how these unique stressors differentially impact academic outcomes (e.g., O'Neal, Espino, Goldthrite, et al., 2016). Specifically, future research should more rigorously investigate if teachers notice that engagement is lower for minoritized, low-income schools experiencing distress. It is also possible that the emotion-heavy language and wording of the distress factors, as well as the connotations of these emotions may differ for dual language learners. As mentioned before, further research should be conducted for the language proficiency optimal for this measure.

Interestingly, it was found post hoc that, for School 1, Time 1 coping had a significant relationship with Time 3 student-reported emotional engagement in the opposite direction of what was expected. That is Time 1 coping negatively predicted student-reported emotional engagement in School 1. As mentioned above, experiencing stress can be all-consuming and overwhelming. Moreover, if one is consistently coping with stressful experiences, it can be psychologically taxing and draining (Taylor & Stanton, 2007). Therefore, it is possible that, at least for students in School 1, elevated

coping results in decreased mental capacity to experience the positive emotions associated with emotional engagement in school.

Further preliminary post-hoc analyses were run by gender. When grouped by gender, Time 1 coping was found to be a significant predictor of Time 3 teacher-reported emotional engagement for females but not for males. It appears as though, across all schools, female students' coping more obviously affected their emotional engagement as rated by teachers. Coping scores were not significantly different between males and females in this sample. However, previous research has found that coping styles differ between girls and boys in childhood. It has been found that girls are more likely to use support-seeking and problem-solving coping strategies than boys (e.g., Causey & Dubow, 1992; Eschenbeck, Kohlmann, & Lohaus, 2007; Spirito et al., 1991). Problem-solving coping involves direct strategies to alter the stressful situation (Eschenbeck et al., 2007). Specifically, support-seeking coping refers to requesting emotional and instrumental support from others to manage stress (Eschenbeck, Kohlmann, & Lohaus, 2007). Boys in childhood have been found to use more distancing and externalizing coping mechanisms (Causey & Dubow, 1992). As girls are more likely to request help from others as a form of coping when experiencing stress these strategies are likely to be more apparent to teachers. Subsequently, the impact of coping on emotional engagement in school is likely to be more obvious to teachers as well. The stress and engagement field would benefit from future studies investigating different coping strategies and how different strategies may be related to both teacher- and student-reported emotional engagement in school. Additionally, future research should conduct a more in-depth analyses of measurement invariance between girls and boys and across demographics variables for the PSS-10.

Limitations

The present study has a number of limitations in its design. The greatest limitation of this study's design is that the literacy achievement and emotional engagement outcomes were measured just three months after the first data collection time point. Noncognitive factors, such as perceived stress, are most valuable when they can predict outcomes years into the future (Farrington et al., 2012). Therefore, the short-term nature of the longitudinal data set is substantially limiting in the inferences that could be drawn about the PSS-10's long-term predictive ability.

Another significant limitation was the use of self- and teacher-rating scale data as the only method to measure the constructs of stress and engagement. Self- and teacher-rated questionnaires are prone to validity threats, including reference bias, inaccurate interpretation of questionnaire items, misinterpretation of behaviors as reflecting certain underlying attitudes, or difficulty synthesizing retrospective memories of behavior and attitudes (Duckworth & Yeager, 2015). Future research may utilize observational measures of engagement to limit potential bias. Additionally, the construct of engagement is a complex multidimensional construct within a robust conceptual framework (Eisenberg et al., 1997; Reschly & Christenson, 2012), and a 5-item questionnaire capturing one element of the engagement construct likely cannot represent the full construct in a comprehensive way.

Another limitation of the study design was reading the scale items aloud. The scale items were read to participants to ensure understanding, particularly for the second-language learners. This technique limits the study's generalizability for future use of the measure. Furthermore, due to time constraints when collecting data at School 1, the

questionnaires were administered in a group format for some participants. This change in format could have impacted the integrity of the data collection.

