ABSTRACT

Title of Thesis: LITERACY AND ANGER REGULATION AMONG UPPER ELEMENTARY STUDENTS

Hayley Weinberg, Master of Arts, 2023

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The contribution of this study is the examination of the relation between literacy and use of anger regulation strategies in upper elementary children. This short-term longitudinal study includes two time points, approximately four months apart. This study examines whether performance on a literacy achievement task predicts later self-reported frequency of anger regulation strategy use. I will also examine the effects of gender on the relation between literacy and anger regulation. Participants included a sample of 253 students between ages 8-11 years old from two Maryland elementary schools (mean age = 9.7; 57% female; 32% dual language learners; 5% Asian, 10% Black, 6% Latinx, 65% White, 12% multiethnic students). Path analyses were conducted to test a model of Time 1 literacy achievement impacting the outcome of later Time 2 anger regulation, controlling for related demographic variables and Time 1 literacy achievement scores. Literacy was not found to be a significant predictor of anger regulation. However, this study provides insight into the relation between literacy achievement and anger regulation and ideas for future directions for research in this area.

LITERACY AND ANGER REGULATION AMONG UPPER ELEMENTARY STUDENTS

by

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Chapter I: Introduction

Language and literacy development are critical domains of child development which have been studied extensively to identify developmental trajectories. A cursory search of the internet will return millions of books, journal articles, and websites detailing the ages at which children should reach certain speech and language milestones. One aspect of language is literacy, or reading fluency. The understanding and use of complex grammatical language has been proposed as a catalyst for developing understanding of emotions in oneself and others (Lindquist et al., 2015).

It is critical to examine children's language abilities, as language holds value not only for conveying information, but also serves as a tool for emotion regulation by providing a socially appropriate means of communicating one's needs and of self-regulating (Bretherton et al., 1986). Therefore, children with lower language achievement may experience frustration with language learning that impacts their ability to regulate strong emotions, including anger (Gickling & Armstrong, 1978; Rosenfield, 2014). In addition, across the wide range of literacy achievement in upper elementary classrooms, girls demonstrate better performance, on average, as compared to boys (Lange et al., 2016). Therefore, the degree to which literacy achievement predicts emotion regulation may vary by gender.

Emotion regulation, in turn, impacts a range of long-term developmental outcomes including behavioral, psychological, social, and academic functioning at all ages (Graziano et al., 2007; Gross, 1998; Roberton et al., 2012). Within the area of emotion regulation, anger regulation is particularly important to examine, as anger is one of the most frequently experienced negative emotions, and its regulation is a critical skill

for academic and social success (Phillips et al., 2006). Additionally, gender differences in anger expression and regulation have been observed to emerge as early as preschool (Bowie, 2010). Because existing studies have found that anger is associated with negative outcomes in academics, it is of particular significance to study this aspect of emotion regulation in school-aged children (Pekrun et al., 2017).

Currently, the majority of the literature on language abilities and emotion regulation is focused on either very young children (e.g., Vallotton & Ayoub, 2011), bilingual or multilingual populations (e.g., Pavlenko, 2008), or students with special needs such as specific language impairment (e.g., Fujiki et al., 2002). There is substantially less literature on language development and anger regulation in typically developing, monolingual students in middle childhood. Most important for this study, the vast majority of studies that do examine these constructs use emotion regulation as a predictor of language abilities, rather than language as a predictor of emotion regulation. They also tend to examine domains of language other than literacy, such as verbal expressive or receptive language. These studies suggested that strong emotions have a high cognitive load and require considerable effortful control to regulate, thereby taking up cognitive resources that could otherwise be devoted to academic outcomes such as language. However, it may also be the case that strong language abilities, including literacy, can serve as a learning mechanism for emotional intelligence and regulation.

This thesis seeks to explore the predictive power of language abilities on emotion regulation, specifically anger regulation, in upper elementary school students. Using a sample of students attending two schools in a Maryland suburb, I examined the relation

between literacy achievement and anger regulation. Additionally, this study also examines whether such a relation varies by gender.

Chapter II: Literature Review

Theoretical Framework

According to the Theory of Constructed Emotion, formerly known as the Conceptual Act Theory (CAT), "emotions emerge when people make meaning out of sensory input from the body and from the world using knowledge of prior experiences" (Lindquist et al., 2012). Cognitive processes are used to appraise environmental stimuli and to determine an appropriate reaction. Psychological components, such as affect, attention, and language, work together to create an emotional experience (Barrett, 2014). Having a broad lexicon allows for greater representation of concepts and experiences. Without a strong vocabulary, interpretation of emotions may be limited to "positive" and "negative," rather than a more nuanced understanding (Lindquist et al., 2015). Therefore, greater language abilities, potentially including literacy, support the acquisition and use of "concept knowledge," which, in turn, is used to interpret external experiences into understandable, meaningful emotions (Lindquist et al., 2015).

Children come to understand the physical manifestations of their experience of emotions through language, socialization, and cultural influences (Barrett, 2014). Their emotion concepts are rooted in their lexicon, which is restricted to the language or languages that they speak (Pavlenko, 2008). It stands to reason that children with a better developed emotion lexicon will have a greater understanding of the emotions they experience. This understanding will enable them to work through the physical manifestations of strong emotions like anger in an appropriate way, such as expressing their feelings to a friend or caregiver appropriately rather than physically acting out. By

verbally expressing emotions, children may be better able to process their experiences in an adaptive manner.

Emotion theorists have also prioritized the importance of language skills in emotion regulation. For instance, Cole and colleagues (2010) explain that expressive language offers a means of articulating emotion expression for communicating wants and needs, serves as a tool to enhance the understanding of one's own and others' emotions, and provides a strategy for regulating both emotions and action. It may be the case that literacy achievement acts as a tool for emotion regulation.

Further, consultation and instructional assessment researchers have examined instructional match and frustration tolerance in reading (Gravois & Gickling, 2008). When attempting to complete tasks at a "frustrational" level of instruction, students exhibit more off-task, externalizing behaviors (Gickling & Armstrong, 1978). This frustration with learning to read may lead to poor regulation of emotions, including anger.

