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# Child anger regulation measure: Psychometric properties, prediction of emotional engagement, and gender differences

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## Abstract

The objective of this study was to understand the psychometric functioning of the Child Anger Regulation Measure (CARM), its prediction of emotional engagement, and if the prediction of emotional engagement differs for girls and boys. The sample included 251 upper-elementary school students in the United States (10% Black, 62% White, 6% Latinx, 5% Asian, 12% Multiethnic/Other; 58% female; average age = 9.7 years). Emotional engagement in school was reported by both students and teachers. Confirmatory factor analysis (CFA) indicated adequate fit of the data to the first-order correlated theioretical model at two time points. Internal and test–retest reliability was moderate-strong; the internal reliability of the anger withdraw strategy was weak for boys but adequate for girls. Of the five anger regulation latent predictors, the path analysis indicated that latent pause anger (i.e., waiting before responding to anger) was the strongest and sole predictor of how emotionally engaged a student felt in school, based on both student- and teacher-reported engagement and controlling for other anger regulation (AR) strategies. There was partial measurement invariance across boys and girls, and there were no gender differences in AR prediction of emotional engagement. Implications for assessment, psychoeducation, and school contexts are discussed.

**Practitioner points**

- A new anger regulation measure titled the Child Anger Regulation Measure (CARM) has good psychometric properties among upper elementary school students.
- Of the five CARM subscales (pause anger, anger withdraw, express anger to teacher, peer, and caregiver), pause anger was the strongest and sole predictor of student emotional engagement, as reported by both students and teachers.
- There were no gender differences in the prediction of emotional engagement by the CARM's anger regulation strategies.

## 1 | INTRODUCTION

Emotion regulation refers to the strategies used to modulate one's emotions (Gross & Thompson, 2007). Indeed, emotion regulation strategies are essential socioemotional skills which merit quality measurement (e.g., Compas et al., 2017; Zeman et al., 2001). Affect theory suggests that it is important to utilize emotion-specific measurements of emotion regulation compared to the typical "global" assessments of emotion regulation (i.e., "global" assessment refers to an average of emotion regulation across multiple emotions; Tomkins, 1963, 1991). Typically, anger regulation is measured as part of a global negative emotion regulation measure (Zeman et al., 2019), so anger-specific effects have often gotten lost in emotion regulation research (Zimmermann & Iwanski, 2014). However, there has been a shift to valuing emotion-specific regulation (Compas et al., 2017). Anger is a particularly important emotion to assess as it can be a challenging emotion to regulate (Price et al., 2022). Indeed, anger can be especially distracting, overwhelming, and difficult to accept (Modrcin-McCarthy et al., 1998). Although emotions, like anger, are not a problem in and of themselves, their expression can be problematic when it is of a long duration, inappropriate timing, and high intensity (Zimmermann & Iwanski, 2014).

Anger can, however, also be a positive regulatory force. Indeed, anger regulation can provide motivation and focus, such as when one feels motivated to solve a frustrating problem (e.g., Tomkins, 1991). Anger can also be an informational indicator that allows one to be aware of and have insight into a frustrating situation. Without such awareness of the anger-inducing context, one might simply react, rather than slowing down to take a moment to reflect on what one is feeling and why. Often, those who are oppressed are expected to swallow their anger, but anger awareness and its regulation via advocacy, for instance, can be a tool for social and racial justice (Archer & Mills, 2019).

School-based socioemotional interventions that promote the adaptive regulation of anger are popular in elementary school settings (e.g., Tosun, 2014), and the assessment of anger regulation may be particularly important for school psychologists and counselors focused on school mental health and prevention programs. There is little choice, however, in the selection of psychometrically sound anger regulation (AR) measures to evaluate AR (Furlong et al., 2002; Leff et al., 2010; von Salisch & Vogelgesang, 2005). Furthermore, existing anger regulation measures largely frame and assess anger regulation strategies as deficit-focused, with the apparent purpose, by

some, to have such deficit-focused anger regulation strategies be tested as predictors of negative psychopathology outcomes (e.g., oppositional defiant disorder; Brunner & Spielberger, 2010). An example of an AR item reflecting a deficit-focus is "I attack whatever it is that makes me angry" (Jacobs et al., 1989). And, there are few anger regulation questionnaires to choose from for the age group in this study—upper elementary school-aged students.