Conclusions and Implications

The results of this study contribute to the psychometric literature of the 10-item Perceived Stress Scale (PSS-10) among a novel population of elementary-age individuals. Additionally, the results of this study contribute to the understanding of how perceived stress impacts academic outcomes for elementary-age students. In the present study the PSS-10 demonstrated promising psychometric properties. A two-factor structure emerged, with a distress and a coping factor, and the factor structure was stable across time. This factor structure aligned with previous research on the factor structure in adolescents and adults. The two factors of the PSS-10 were found to differentially predict academic outcomes for elementary-age students. The coping factor predicted later literacy achievement. The distress factor predicted later student-reported emotional engagement, when coping was removed from the model. These results justify further investigation into the mechanism through which distress and coping impact academic outcomes. Furthermore, these results justify the continued use and study of the PSS-10 among an elementary-age population.

The results of this study have important implications for researchers and school personnel. Understanding that stress affects literacy achievement is necessary to inform interventions and school-based practices. Furthermore, since it was found that coping, in particular, impacted later literacy achievement, research dedicated to teaching and promoting adaptive coping practices in school and at home may have important implications for literacy achievement. Distress was found to negatively impact emotional

engagement in school. This finding warrants further work investigating both how to reduce the experience of stress among students and, furthermore, how to promote resilience against the negative impact of distress. This subsequently may impact emotional engagement in school, which is known to be an essential construct for success in academics. Finally, there were some differences between the three schools in the student's relationship to both student- and teacher-reported emotional engagement.

School psychologists should consider these findings in their practice. In addition to selecting interventions that promote coping and considering stress as a reason for disengagement in their work with students, school psychologists should use their unique position within the school to promote practices that reduce stress for children. School psychologists are uniquely positioned to advocate for systematic changes within the school as well as in the greater community (Strein, Hoagwood, & Cohn, 2003). These findings should inform school psychologists systems-level work which could reduce student stress and improve academic outcomes. Furthermore, school psychologists should consider how stress and engagement are related within their school culture. Student- and teacher-reported emotional engagement had different significant findings depending on the school. School psychologists should use their position evaluate the culture of engagement in their school and, furthermore, encourage practices that have been found to promote engagement and facilitate connection between students, staff and faculty. This study suggests that promoting emotional engagement in the school culture may have important effects on reducing experiences of distress and improving coping.

Overall, this study contributes to the literature on the effects of childhood stress on academic outcomes. Additional studies should replicate the use of the PSS-10 among

elementary-age samples. Additionally, further academic outcomes should be assessed in relation to stress to better understand the global effects stress has on academic functioning. A more comprehensive understanding of the effects of stress on academics can inform important interventions to promote resilience in the face of adversity and promote positive academic outcomes.

Appendix A

Table 1

10-item Perceived Stress Scale (PSS-10) and Adapted PSS-10 in Current Study

	Original Items		Current Study Adapted Items
	The questions in this scale ask you about your feelings and thoughts during the last month. In each case, please indicate with a check how often you felt or thought a certain way.		These next questions are about how you felt and what you thought during the last week:
1.	In the last month, how often have you been upset because of something that happened unexpectedly?	1.	In the last week, how often did you get upset because something you did not expect happened?
2.	In the last month, how often have you felt that you were unable to control the important things in your life?	2.	In the last week, how often did you feel like you could not do anything to change the way things were going?
3.	In the last month, how often have you felt nervous and "stressed"?	3.	In the last week, how often did you feel nervous and "stressed"? [*in general when you're in school*]
4.	In the last month, how often have you felt confident about your ability to handle your personal problems?	4.	In the last week, how often did you feel like you could make your problems better?
5.	In the last month, how often have you felt that things were going your way?	5.	How often did you feel like things were going right for you?
6.	In the last month, how often have you found that you could not cope with all the things that you had to do?	6.	How often were you too upset to do all the things you had to do?
7.	In the last month, how often have you been able to control irritations in your life?	7.	How often did you feel like you could deal with things that frustrated you? [*or do something to feel better or fix the frustrating problem?]*
8.	In the last month, how often have you felt that you were on top of things?	8.	How often did you think about your schoolwork and think, "I can do all of this!"?
9.	In the last month, how often have you been angered because of things that were outside of your control?	9.	Think about a time there were things you could not change. How often did you get mad about that?
10.	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	10.	How often did you feel like there were so many hard things to do that you just could not do them all?