Literacy and Emotion Regulation

Language encompasses a variety of abilities that range from expressive to receptive; verbal to written. Within this category of abilities, literacy refers to a set of skills including decoding, fluency, vocabulary, and coherence. This study uses the Test of Silent Reading Efficiency and Comprehension (TOSREC) to examine literacy achievement, which provides insight into reading comprehension, fluency, and decoding (Durwin et al., 2018). Though written language is not a requirement for communication, and children can communicate their needs in other ways, literacy aids in the

understanding of complex abstract concepts, including emotions, which may in turn impact emotion regulation abilities (Lindquist et al., 2015).

The few studies that examine literacy as a predictor of emotion regulation typically focus on reading emotion-centered books or passages. Such studies have found that children who receive reading-based interventions exhibit greater emotional competence and self-regulation strategies (Kumschick et al., 2014; Wanzek et al., 2006). While the effects are generally strongest for reading interventions that include an emotional competence component, there are smaller, positive effects on social and behavioral outcomes for interventions that solely target literacy (Wanzek et al., 2006). This suggests that differences in literacy achievement are related to emotion and regulatory responses.

Other work on literacy and emotion regulation almost exclusively uses a model in which emotion regulation is used to predict literacy, rather than literacy predicting emotion regulation. Such studies have found that children who exhibit greater self-regulation skills demonstrate greater language achievement across domains of vocabulary, decoding, and reading comprehension (Bohlmann & Downer, 2016; Graziano et al., 2007; Skibbe et al., 2019). In a study of kindergarteners by Graziano and colleagues (2007), parent-reported emotion regulation could predict academic success in multiple domains, including reading. Another study that encompassed a number of socioemotional variables demonstrated that self-regulation, defined as the integration of emotion and cognition, in preschool could predict literacy outcomes in kindergarten (Blair & Razza, 2007). Likewise, Bohlmann and Downer (2016) examined self-regulation, defined in the same manner, with a variety of language outcomes in

preschoolers. They found that children with greater self-regulation skills at an initial assessment displayed greater receptive vocabulary, expressive vocabulary, phonological awareness, and print knowledge at a second time point.

It may be the case that anger regulation, as a subset of emotion regulation, acts on literacy achievement by freeing up cognitive resources and allowing for greater engagement in the classroom (Blair, 2002). Further, poor regulation may interfere with processes such as higher order thinking and engagement, which are critical to academic achievement (Valiente et. al, 2012).

Given the lack of research on the impact of literacy on AR, it is possible that research on the impact of early language abilities on socioemotional outcomes is relevant for this proposed study's model. The rest of the research on the effects of language on emotion regulation is centered on spoken language rather than literacy. These studies have found that early abilities in this domain are associated with a variety of long-term academic and psychological outcomes. Toddlers with high strong spoken language skills exhibited less anger and more use of support-seeking and distraction as regulatory strategies at age 4 (Roben et al., 2013). In comparison, research on the relation between early language delay (age 5 or younger) and later cognitive outcomes indicate that the effects of delayed speech may be long lasting. Some studies suggest that late talkers can catch up to peers through spontaneous, rapid language development in later childhood years (e.g. Dale et al., 2003), while others show a strong correlation with later deficits, including a variety of psychological, behavioral, and attention problems (e.g. Rescorla 2002, 2005). In either case, there may be long lasting effects of early language delays, such as diminished vocabulary in later childhood (Durand et al., 2013), or deficits in

other domains, such as social skills (Paul et al., 1991). It is possible that literacy achievement may follow a similar pattern, such that early delays in literacy contribute to later cognitive and social deficits.

Vallotton and Ayoub (2011) examined the relation between expressive language skills, specifically spoken vocabulary and talkativeness, and later self-regulation in toddlers. They found that vocabulary was predictive of later regulation abilities, as measured via the Bayley Behavior Rating Scale (BBRS), which assesses negative affect and frustration with tasks. This may be because children with a more robust vocabulary can better communicate their needs and understand their own internal states and behaviors. They also found gender differences in self-regulation trajectories and in the impact of language on self-regulation, explained in more depth below. Researchers suggested that having an adequate vocabulary may allow for the ability to label, describe, conceptualize, and understand emotions, which is essential to gaining insight and to accessing and regulating one's emotions (Cole et al., 1994; Vallotton & Ayoub, 2011). Researchers have further speculated that this relation is due to an association between children's language skills and the ability to use self-talk and distraction when experiencing frustration or other negative emotions (Eisenberg et al., 2005; Kopp, 1989). Language skills may enhance the child's ability to express their needs with words rather than acting out in anger (Cole et al., 2010).

Children who have not developed these language abilities by middle childhood, when they begin formal schooling, are at a disadvantage compared to their peers (Lemerise & Harper, 2009). Lower language development by this age impedes the ability to identify and regulate anger, and these students are at risk for poor behavioral and

academic outcomes. This is perhaps most clear in research with elementary and middle school students with specific language impairments (SLI). The students with SLIs exhibit poor emotion regulation relative to their typically developing peers (Fujiki et al., 2002), and they experience clinically significant elevations in emotional, behavioral, and attentional symptoms at greater frequency than their typically developing peers (Yew & O'Kearney, 2013). Given that language abilities fall along a continuum, it may follow that individuals who fall in the low range of typical language abilities may have similar deficits in emotion regulation, despite not meeting criteria for psychopathology, whereas individuals with high language abilities may demonstrate stronger emotion regulation abilities.

Additionally, language has been demonstrated to "prime" the way a speaker interprets and regulates their emotions (Matsumoto et al., 2008). Work with individuals who speak two or more languages fluently has suggested that such individuals may be able to express emotion concepts in greater detail or in a more distinct manner than those who only speak one, as fluency in multiple languages may offer a more nuanced vocabulary with which to express one's emotions (Pavlenko, 2008). This may suggest that breadth of vocabulary, whether in a single language or multiple, impacts one's emotion regulation strategies. In other words, children with the strongest language abilities who are able to conceptualize and articulate their emotions to a greater extent may be more capable than peers with lower language achievement of using expression-based regulation strategies. However, it may be that such a difference would not be apparent in the use of other strategies, such as withdrawal.