The current study addresses the need for emotion-specific, anger regulation measures by examining the psychometrics of the novel Child Anger Regulation Measure (CARM). The CARM offers a potential alternative to anger regulation measures coming from psychopathology and personality frameworks (e.g., State-Trait Anger Expression Inventory—Children and Adolescents [STAXI-2 C/A]; Brunner & Spielberger, 2010; PAR Inc, 2019). In addition to testing the psychometrics of the CARM, this study examines the CARM's prediction of emotional engagement and how that predictive power may differ by gender.

Unlike more personality-driven measures, the CARM utilizes more of a state (i.e., the temporary state of anger arousal that results from threat or frustration in the environment), rather than trait (i.e., the stable and often enduring tendency to experience anger; Spielberger et al, 1985), approach to operationalizing anger regulation. From a state-perspective, anger regulation is conceptualized as strategies to regulate one's anger, rather than strategies ingrained in one's personality (Spielberger et al., 1985). Some emotion regulation theoretical models have framed regulatory strategies as deficit-focused (e.g., anger suppression; Aldao et al., 2010). The couple anger regulation measures that exist (e.g., Brunner & Spielberger, 2010) also seem designed to tap into a conceptualization of anger regulation as largely trait-based and deficit-focused. Yet, much of the emotion regulation field has shifted away from conceptualizing emotion regulation as "deficit-focused" and, rather, emphasizes the conceptualization of emotion regulation strategies as helpful, unhelpful, or neither. Some argue that emotion regulation is not necessarily strengths- or deficit-focused, but, at the same time, others argue that deficit-focused ER exists when emotion suppression, for instance, is persistent over time (Price et al., 2022). The novel contribution of our measure is that we do not take a value-laden, "deficit-focused" approach to conceptualizing regulation strategies. This paper conceptualizes anger regulation as a state-based emotion regulation approach which can be positive or negative depending on the context, including the contextual influences of situational, individual, and emotion-specific factors (e.g., Doré et al., 2016).

Most of the CARM items do not have an explicit positive or negative valence. Anger regulatory strategies could be unhelpful or helpful in different contexts. For example, the CARM item "When I was angry, I would spend time alone" is part of the CARM withdraw strategy, and the item may refer to a helpful strategy, depending on *how* the child spends time alone (e.g., using relaxation techniques). Indeed, withdraw has been viewed as potentially positive, depending on the context and way it is used because it could be a moment to regroup away from others (Zeman et al., 2019). The CARM includes strategies that students can use to express their anger (e.g., I would share my feelings with a friend), withdraw (e.g., I would go off by myself), and a "pause anger" strategy involving waiting before acting on one's anger (e.g., I wait before acting on my anger) (Table 1). A strengths-focused approach opens up opportunities to study the relation between AR and positive outcomes. This approach also creates room for AR items that capture a range of behavior, given that children have a spectrum of reactions to anger in their lives (e.g., Zimmermann & Iwanski, 2014). Other anger-specific measures include regulation strategies which seem to have a negative, deficit-focused framework, such as anger suppression and aggressive expression (e.g., STAXI-2 C/A; Brunner & Spielberger, 2010); these have been found to be related to psychopathology (e.g., te Brinke et al., 2021).

In contrast to most research which has tested the relation of deficit-focused emotion regulation with negative outcomes in school, it is possible that anger regulation could have a positive relation with emotional engagement in school (e.g., Pekrun et al., 2006). Some research continues to largely conceptualize and measure anger regulation constructs as deficit-focused and test their relation to externalizing problems (e.g., te Brinke et al., 2021), rather than testing their relation to more positive outcomes like emotional engagement. Yet, some of the field seems to have shifted away from deficit-focused notions of emotion regulation.