Table 2

Engagement versus Disaffection with Learning Scale (EvsD) and Adapted EvsD in Current Study

	Original Items		Current Study Adapted Items
1.	When I'm in class, I feel good.	1.	When I'm in class, I feel good. [*Or, you feel happy and positive when you are in class.]*
2.	When we work on something in class, I feel interested.	2.	When we work on something in class, I feel interested.
3.	Class is fun.	3.	Class is fun.
4.	I enjoy learning new things in class.	4.	I enjoy learning new things in class.
5.	When we work on something in class, I get involved.	5.	When we work on something in class, I get involved [*Involved means you participate and work on the assignment or project happening in class*].

Appendix B

Table 3

Sample Demographics

	Full Sample	
Demographic Variables	*N*	%
Child Sex		
Female	228	55
Age at Time 1		
8 years	48	12
9 years	134	33
10 years	136	33
11 years	77	19
12 years	1	.2
School		
School 1	137	33
School 2	129	31
School 3	146	35
Grade Level		
3rd	125	30
4th	120	29
5th	144	35
Ethnicity		
Asian	26	6
Black	49	12
Latina/o	120	29
Multiracial	30	7
Not Reported	9	2
Other	2	.5
White	176	43
Language Status[b]		
DLL	229	56

Note. Total n = 396. School 3 primarily serves children who are in poverty and are dual language learners (DLL). Children were coded as DLL) if the child spoke another language with at least one parent.

Table 4

Descriptive Statistics

			Time 1		Time 3	
	Number of Items	***Total Possible Range***	***M(SD)***	***α***	***M(SD)***	***α***
PSS-10	10	1-4	2.47(.60)	**.76**	2.50(.59)	**.78**
Distress	6	1-5	2.67(.71)	**.71**	2.73(.71)	**.76**
Coping	4	1-5	2.18(.67)	.61	2.16(.71)	**.68**
SR-EE	5	1-5	4.17(.66)	**.77**	4.10(.69	**.80**
TR-EE	5	1-5	4.13(.88)	**.94**	4.23(.84)	**.95**
TOSREC Percentiles	--	1-100	52.97(34.19)	--	53.32(35.00)	--

Note. Time 1 n = 396, Time 3 n = 333. Alpha coefficients in bold meet an acceptable internal reliability level of .65 or higher (DeVellis, 2003). PSS-10 = 10-item Perceived Stress Scale (Cohen & Williamson, 1988). SR-EE = Student-Reported Emotional Engagement (Skinner et al., 2008). TR-EE = Teacher-Reported Emotional Engagement (Skinner et al., 2008). TOSREC = Test of Silent Reading Efficiency and Comprehension (Wagner, Torgesen, Rashotte, & Pearson, 2010).

Table 5

Time 1 10-Item Perceived Stress Scale One-Factor CFA

Items	**Unstandardized Estimate (SE)**	**Standardized Estimate (SE)**	**P-Value**	**CI (95%)**
T1PS1	1.06 (0.15)	0.48 (0.06)	0.00	(0.76, 1.36)
T1PS2	0.94 (0.14)	0.43 (0.05)	0.00	(0.67, 1.16)
T1PS3	1.34 (0.18)	0.60 (0.03)	0.00	(0.98, 1.64)
T1PS4R	0.68 (0.18)	0.33 (0.09)	0.00	(0.33, 1.03)
T1PS5R	0.97 (0.16)	0.51 (0.03)	0.00	(0.65, 1.29)
T1PS6	1.29 (0.19)	0.60 (0.05)	0.00	(0.92, 1.66)
T1PS7R	0.74 (0.19)	0.36 (0.07)	0.00	(0.38, 1.11)
T1PS8R	0.77 (0.14)	0.43 (0.05)	0.00	(0.50, 1.04)
T1PS9	1.15 (0.15)	0.53 (0.05)	0.00	(0.86, 1.43)
T1PS10	1.26 (0.20)	0.58 (0.05)	0.00	(0.86, 1.66)

Table 6

Time 1 10-Item Perceived Stress Scale Two-Factor CFA: Distress Factor

Items	Unstandardized Estimate (SE)	Standardized Estimate (SE)	P-Value	CI (95%)
T1PS1	1.06 (0.16)	0.49 (0.06)	0.00	(0.76, 1.37)
T1PS2	0.94 (0.14)	0.43 (0.05)	0.00	(0.67, 1.21)
T1PS3	1.33 (0.18)	0.60 (0.03)	0.00	(0.97, 1.68)
T1PS6	1.30 (0.19)	0.61 (0.03)	0.00	(0.93, 1.68)
T1PS9	1.16 (0.15)	0.54 (0.05)	0.00	(0.87, 1.45)
T1PS10	1.27 (0.22)	0.59 (0.05)	0.00	(0.85, 1.69)