Anger

Anger, like all emotions, can be operationalized in a trait- (i.e., characteristic of one's personality) or state- (i.e., transient state caused by external factors; Spielberger et al., 1985) based manner. While trait-based approaches are often used in personality assessment, a state-based approach may better capture the temporary nature of intensely experienced emotions, like anger. For the purpose of this study, anger has been operationalized as a temporary state of heightened negative arousal; that is, it is experienced in specific instances based on a variety of internal and external factors, but is not necessarily an aspect of one's personality. Children's anger and anger management often depends on factors such as the school environment or peer conflict (Macklem, 2008). Children who report high levels of school anger tend to exhibit more externalizing behaviors and lower motivation in school (Heavey et al., 1989). This is especially true for children who have learning disabilities, and it is possible that individuals with lower reading achievement who do not meet criteria for a learning disability would exhibit similar results.

While anger has adaptive purposes, such as overcoming obstacles and obtaining one's goals, it can also have negative consequences, such as peer rejection and victimization (Lemerise & Harper, 2009). In middle childhood, the peer context becomes particularly important in socialization, as children begin to spend more time with their peers and less with their parents. By this period, children tend to have an understanding of the reactions that their emotional displays will affect in others (Underwood, 1997). Therefore, anger regulation strategies are likely to be developing during this stage (Cole et al., 1994). Children have reported that anger regulation is more challenging than

regulation of other emotions such as sadness, and, therefore, the use of these strategies takes longer to develop (Waters & Thompson, 2014).

Anger Regulation

Emotion regulation refers to the strategies one uses to manage their emotions, which have consequences for socioemotional functioning (Thompson, 1994). The majority of research in areas of emotion regulation center around either early childhood or adolescence. Regulation strategies vary in nature (e.g., inhibitory vs. expressive) and efficacy. Different theoretical approaches often conceptualize anger regulation in an either wholly positive or negative light; that is, anger regulation as an ability has generally been conceptualized as either adaptive or maladaptive, rather than breaking down the construct into more specific strategies. Examining different regulation strategies has revealed differences in effectiveness by strategy used (Nyklíček et al., 2011; Szasz et al., 2011). For example, suppression strategies are effective at inhibiting the outward expression of emotion-related behavior, but they typically do not improve the internal, subjective experience of negative emotions (Nyklíček et al., 2011). These strategies may negatively influence one's self-image and facilitate negative emotions and depressive symptoms. Studies which conceptualize anger regulation as a negative trait are centered around maladaptive strategies, such as anger suppression and disruptive outward behaviors, and have suggested associations with negative outcomes ranging from anxiety to externalizing problems (Kerr & Schneider, 2008). It may be that a state-based conceptualization of anger regulation that examines a wider range of strategies, including adaptive ones, such as pausing before acting, will indicate different outcomes (Pekrun et al., 2002).

Measuring Anger Regulation

This study conceptualizes anger from a state-based approach. The most commonly used measure for anger regulation assessment is the State-Trait Anger Expression Inventory-2 Child and Adolescent (STAXI2-C/A). As the name would indicate, the STAXI2-C/A examines both frequency of anger (trait-anger) and intensity (state-anger). However, the STAXI2-C/A examines anger regulation from a psychopathological model. The Child Anger Regulation Measure (CARM; O'Neal et al., under review) is a scale designed to examine specific strategies used in anger regulation from a state-based, adaptive conceptualization of anger. Subscales of the CARM examine anger expression, anger withdrawal, and pause anger as distinct strategies. Unlike anger suppression, these strategies may be adaptive in that they allow the student to "cool off" before reacting. Indeed, the ability to effectively and appropriately regulate emotions such that they are expressed appropriately in a given context may be a protective factor against the development of psychopathology.

Gender Differences

Existing research has examined gender differences in both anger regulation and language abilities for boys and girls. Girls on average demonstrate better performance in language domains including vocabulary, grammar, speech comprehension, and sentence understanding as young as age 3 (Lange et al., 2016). By age 10, girls had better reading comprehension and had a more positive attitude toward reading than their male counterparts (Logan & Johnston, 2009). Differences in language and literacy achievement are relatively consistent across languages and countries, which suggests that these differences are not due to differences in cultural or societal expectations by gender,

but rather that there are neurological differences in language processing by gender (Eriksson et al., 2012).

With regards to anger, boys exhibit more externalizing emotions than girls at the preschool and middle childhood age ranges (Chaplin & Aldao, 2013). In contrast, girls express more positive emotions and negative internalizing emotions (e.g., sadness and anxiety). This may be due in part to the fact that parents talk about emotions differently with boys and girls, focusing primarily on the emotion itself with daughters but instead focusing on the causes and consequences of the emotion with sons (Fivush, 1989). The differences seen by gender vary based on factors such as interpersonal context, suggesting that they are not fixed, but rather based on socialization differences in emotional expression, in contrast with findings related to differences in language. There are also differences in the types of strategies typically employed by boys and girls to regulate emotions. In a study of anger and sadness regulation in children ages six to nine, girls tended to report more use of emotion-focused strategies, like seeking support or expressing their feelings, as more effective, while boys endorsed more "problem-focused" strategies (Waters & Thompson, 2014).

No studies have examined the effects of gender on literacy predicting anger regulation. However, as noted previously, in a study of language and self-regulation in preschoolers, Vallotton and Ayoub found that the impact of vocabulary on self-regulation is greater for boys (2011). They suggest language is a tool that can be applied to the task of self-regulation that may be more necessary for boys than for girls. Given the similarities between their construct of self-regulation and conceptualization of anger regulation in this study, it is possible that results would be similar for AR. Additionally,

some researchers have suggested this possibility, given the known gender differences in both language and emotion expression and regulation (Lange et al., 2016; Bowie, 2010). A biopsychosocial model presented by Chaplin proposes that small biological gender differences in language skills combined with gendered socialization around emotion expression leads to differences in the use of regulation strategies (2015). I expect that literacy achievement will be a stronger predictor of anger regulation in boys than in girls, as girls tend to demonstrate higher levels of and less variation in literacy achievement and emotion regulation across domains and developmental abilities.