In sum, this short-term longitudinal study examined CARM's psychometric strength and its prediction of concurrent student- and teacher-reported emotional engagement in school, along with gender differences. AR was

**TABLE 1** Child anger regulation measure (CARM) subscales and sample items.

| | Definition | Sample item (when I was angry, I would…) |
|---|---|---|
| 1. Pause anger | Take a break before responding to anger | I wait before acting on my anger |
| 2. Anger withdraw | Spend time alone | I would spend time alone |
| 3. Anger express to caregiver | Tell a caregiver when ang | I would tell my mother or caregiver about what made me feel angry |
| 4. Anger express to friend | Tell a friend | I would share my feelings with a friend |
| 5. Anger express to teacher | Tell a teacher | I would share my feelings with my teacher |

operationalized as strategies (i.e., behaviors) children use in response to their own anger, and emotional engagement (EE) was conceptualized as children's emotional involvement, interest, enthusiasm, and enjoyment in school.

## 2 | CONCEPTUAL MODEL

Our aim was to develop a self-report anger regulation scale for children that captured the frequency with which a child uses different AR strategies. Functionalist, affect, and differential emotions theories (Campos et al., 2004; Izard, 1977; Tomkins, 1963, 1991) informed the construction of the measure. The five regulation strategy subscales (Table 1) were based on affect theory and emotion regulation constructs (e.g., Cicchetti et al., 1995; Izard, 1977; Tomkins, 1963, 1991). The AR strategies were operationalized as taking a break before responding to one's own anger ("pause anger"), spending time alone when angry ("anger withdraw"), in addition to discussing one's anger with either a caregiver ("express anger to caregiver"), friend ("express anger to friend"), or teacher ("express anger to teacher") (Table 1).

### 2.1 | Emotion theories

Our model is guided by discrete emotion frameworks which informed the development of the CARM scale which focuses solely on the emotion of anger. Tomkins' (1991) affect theory seeks to organize emotions into discrete categories. These discrete emotions and responses to emotions are important in socioemotional functioning (Tomkins, 1991). Izard's differential emotions theory (DET) also underscores discrete emotional responses and their differential impacts on socioemotional functioning (Izard, 1977). Each emotion is viewed as having unique motivational and phenomenological properties which lead to a unique impact of different emotions on different behaviors, including both negative and positive behaviors. Therefore, we should use emotion-specific measures to assess emotion regulation given that different emotions elicit different behavioral responses (Compas et al., 2017). For instance, anger regulation is viewed as typically affecting aggression or externalizing problems, rather than internalizing problems (Zeman et al., 2019). Another reason to employ an emotion-specific approach to emotion regulation assessment is that one can narrowly identify the emotion context rather than trying to unsuccessfully peel apart the general emotion context (e.g., simply asking how you regulate all emotions), which is often the way emotions are assessed in emotion regulation measures.

The CARM also relies on a functionalist model of emotion regulation (Campos et al., 2004). The functionalist approach views emotions and their regulation as serving unique functions, like anger being experienced and

regulated when using strategies to get past obstacles to a goal, for instance. The functionalist model influenced the development of the CARM in its assumption that emotion regulation strategies are unique to each emotion, with different functions for each emotion's regulation. "Pause anger," for instance, is framed with a functionalist perspective given that it is uniquely crafted in response to anger; pause anger may have a different function for a different emotion. Like the functionalist approach, each AR factor in the CARM is framed as a behavioral strategy used to achieve a goal—to manage anger. For instance, "pause anger" is framed as a strategy to wait before responding to anger with the functionalist goal of disengaging and avoiding responding to anger in a way that might exacerbate the angry situation.