Table 7

Time 1 10-Item Perceived Stress Scale Two-Factor CFA: Coping Factor

Items	Unstandardized Estimate (SE)	Standardized Estimate (SE)	P-Value	CI (95%)
T1PS4R	0.92 (0.18)	0.50 (0.09)	0.00	(0.56, 1.28)
T1PS5R	1.08 (0.22)	0.57 (0.05)	0.00	(0.66, 1.51)
T1PS7R	0.93 (0.15)	0.45 (0.08)	0.00	(0.64, 1.22)
T1PS8R	1.00 (0.19)	0.56 (0.05)	0.00	(0.62, 1.37)

Table 8

Time 3 10-Item Perceived Stress Scale Two-Factor CFA: Distress Factor

Items	Unstandardized Estimate (SE)	Standardized Estimate (SE)	P-Value	CI (95%)
T3PS1	0.88 (0.11)	0.54 (0.06)	0.00	(0.67, 1.08)
T3PS2	1.14 (0.14)	0.59 (0.05)	0.00	(0.87, 1.42)
T3PS3	1.03 (0.13)	0.59 (0.05)	0.00	(0.76, 1.29)
T3PS6	1.02 (0.12)	0.60 (0.04)	0.00	(0.79, 1.26)
T3PS9	1.10 (0.13)	0.66 (0.04)	0.00	(0.85, 1.55)
T3PS10	0.96 (0.14)	0.56 (0.05)	0.00	(0.69, 1.23)

Table 9

Time 3 10-Item Perceived Stress Scale Two-Factor CFA: Coping Factor

Items	**Unstandardized Estimate (SE)**	**Standardized Estimate (SE)**	**P-Value**	**CI (95%)**
T3PS4R	0.96 (0.15)	0.58 (0.06)	0.00	(0.68, 1.27)
T3PS5R	1.03 (0.16)	0.63 (0.04)	0.00	(0.72, 1.33)
T3PS7R	1.12 (0.13)	0.65 (0.06)	0.00	(0.86, 1.36)
T3PS8R	0.89 (0.13)	0.56 (0.06)	0.00	(0.64, 1.15)

Table 10

Latent Distress and Coping Path Estimates Predicting Literacy Achievement and Emotional Engagement

Predictors	**Literacy Achievement**				**Student-Reported Emotional Engagement**				**Teacher-Reported Emotional Engagement**			
	Unstand. Estimate (SE)	**Standardized Estimate (SE)**	**Unstand. Estimate (SE) *p*-value**	**Unstand. Estimate (SE) CI**	**Unstand. Estimate (SE)**	**Standardized Estimate (SE)**	**Unstand. Estimate (SE) *p*-value**	**Unstand. Estimate (SE) CI**	**Unstand. Estimate (SE)**	**Standardized Estimate (SE)**	**Unstand. Estimate (SE) *p*-value**	**Unstand. Estimate (SE) CI**
Distress	11.28(6.14)	.17(.09)	.07	(-.77, 23.32)	-.24(.19)	-.18(.14)	.21	(-.62, .14)	-.10(.16)	-.07(.11)	.54	(-.42, .22)
Coping	**-15.26(7.63)**	**-.23(.11)**	**.05**	**(-30.22, -.31)**	.07(.21)	.05(.15)	.74	(-.33, .47)	-.09(.15)	-.06(.10)	.54	(-.38, .20)
Controls												
Age	.58(1.71)	.02(.05)	.73	(-2.77, 3.94)	-.02(.06)	-.03(.08)	.72	(-.14, .10)	-0.09(.07)	-.11(.08)	.16	(-.22, .04)
Female	2.54(2.49)	.04(.04)	.31	(-2.33, 7.42)	-.11(.10)	-.08(.07)	.25	(-.31, .08)	.08(.09)	.05(.05)	.34	(-.09, .25)
DLL	**-13.44(4.98)**	**-.19(.07)**	**.01**	**(-23.20, -3.68)**	.15(.10)	.10(.07)	.13	(-.04, .34)	.08(.14)	.05(.08)	.56	(-.19, .34)
School 1	**32.92(5.21)**	**.44(.08)**	**.00**	**(22.70, 43.14)**	-.09(.18)	-.06(.11)	.60	(-.44, .26)	.03(.14)	.02(.08)	.81	(-.24, .31)
School 2	**40.31(7.83)**	**.55(.12)**	**.00**	**(24.96, 55.66)**	.07(.18)	.05(.12)	.69	(-.28, .42)	**.31(.12)**	**.18(.07)**	**.01**	**(.07, .54)**