Current Study

The association between language development and emotion regulation has been established in existing literature. However, work is limited in that most do not examine the period of middle childhood, focusing instead on language development and emotion regulation prior to the start of formal schooling, around age 5. Further, most studies use measures of verbal expression rather than literacy. This study examines the relation between literacy achievement and anger regulation (AR) in upper elementary school students.

The current study examines the following research questions:

Question 1: Does literacy achievement predict later use of anger regulation strategies?

Hypothesis 1: High Time 1 literacy scores will predict an increase in AR from Time 1 to Time 2.

Hypothesis 1a: Children with higher T1 literacy scores will be more likely to rely on anger-express as an AR strategy at T1 and T2 than those with lower literacy scores.

Question 2: Are there effects of gender on the relation between T1 literacy achievement and T2 AR?

Hypothesis 2: High Time 1 literacy scores will predict an increase in AR from Time 1 to Time 2 that varies by gender.

Hypothesis 2a: There will be within group gender differences in T1 literacy predicting AR at T1 and T2.

Chapter III: Methods

Design

This study uses existing data from a short-term longitudinal study. Data were collected over three time points from March to June 2015, as part of a larger study with other social-emotional variables. The analyses use literacy and AR measures from Time 1 and Time 3, while controlling for demographic variables such as age, grade, ethnicity, dual language learner status, student-reported anger and questionnaire format. In this study, I refer to these time points as Time 1 and 2.

Participants

The sample consisted of 253 students in 3rd through 5th grades from two elementary schools in Maryland. Of the total sample, 57% were female; 32% were English language learners; and the average age was 9.7 years old. The racial and ethnic backgrounds were 65% White, 10% Black, 6% Latinx, 5% Asian, and 12% multiethnic or other, which was congruent with that of the schools' total student body. While we could not obtain information about income or immigration status, school-level statistics revealed that approximately 14% of students qualified for Free and Reduced Meal Status (FARMS).

Procedures

This study procedure involved collection of questionnaires and a literacy achievement task. The research was approved by the University of Maryland's Institutional Review Board (IRB) and the participating schools' district IRB. Researchers obtained assent from the students and consent from parents and teachers. Students were recruited from all upper elementary classrooms across the two schools by speaking with

teachers during team meetings. This study included student-reported questionnaires of AR at three time points (March, April to May, and June 2015). Researchers read the CARM anger questionnaire aloud to students, in one-on-one sessions, while participants read along on hard copies. Answer options were presented to the students on a printed scale so that they had the opportunity to point to their response. Afterwards, researchers administered the TOSREC task to assess literacy achievement. Due to time constraints, 21% of students' data from one of the schools were collected in a small group setting rather than individually.

Measures

Language measurement. The TOSREC is a brief, standardized, objective measure of literacy which provides norm-referenced scores. It has been used as a tool to screen students for oral reading fluency and to monitor progress (Johnson et al., 2011; Durwin et al., 2018). The TOSREC requires students to complete as many questions as possible on a grade-appropriate worksheet in three minutes and indicate whether the sentences are true or false (e.g., "An apple is blue."). Total scores are calculated by counting the number of correct responses and subtracting the number of incorrect responses, such that a high score indicates strong literacy abilities. This assessment tests for multiple components of literacy, including comprehension, decoding, and fluency. For the purpose of this study, TOSREC scores are reported as standardized scores.

Anger regulation measurement. This study uses the Child Anger Regulation Measure (CARM; O'Neal et al., under review), which includes subscales for the following constructs: anger frequency, pause anger, anger withdrawal, anger-express caregiver, anger-express friend, and anger-express teacher. Anger expression refers to

talking to a teacher, peer, or caregiver when one is experiencing anger (e.g. “I would share my feelings with a friend”;); anger withdrawal refers to spending time alone (e.g. “I would spend time alone”); pause anger refers to taking a break before reacting (e.g., “I wait before acting on my anger”). Each subscale contained 3 items, for a total of 15 items. Each of the five different AR strategies is used as a latent variable in analyses. Students were instructed to reflect on times they felt angry over the past month and rate on a five-point scale (1 = Never, 5 = Very often) how often they would engage in various AR strategies when angry. The three items in each subscale have been averaged to obtain a score out of 5 for each of the latent AR variables (see Table 2).

Data Analyses

Descriptive statistics were assessed using IBM SPSS Statistics Version 26. Prior to model testing, correlational and internal consistency analyses were assessed using SPSS. A confirmatory factor analysis (CFA) was conducted using MPlus Version 8 modeling software to determine if the emotion regulation data fit the expected latent factor structure. A separate CFA was conducted for T1 AR data and T2 AR data. Latent variable path analyses were conducted to test the predictive power of observed T1 literacy on change in latent AR factors from T1 to T2. To do so, the model controlled for T1 latent AR factors. In all models, fit indices were examined to evaluate model fit, including Root Mean Square Error of Approximation (RMSEA) and Comparative Fit Index (CFI). Additional multi-group analysis was conducted to test gender differences in the magnitude of the estimates of literacy predicting change in AR from T1 to T2.

There were 244 participants at Time 1 and 192 participants at Time 2, indicating a total attrition of 52 participants. A maximum likelihood standard error (MLR) estimation approach will be used to account for attrition.

All path analyses controlled for age, grade, ethnicity, dual language learner status, student-reported anger, and questionnaire format. It is possible that these may account for some of the variation in literacy achievement and anger regulation skills.

Chapter IV: Results

Descriptives

Table 2 presents the means, standard deviations, alpha coefficients, and ranges for literacy and anger regulation.

Literacy achievement. There was a wide range in TOSREC scores in the sample ranging from 65 (1st percentile) to 146 (99th percentile). The mean TOSREC score at Time 1 was $M = 112.03$ ($SD = 16.05$).