## 2.2 | Emotion regulation construct

Emotion regulation has a long history of diverse operationalizations which contribute to the complexity of defining and studying the construct (e.g., Cicchetti et al., 1995), but most agree that it involves the management of emotional arousal with consequences for social functioning (e.g., Rydell et al., 2003). Cole et al. (2004) conceptualized emotion regulation as changes to the emotion (e.g., intensity or duration) or to other psychological processes connected to the emotion (e.g., social interaction). Campos et al. (2004) viewed emotional regulation functionally, in terms of goals and intent of the regulator, in the service of accomplishing affect-related biological and social adaptations.

In this study, we operationalized anger regulation as the frequency with which children employ behavioral strategies in response to their anger. The AR constructs (e.g., pause anger) in the CARM are grounded in theoretical and empirical approaches of emotion regulation which posit an emotion-specific conceptualization of emotion regulation (Izard, 1977; Tomkins, 1991). Further, the CARM captures the range of emotion regulation along a non-deficit-oriented spectrum of somewhat more inhibited to more expressive, based on Tomkins' and Izard's models (e.g., Cicchetti et al., 1995; Izard, 1977; Tomkins & McCarter, 1964).

## 3 | ANGER REGULATION ASSESSMENT

Using emotion-specific measures, like anger-specific regulation, is important. Anger is a unique and complex emotion that can be challenging to regulate (e.g., Tomkins, 1991). Across the three child anger-specific regulation self-report questionnaires which have published psychometric results—STAXI-2 C/A (Brunner & Spielberger, 2010), Pediatric Anger Expression Scale (PAES & PAES-III; an adapted version of the STAXI) (Jacobs et al., 1989) and Strategies on Anger Regulation (SAR; von Salisch & Vogelgesang, 2005)—AR has been operationalized in a variety of ways.[1] SAR framed AR as cognitive and behavioral anger management strategies only in reference to *friends*, for children aged nine to 18 (von Salisch & Vogelgesang, 2005). The STAXI-2 C/A and PAES were both developed from the adult STAXI and were guided by a personality, trait-based approach to anger. The STAXI-2 C/A (Brunner & Spielberger, 2010) taps into the intensity of experiencing anger ("state-anger") and the frequency with which anger is experienced over time ("trait-anger"). It also includes the traits of verbally/physically expressing ("anger-out") or suppressing one's anger ("anger-in"), and the frequency with which students control their verbal or physical anger expression ("anger-control"). Confirmatory factor analysis (CFA) testing the fit of an a-priori AR theoretical model factor structure with children has only been done with the STAXI-C/A (del Barrio et al., 2004) and PAES (Hagglund et al., 1994). In sum, only two similar anger-specific regulation measures are available for elementary-aged students (STAXI-C/A and PAES; both are adapted versions of the STAXI).

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[1]Note that this paper does not review AR measures which have been used with only middle/high school-aged youth; focus only on physical health; use vignettes to tap into anger; anger seems blended with other emotions; or only assess anger frequency, rather than anger regulation.

## 3.1 | Novel contribution of the CARM

The CARM offers a unique contribution to child anger regulation measurement not captured in the aforementioned scales. AR scales typically place a value of a deficit-focus on their regulation strategies, which may be because most child anger regulation research comes from the field of child psychopathology and health; however, affect theory places less emphasis on emotion regulation as strengths- or deficit-focused (Tomkins, 1991). As discussed below, the CARM was adapted from the Emotions as a Child—Emotion Regulation scale (EAC-ER; O'Neal & Magai, 1997a) which was designed for adults; the EAC-ER has a number of different items than the CARM which was adapted for children. The adult EAC-ER also did not rely on a deficit-focused approach.