Note: Bolded rows are significant

Appendix C

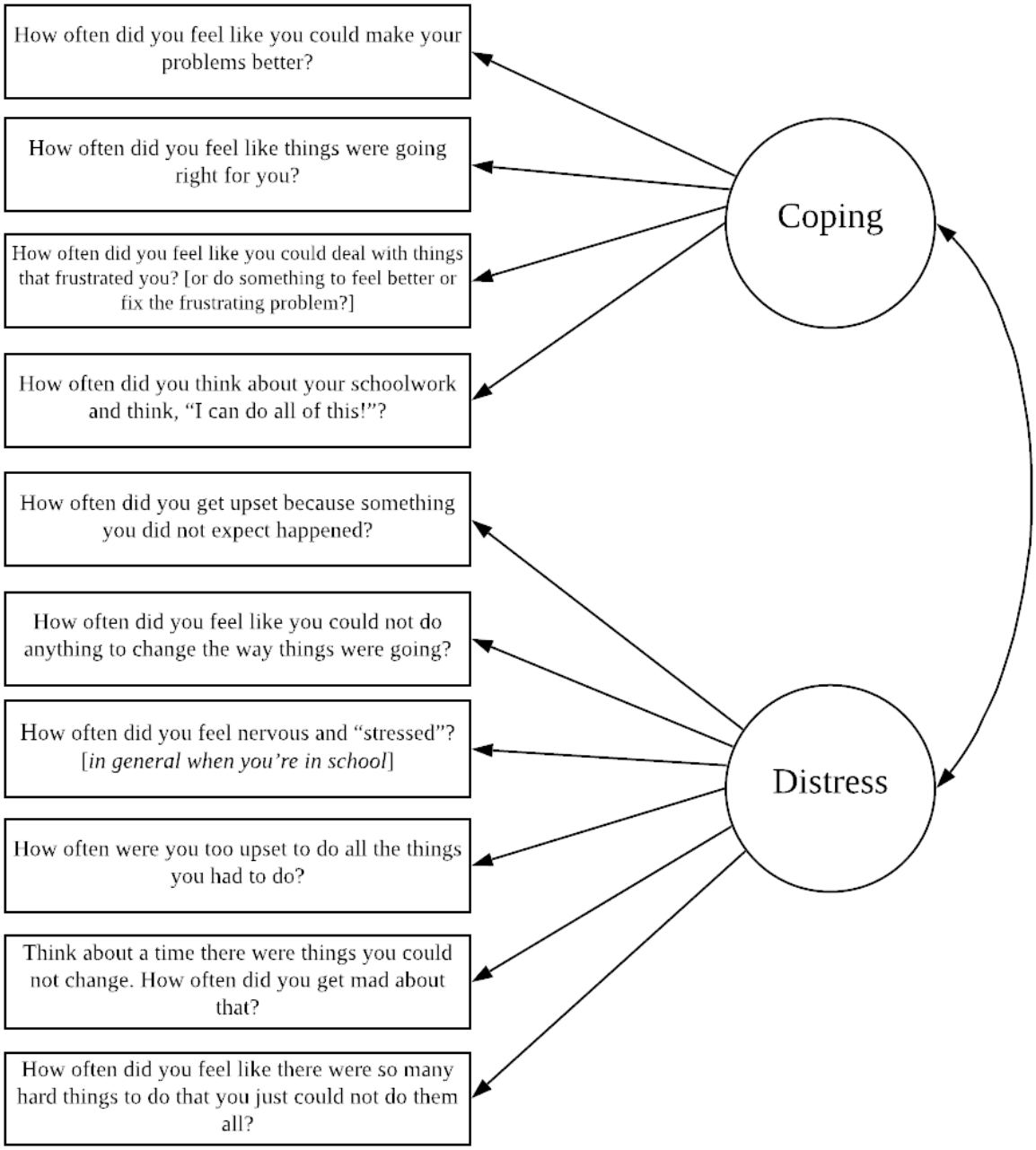

Figure 1. Expected Two-Factor Structure of the 10-item Perceived Stress Scale (PSS-10).