Anger regulation. The CARM scales all had means close to three, on a scale from one to five. The means and standard deviations of the subscales at Time 1 were as follows: Pause Anger was $M = 3.57$ ($SD = .84$), Anger Withdraw was $M = 3.24$ ($SD = .84$), Anger Express-Caregiver was $M = 3.32$ ($SD = .99$), Anger Express-Friend was $M = 2.74$ ($SD = .98$), and Anger Express-Teacher was $M = 2.25$ ($SD = 1.01$). Items within each subscale were all significantly correlated with one another (see Tables 3-7). The only item that was significantly correlated with TOSREC score was anger withdraw item 1 ("When I was angry, I would go off by myself."). There were no significant differences in these results by gender.

Factor Structure

A confirmatory factor analysis (CFA) was conducted using MPlus Version 8 modeling software to determine if the CARM data fit the expected latent factor structure (Muthén & Muthén, 1998-2018). Items were considered to load sufficiently onto a factor when loadings measured ≥ .40 on the primary factor. Analyses clustered by teacher to account for possible patterns within classes. At T1, the loading of withdraw items onto the withdraw factor was weak.

The data fit the expected factor structure of five factors with three items loading onto each factor: Pause Anger, Anger Withdraw, Anger Express-Caregiver, Anger Express-Friend, and Anger Express-Teacher. Both Time 1 and Time 2 models had adequate fit.

Latent Variable Path Analyses

The goal of the latent variable path analyses was to test if literacy achievement at Time 1 is a significant predictor of anger regulation at Time 2. The full model included Time 1 TOSREC score as the predictor, Time 2 anger regulation outcomes, and Time 1 control variables (school, age, gender, DLL status, anger frequency). The path analyses utilized all of the CARM items as they loaded onto their latent subfactors.

Unfortunately, literacy achievement was not found to be a significant predictor of any of the anger regulation strategies. Another variation of the path analysis was run in which gender was added as a moderator to determine if there were between-group gender differences. Again, the results were nonsignificant.

Additional analyses were conducted to explore the data further. An analysis of the model used dual-language learner status as a moderator, which was found to be nonsignificant. Other analyses were run using the individual latent variables as predictors in separate models, to explore the possibility of a relation that the full model did not capture. No such relation was found.

Chapter V: Discussion

This study contributed to the current understanding of the relation between literacy achievement and anger regulation. The goal was to examine whether literacy achievement would impact later anger regulation in upper elementary school children. The use of the CARM to measure anger regulation strategies in upper elementary school children is a novel approach to studying emotion regulation, and its relations with literacy achievement. The results of this study indicated that literacy achievement was not a significant predictor of anger regulation, nor was there a significant difference by gender. Despite this, the current study does provide a basis for future research on this subject, as explained below. The discussion addresses the findings of this study in the context of existing literature, limitations of the current study, and future directions for research in this area.

Literacy Achievement and Emotion Regulation

The current study did not find literacy achievement to be a significant predictor of anger regulation. Such a relation was hypothesized based on existing literature, which has indicated a connection between other domains of language development and emotion regulation (Blair, 2002; Bohlmann & Downer, 2016; Graziano et al., 2007; Skibbe et al., 2019). However, most existing work examines a model of the opposite direction, such that regulation is used to predict literacy, instead of literacy predicting regulation. It is possible that there would be reciprocal effects as well. However, it may also be that the previously noted dearth of research on this subject and the focus on other domains of language points to a nonsignificant impact of literacy on anger regulation, given that few studies with nonsignificant results are published.

Emotion regulation, as whole, has been shown to be positively associated with early academic success (e.g., Graziano et al., 2007). This study, in contrast, found no relation between literacy achievement and anger regulation, aside from the one previously mentioned anger withdraw item. Given the complex nature of anger, it is important to examine this discrete emotional response in relation to achievement (e.g., Waters & Thompson, 2014). Using the CARM, an anger-specific measure of emotion regulation, has the benefit of providing specificity into the unique effects of anger, compared to more general measures of behavioral or self-regulation (O'Neal et al., under review). However, given the nonsignificant results in this study, it is possible that other areas of regulation would be useful to examine in relation to literacy achievement. Likewise, it would be valuable to explore the relation between other domains of language with anger regulation.

Literacy Achievement and Socioemotional Variables. It is critical to examine children's language abilities in relation to socioemotional variables (Lindquist et al., 2015). The TOSREC is a useful tool to do so, as it assesses reading comprehension, fluency, and decoding. It is, however, a narrow measure of language abilities. It is possible that other domains of language, such as language production, would be a more useful predictor of anger regulation. There is some limited research on the relation between expressive language and later self-regulation in toddlers, which suggests that early vocabulary can predict later regulation abilities (e.g., Cole et al., 1994; Vallotton & Ayoub, 2011). Future research could include measures of expressive language to examine whether a similar pattern remains in upper elementary aged children as well.

Researchers have posited that language development contributes to the development of self-regulation by enhancing a child's ability to express needs with words rather than with emotion, to think before acting in a frustrating situation, and to generate and sustain ideas that serve attention control (Cole et al., 2010). Such theories have been supported by work with infants and toddlers, as language develops quickly during this time frame. Toddlers with greater language abilities have been observed to demonstrate less anger at age 4, and to engage more in the use of the regulatory strategies of support-seeking and distraction (Roben et al., 2013). By the elementary age range, children who exhibit lower language abilities typically struggle more to identify and regulate anger, and these students are at risk for poor behavioral and academic outcomes (Lemerise & Harper, 2009).

However, it is likely that relations between language and socioemotional abilities vary with stages of development. Although literacy was not found to be a predictor of anger regulation at the upper elementary level in the current study, it may be that such a relation would be observed if examining a different age range, as such patterns between various language domains and anger regulation have been observed in preschool aged children (Bowie, 2010; Roben et al., 2013). Different relations by age have been demonstrated in studies of other socioemotional variables, such as grit, which have found significant relations between grit and literacy achievement in older samples, but not younger (O'Neal et al., 2018). Similarly, studies on growth mindset have found a relation with literacy at the elementary school age range and math at the high school age range (Claro et al., 2016). It is possible that the opposite pattern may emerge for literacy

achievement, such that a relation is observed at the high school level rather than elementary school.