This paper argues that CARM's novel contribution is it (a) does not rely on a deficit assumption of anger regulation; thus, researchers can examine how anger regulation strategies are related to positive outcomes, rather than only negative outcomes or psychopathology; (b) the pause anger scale may capture, depending on the context, what can be viewed as a "mindful" response to anger; pause anger can be conceptualized as "mindful" in that responding to anger involves taking a moment or longer before responding, like waiting to act on anger, calming down, or taking a breath (e.g., Feldman et al., 2007); the context may lead to a less "mindful" version of pause anger if, for example, you are threatened by someone and your fear leads you to pause your angry response or freeze; (c) includes expressive scales clearly distinguishing with whom (caregiver, friends, teacher) the child shares their anger, and introduces the first, to our knowledge, anger express-teacher scale; (d) is conceptualized as a state-based, rather than trait-based, measure; and (e) is one of the few AR measures tested with elementary-aged children that has a clear, sole focus on anger. These contributions are valuable advancements in the field of anger regulation measurement in children.

The CARM is a state-based measure because it is phrased to capture recent strategy use (e.g., "When I was angry, I would go hang out with a friend.") rather than phrasing designed to tap into trait-like, personality behavior patterns (e.g., "I am a calm person."). The CARM asks respondents to think about times that they felt angry over 1 month. An individual's anger regulation item responses could differ depending on when the CARM is administered. The benefit of a state-based measure for use in schools, rather than a trait-based, personality approach, is that children's anger at young ages and in schools can often be a reactive and temporary state that depends on the recent school environment or short-term frustrations with peers (e.g., Dodge, 1991). Measuring anger regulation in this way would likely capture children's regulation in response to transient events and short periods of time, some of which may occur within the school context. An awareness of the importance of the context has grown in the emotion regulation literature (e.g., Zeman et al., 2019), underscoring a state-based framing of emotion regulation.

## 4 | ANGER REGULATION AND EMOTIONAL ENGAGEMENT

Affect and differential emotions theories posit that emotions and emotion regulation impact behavior, and vice-versa. (Izard, 1977; Tomkins, 1991). The current AR measure assesses behavioral responses to anger, with some focus on the school context. Emotional engagement assesses positive emotional responses to learning activities in school (i.e., interest, joy; Skinner & Belmont, 1993). The current study used emotional engagement as an outcome in a test of the CARM's predictive validity because AR was expected to relate to positive emotion-based indicators of academic functioning in school. Although the valence of emotions in emotional engagement and AR constructs differ (i.e., positive vs. negative emotions), emotional engagement is a useful construct for predictive validity because both AR and emotional engagement are related to affect, capture how affect and behavior overlap, and are relevant to the education context. A previous study with this same sample found that anger withdrawal, using the CARM, predicted reading and math achievement, and the relation was moderated by emotional engagement; it is important to note that the study did not test a model of anger regulation predicting emotional engagement (O'Neal et al., 2022).

It has been posited that emotions play an important role in academic learning (e.g., Raver, 2002). Positive emotions, such as enjoyment of learning, have positive relations with academic achievement, whereas negative emotions (e.g., test anxiety) show negative relations with achievement (Pekrun et al., 2002). Pekrun et al. (2002) argued that the relation of emotions with academic engagement is mediated by emotion regulation, motivation, and learning strategies. Furthermore, they suggested that emotion and emotion regulation processes impact enjoyment of task engagement, which is a close proxy to emotional engagement. Skinner et al. (2013) argued that a student's difficulty managing anger likely affects engagement in class, resulting in off-task or disruptive behavior. Little research, however, has tested emotion regulation relations with academic engagement (Kwon et al., 2017). Most research examining regulation and academic engagement has linked self-regulation, rather than emotional regulation, with academic engagement (e.g., Wolters & Taylor, 2012).