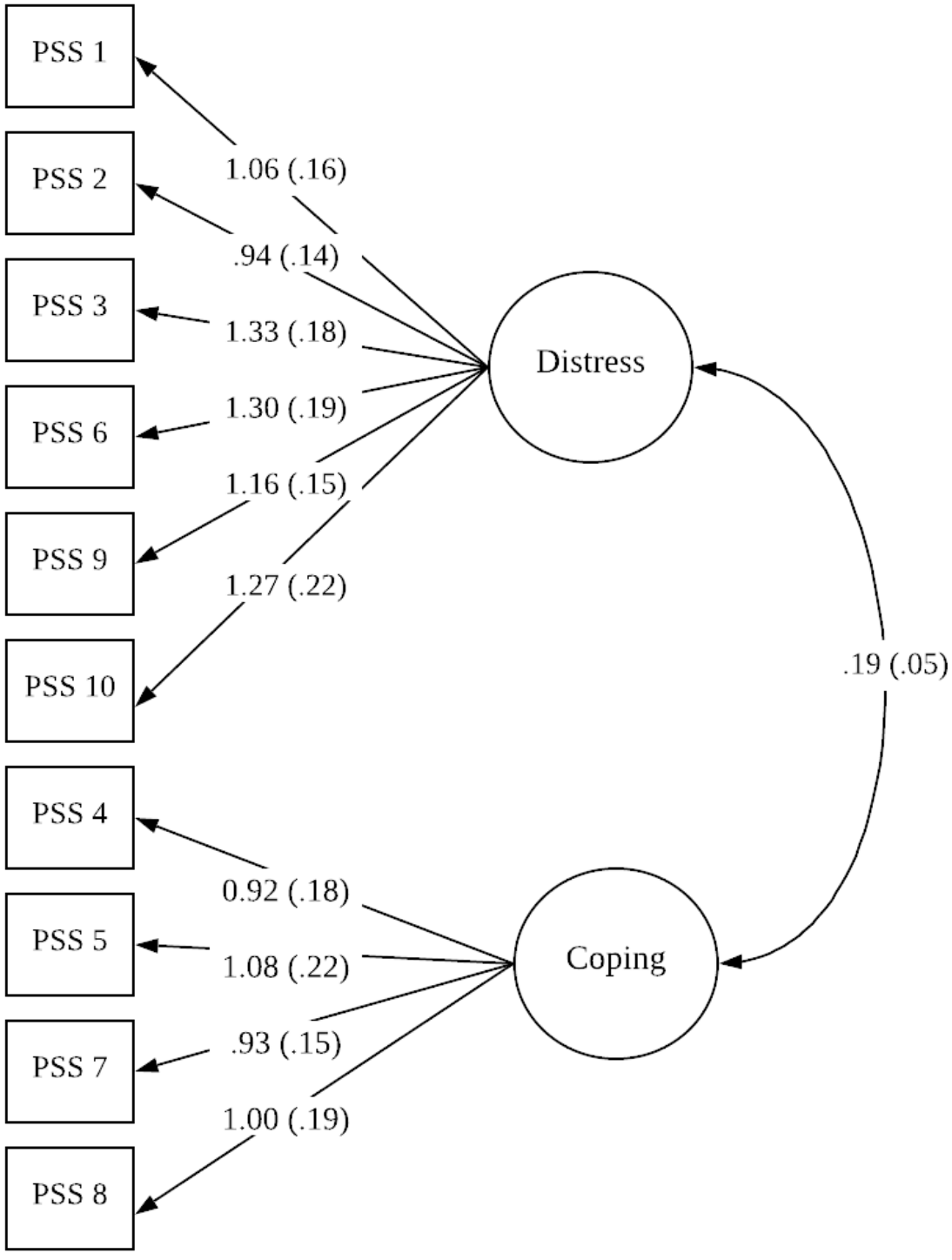

Figure 2. Confirmatory Factor Analysis: Unstandardized estimates of the two-factor structure of the 10-item Perceived Stress Scale (PSS-10).