Various language abilities, including language mechanics, expression, and vocabulary, have been found to be associated with behavior problems in children and adolescents, including ADHD and externalizing disorders (Petersen et al., 2013). There are several proposed mechanisms for this phenomenon. One is that the use of self-talk could serve as a regulator to guide behavior to facilitate problem solving and self-regulate (Petersen et al., 2013; Vallotton & Ayoub, 2011). It is also possible that there is a biological component to this, as neural networks for language processes are closely related to the frontal lobe, which is involved in self-regulation (Pisoni et al., 2008). Finally, it may be that poor language ability is associated with heightened negative emotions such as anger and frustration, which in turn lowers effortful control. This sample demonstrated a high mean TOSREC score of $M = 112.03$, nearly a full standard deviation above the population mean (100). It may be the case that this high achieving sample exhibits a ceiling effect of sorts, such that any relation between literacy achievement and anger regulation is not observed.

Overall, academic achievement (as indicated by broad measures such as GPA) has been found to be linked to self-regulation and academic emotions (Pekrun et al., 2002). Self-regulation, although defined variably by different theorists, generally refers to a child's ability to initiate regulatory strategies in the absence of adult instruction (Kopp, 1982). Researchers have proposed that there may be a reciprocal relation between emotions and academic achievement such that both could increase or decrease over time in parallel ways, which might also be one of the reasons why the gap between high- and

low-achieving students tends to widen throughout the school years (e.g., Weinert & Helmke, 1997).

Gender Differences

The current study did not find any gender differences in the relation between literacy and anger regulation. Existing research has indicated gender differences in domains of literacy achievement and emotion regulation (Lange et al., 2016). In addition, language impairment is associated with boys' difficulty with emotion regulation (Fujiki et al., 2002). Because patterns of development of anger regulation and literacy have been observed to vary by gender, it was expected that the relation would vary as well. However, the literature is primarily centered around younger children. It may be the case that, by the upper elementary age, any gender gaps would have closed. It is also possible that gender differences exist at the extreme tails of the TOSREC distribution, and that closer examination of the highest and lowest achieving students would reveal different patterns (Baye & Monseur, 2016).

Limitations

The main limitations of this study are related to the design; namely, the short-term longitudinal nature and the relatively homogenous demographics. Future research in this area should address these limitations. In the present study, T1 and T2 were approximately 3 months apart (March 2015 and June 2015). Due to the short amount of time between Time 1 and Time 2, it is possible that this did not provide enough opportunity for change in anger regulation abilities. It would be useful to examine students over a longer period of time to gain a better idea of any potential causal relations between language development and anger regulation strategy development. Thus, future studies can build

on these findings by utilizing a longer-term longitudinal design that extends across the years of middle childhood.

Another limitation regarding the sample was that it consisted primarily of students who were in public school in a suburb that housed middle-to-upper class families, with a minority of low-income, minoritized students; however the dual language learner status was higher than the norm, at 32%. Although information on socioeconomic status was not collected in this study, it is likely that the sample of students would be consistent with the neighborhood demographics. Future studies should consider including students across multiple schools that serve families from diverse socioeconomic status' in order to obtain generalizable findings.

Additionally, there are some limitations in the means of administration of the CARM. Research assistants read the CARM items aloud to the participants, rather than participants reading silently to themselves. It is possible that the method of delivery may impact participant responses. Additionally, some students received individual administration, while others were in small groups. This may further impact participant responses, although mode of administration was a control.

Future Directions

Understanding if and how literacy achievement impacts anger regulation is necessary to inform instructional and intervention practices. Continued research in this area could include alternative measures of anger regulation, such as parent or teacher reports. It would also be useful to include bilingual or multilingual status as a moderator. The current study explored this possibility, but the students were categorized as English language learners if at least one parent speaks a language other than English at home.

Therefore, it was not possible to separate the truly bilingual or multilingual students from those who had exposure to but limited understanding of a second language. Given that prior research has demonstrated that multilingual individuals have greater emotion regulation and understanding, future research would benefit from the inclusion of this additional analysis.

Additionally, the language measure used in this study exclusively examines literacy achievement. While the TOSREC is a useful measure of literacy achievement, in part, due to the ease of administration to a large sample population, there are other aspects of language that would be useful to include in future work, such as verbal expression and oral comprehension. While reading comprehension and oral language abilities have been demonstrated to be highly correlated, they are distinct skills within the broader domain of language. Future research may benefit from including measures of additional components of language use and understanding to obtain a more detailed view of the specific aspects of language that may contribute to anger regulation.

Conclusions and Implications

The results of this study contribute to the current dearth of research on literacy as a predictor of anger regulation in elementary-aged children. While the results of the present study were non-significant, they warrant further investigation into the effects of literacy achievement on emotion regulation. While literacy achievement may not be a predictor of anger regulation, it is possible that a significant relation would emerge over a longer-term study. It is also possible that literacy achievement would be a predictor of a different domain of regulation. Therefore, future research would benefit from the inclusion of additional measures. Further, it will be important to continue examining

gender differences in the relation between literacy achievement and regulation, particularly among those with the highest and lowest literacy achievement.

Understanding the effects of literacy achievement is valuable in designing interventions and school-based practices. Connections between domains of achievement and emotions have been established in existing literature, which has led to the incorporation of academic and social-emotional learning (SEL) curricula in schools in recent years; however, the reverse effects of achievement on emotion regulation has been rarely examined. The relation between literacy achievement and anger regulation requires additional exploration. A more comprehensive understanding of the effects of various domains of language on emotions can be used to promote positive social and academic outcomes. Overall, this study holds important implications for educators and school psychologists in understanding the relation between literacy achievement and anger regulation.