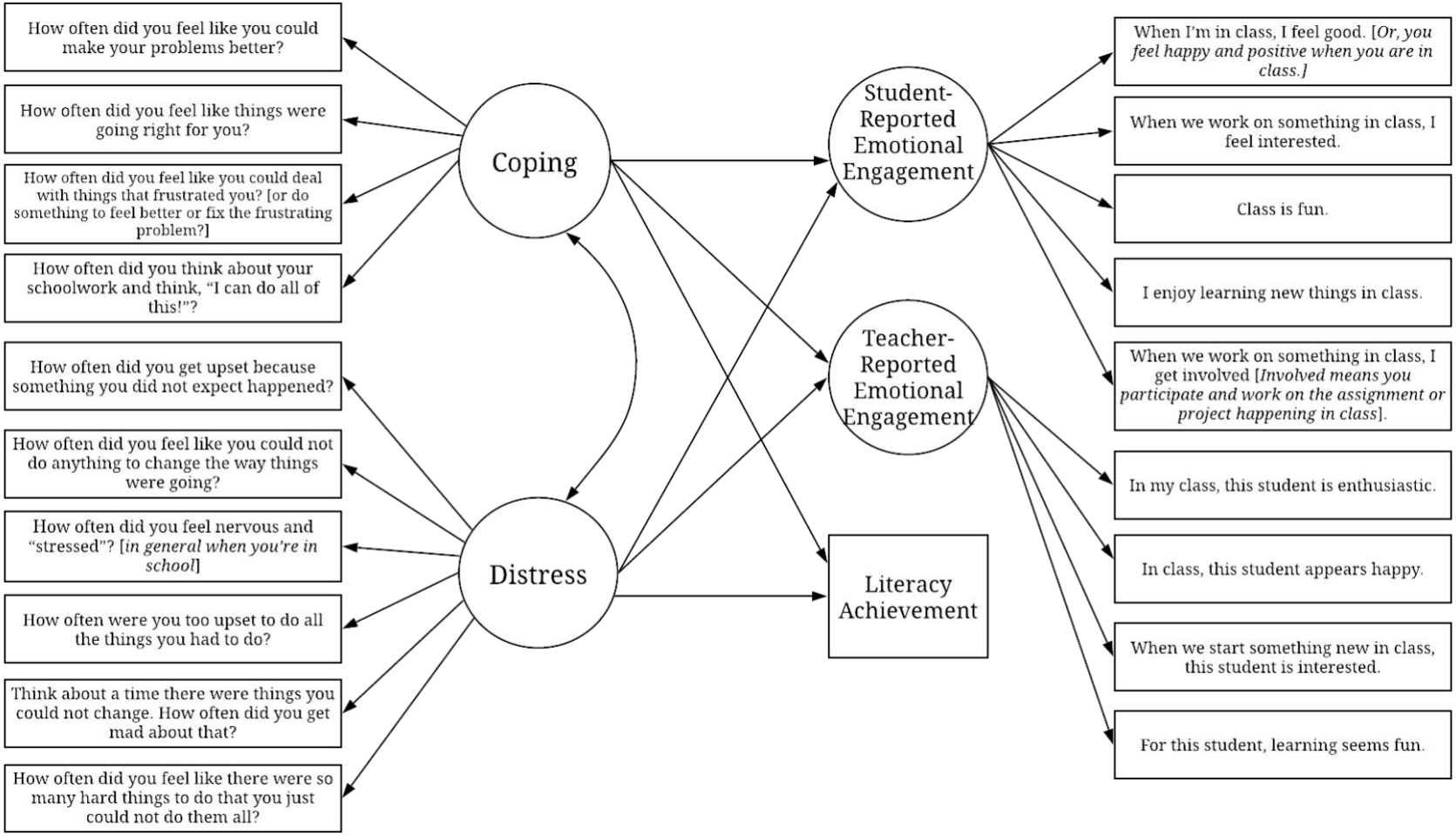

Figure 3. Expected path model with Time 1 latent distress and Time 1 latent coping predicting Time 3 measured TOSREC reading task and Time 2 latent student- and teacher-reported emotional engagement.