Appendix A

Table 1

Sample Demographics

	Total Sample	
Demographic Variables	N	%
Child Sex		
Female	151	57
Age		
8 years	23	9
9 years	83	33
10 years	93	37
11 years	54	21
Ethnicity		
Asian/Pacific Islander	14	5
Black, non-Hispanic	26	10
Latinx	16	6
White, non-Hispanic	171	65
Multiethnic	30	12
Other	2	1
Language status		
DLL	82	32

Note: Total n = 253

Table 2

Descriptive Statistics

	Number of Items	Total Possible Range	Time 1		Time 3	
			M(SD)	α	M(SD)	α
CARM						
Anger Withdraw	3	1-5	3.24(.84)	.557	3.38(.90)	.660
Express Caregiver	3	1-5	3.32(.99)	.817	3.32(1.06)	.873
Express Friend	3	1-5	2.74(.98)	.710	2.77(1.09)	.793
Express Teacher	3	1-5	2.25(1.01)	.891	2.33(1.08)	.897
Pause Anger	3	1-5	3.57(.84)	.672	3.70(.95)	.772
TOSREC Scores	--	1-100	112.03(16.05)	--	--	--

Table 3

Anger Withdraw – Bivariate Correlations

Measures		1	2	3	4	5	6	7	8	9
Predictors										
1.	T1 Literacy	-								
2.	T1 Withdraw 1	.164*	-							
3.	T1 Withdraw 2	-.036	.182**	-						
4.	T1 Withdraw 3	.019	.407**	.318**	-					
5.	T1 Withdraw Average	.090	.758**	.664**	.766**	-				
Outcomes										
6.	T2 Withdraw 1	.150*	.440**	.181*	.365**	.460**	-			
7.	T2 Withdraw 2	-.114	.150*	.359**	.273**	.363**	.299**	-		
8.	T2 Withdraw 3	.090	.235**	.280**	.424**	.426**	.480**	.421**	-	
9.	T2 Withdraw Average	.055	.360**	.349**	.451**	.537**	.782**	.741**	.799**	-

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

Note. Withdraw 1: When I was angry, I would go off by myself.
Withdraw 2: When I was angry, I would clam up and keep to myself.
Withdraw 3: When I was angry, I would spend time alone.

Table 4

Pause Anger – Bivariate Correlations

Measures	1	2	3	4	5	6	7	8	9
Predictors									
1. T1 Literacy	-								
2. T1 Pause 1	.038	-							
10. T1 Pause 2	.070	.497**	-						
11. T1 Pause 3	.058	.334**	.408**	-					
12. T1 Pause Average	.065	.801**	.793**	.744**	-				
Outcomes									
13. T2 Pause 1	.133	.425**	.480*	.288**	.490**	-			
14. T2 Pause 2	.055	.393*	.526**	.367**	.526**	.601**	-		
15. T2 Pause 3	.123	.234**	.363**	.404**	.408**	.409**	.598**	-	
16. T2 Pause Average	.127	.423**	.548**	.422**	.570**	.819**	.874**	.799**	-

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

Note. Pause 1: When I was angry, I would take a few deep breaths before reacting.
Pause 2: When I was angry, I would calm myself down.
Pause 3: When I was angry, I wait before acting on my anger.

Table 5

Anger Express-Caregiver – Bivariate Correlations

Measures		1	2	3	4	5	6	7	8	9
Predictors										
1.	T1 Literacy	-								
2.	T1 Express - Caregiver 1	-.025	-							
3.	T1 Express - Caregiver 2	-.006	.519**	-						
4.	T1 Express - Caregiver 3	.063	.549**	.730**	-					
5.	T1 Express - Caregiver Average	.008	.806**	.877**	.885**	-				
Outcomes										
6.	T2 Express - Caregiver 1	-.013	.424**	.454*	.405**	.508**	-			
7.	T2 Express - Caregiver 2	.009	.371**	.584**	.437**	.550**	.634**	-		
8.	T2 Express - Caregiver 3	.005	.318**	.514**	.393**	.491**	.655**	.789**	-	
9.	T2 Express - Caregiver Average	-.001	.414**	.581**	.461**	.578**	.849**	.910**	.918**	-

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

Note. Express Caregiver 1: When I was angry, I would go to my mother or caregiver.
Express Caregiver 2: When I was angry, I would tell my mother or caregiver about what made me feel angry.
Express Caregiver 3: When I was angry, I would share my feelings with my mother or caregiver.

Table 6

Anger Express-Friend – Bivariate Correlations

Measures		1	2	3	4	5	6	7	8	9
Predictors										
1.	T1 Literacy	-								
2.	T1 Express - Friend 1	.034	-							
3.	T1 Express – Friend 2	-.021	.679**	-						
4.	T1 Express – Friend 3	.065	.364**	.317**	-					
5.	T1 Express – Friend Average	.037	.855**	.825**	.711**	-				
Outcomes										
6.	T2 Express – Friend 1	.017	.508**	.499**	.325**	.552**	-			
7.	T2 Express – Friend 2	-.043	.458**	.500**	.345**	.537**	.821**	-		
8.	T2 Express – Friend 3	.094	.293**	.275**	.601**	.489**	.424**	.437**	-	
9.	T2 Express – Friend Average	.027	.500**	.505**	.505**	.626**	.888**	.896**	.738**	-

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

Note. Express Friend 1 (AR5): When I was angry, I would share my feelings with a friend.
Express Friend 2 (AR9): When I was angry, I would tell a friend about what made me feel angry.
Express Friend 3 (AR11): When I was angry, I would go hang out with a friend.