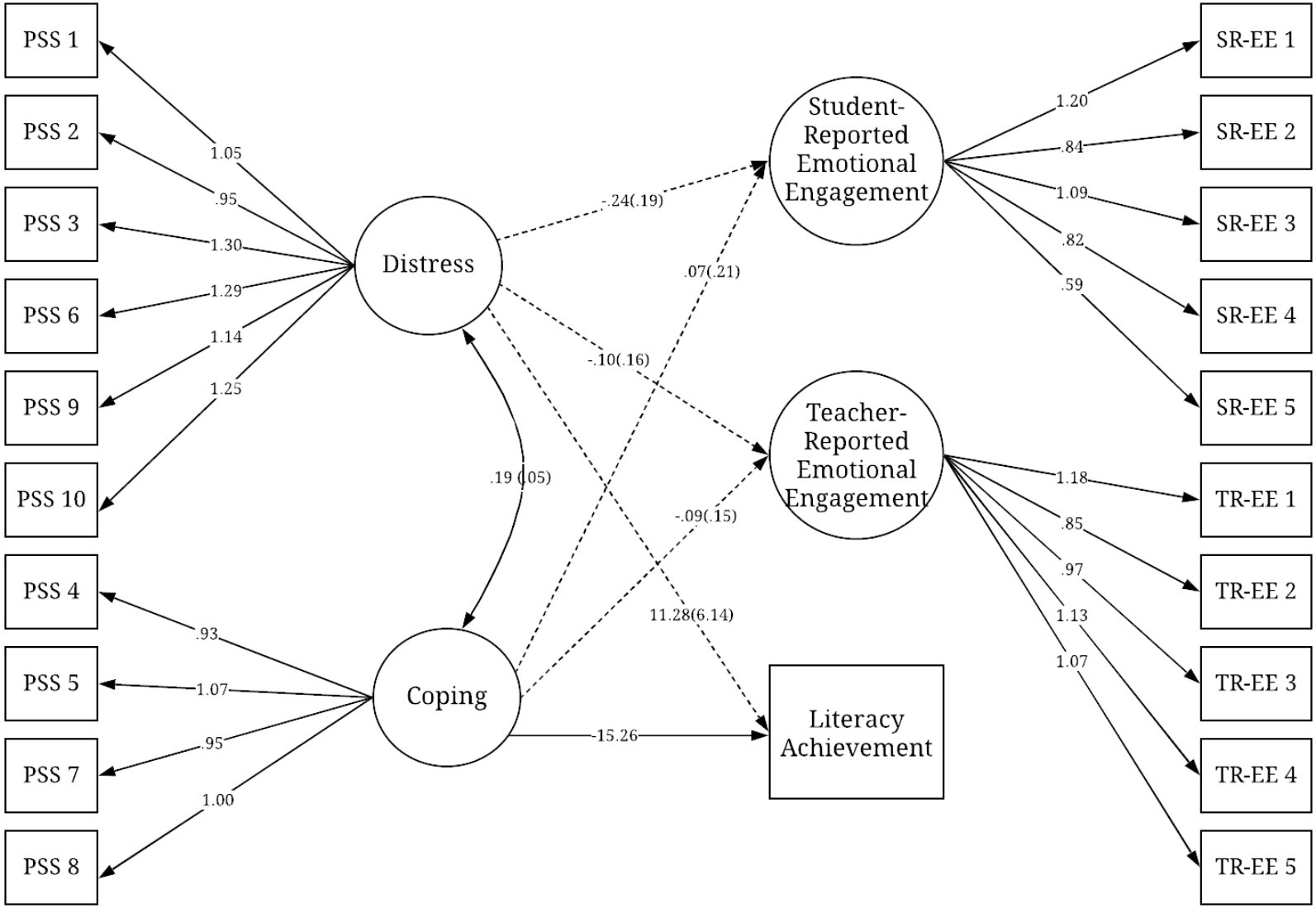

Figure 2. Path analysis with unstandardized parameter estimates. Solid lines indicate significant results, dotted lines indicated

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