Table 7

Anger Express-Teacher – Bivariate Correlations

Measures		1	2	3	4	5	6	7	8	9
Predictors										
1.	T1 Literacy	-								
2.	T1 Express - Teacher 1	.017	-							
3.	T1 Express – Teacher 2	.058	.720**	-						
4.	T1 Express – Teacher 3	.047	.707**	.769**	-					
5.	T1 Express – Teacher Average	.045	.889**	.918**	.912**	-				
Outcomes										
6.	T2 Express – Teacher 1	-.098	.425**	.413**	.378**	.445**	-			
7.	T2 Express – Teacher 2	.006	.423**	.457**	.451**	.488**	.757**	-		
8.	T2 Express – Teacher 3	.023	.406**	.417**	.415**	.454**	.670**	.804**	-	
9.	T2 Express – Teacher Average	-.025	.459**	.472**	.456**	.508**	.889**	.939**	.904**	-

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

Note. Express Teacher 1: When I was angry, I would go to my teacher.
Express Teacher 2: When I was angry, I would tell my teacher about what made me feel angry.
Express Teacher 3: When I was angry, I would share my feelings with my teacher.

Appendix B

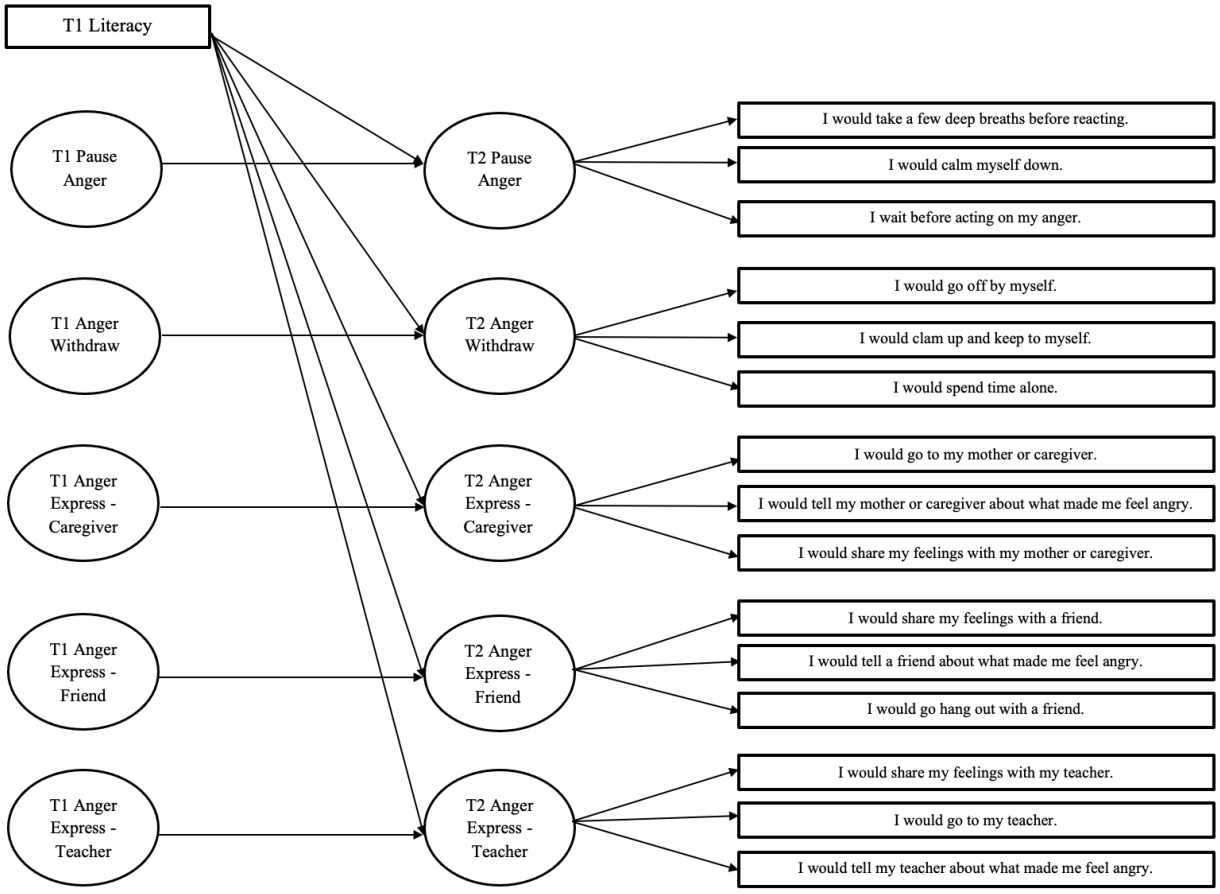
4th Grade TOSREC Sample

21.	yes	no	An astronaut is a man or woman whose job it is to catch fish.
22.	yes	no	Going to a store during a sale might result in a good bargain.
23.	yes	no	If you bump into a friend on purpose it would be an accident.
24.	yes	no	An anchor is used to keep a boat from floating away.
25.	yes	no	A telescope is commonly used to view the stars in the sky.
26.	yes	no	A mother may not approve of her daughter's boyfriend.
27.	yes	no	The correct place to wear a colorful hat is on your ankle.
28.	yes	no	Something that is easy for you to do is a challenge.
29.	yes	no	Giving your old clothes to charity is a way to help others.
30.	yes	no	A bashful person is someone who loves to talk to large groups.
31.	yes	no	A person who gets lost might try to use a compass to get home safely.
32.	yes	no	You might be anxious if you are about to take a spelling test.
33.	yes	no	Most modern women attempt to grow very long beards.
34.	yes	no	A teacher will be mad if one of her students wins a spelling contest.
35.	yes	no	Broccoli refers to a kind of dog that has been used for years to guard sheep.
36.	yes	no	Some kids eat peanut butter and jelly on crackers.
37.	yes	no	A buzzard might build a cabinet in a cafe.
38.	yes	no	Water balloons that kids throw at each other are made out of concrete.
39.	yes	no	A recipe tells the cook which ingredients to use for baking a cake.
40.	yes	no	A person who has been on a diet and has lost a lot of weight may be slender.
41.	yes	no	A leaky balloon will expand.

Number Correct [ ] − Number Incorrect [ ] = Raw Score Subtotal (p. 3) [ ]

Appendix C

Figure 1. Path model with Time 1 literacy achievement and latent AR variables and Time 2 latent AR variables



Note. Not pictured – controls of age, grade, ethnicity, dual language learner status, student-reported anger and questionnaire format; T1 observed AR items

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