To our knowledge, there is no research testing the relation between AR and emotional engagement. Indeed, we found no literature studying the relation between emotion regulation (as defined by regulatory strategies in response to emotions) and emotional engagement. There has been one study which reported that emotion regulation (i.e., assessed using a "global" latent emotion regulation variable with anger, sadness, and exuberance regulation indicators) was positively related to elementary-aged behavioral engagement; they also reported a positive bivariate correlation between a two-item, teacher-reported AR average score and behavioral engagement (Kwon et al., 2017). There is a gap in the emotional regulation and engagement literature, and the current study addresses this gap by testing the link between anger regulation and emotional engagement in school.

Models that test AR as a predictor often do not control for the frequency of experiencing anger. This is problematic as anger frequency has been found to be related to elementary-aged students' anger control (Boekaerts & Michels, 1990) and adolescent anger expression (Brunner & Spielberger, 2010). For instance, anger expression's prediction of aggression among male children and adolescents was found to be dependent on anger frequency (Clay et al., 1996). Therefore, in this study, anger frequency was used as a control in the AR and engagement model; anger frequency is assessed in the CARM by one anger frequency item.

## 4.1 | Anger regulation, emotional engagement, and gender

Literature suggests that emotion regulation, including regulation of anger, may differ by gender. Meta-analytic results suggest that girls display more internalizing emotions (e.g., sadness), while boys display more externalizing emotions (e.g., anger) (Chaplin & Aldao, 2013). Regarding anger regulation, boys are more likely to express their anger (in an observable manner) than girls (Jones et al., 2002). Measurement invariance indicates if a construct functions the same across groups (e.g., girls vs. boys); noninvariance indicates that there are differences in the patterns by which members of different groups respond to items in a latent construct (Putnik & Bornstein, 2016). Indeed, noninvariance can indicate that a construct, like AR, may hold a different meaning for each group. There is not any literature, to our knowledge, suggesting that there is measurement invariance in anger regulation across girls and boys. Testing measurement invariance illuminates if different groups, like boys versus girls, place differing meaning to a construct like AR; therefore, it is important to test group measurement invariance when establishing a measure like the CARM and if it differs by gender.

Emotional engagement in school may also differ by gender; for example, girls demonstrate higher levels of emotional engagement than boys (Wang et al., 2011). To our knowledge, there are no existing studies of gender differences in the relation between emotion regulation and engagement. Given that there is only one article that we are aware of that reports a relation between emotion regulation and emotional engagement (Kwon et al., 2017), and that article did not test gender differences in that relation, there is a need to test gender differences in the link between emotion regulation and emotional engagement. And, testing measurement invariance is important before testing if there are gender differences in the relation of AR factors to engagement. Given that there are gender differences in both AR and emotional engagement, the prediction of emotional engagement by AR may differ by gender.

Hypotheses

1. The CARM data will fit the expected five-factor AR model; model fit will remain adequate across time.
2. The CARM will demonstrate adequate internal consistency and test–retest reliability across time.
3. The latent CARM strategies will predict concurrent student- and teacher-reported latent emotional engagement (Figure 2).
4. There will be gender differences in the CARM measurement invariance, and there will be gender differences in the predictive power of latent CARM strategies on latent emotional engagement.

## 5 | METHODS

## 5.1 | Sample

The sample consisted of 251 participants from two elementary schools. Of the total sample, 59% were female; 36% were emergent bilingual students (i.e., speak a language other than English with at least one parent); their race/ethnicity categories were 10% Black, 62% White, 6% Latinx, 5% Asian and 12% Multiethnic/other; their average age was 9.70 years, ranging from 8 to 11 years of age (Table 2). Participants' racial demographics were proportional to that of the schools' total student bodies. Both schools were located in middle to upper-income neighborhoods but served some students in low-income surrounding areas; about 14% of students qualified for Free and Reduced Meal Status (FARMS). Note that the school district did not permit researchers to ask students or parents about their socioeconomic or immigrant generational status. Twenty-one percent of the sample were in the gifted program at one of the two schools. All of the teachers at the schools participated in the study—there were 27 third, fourth, and fifth grade classroom teachers (26% male; 7% Black, 79% White, 3% Latinx, 11% Asian) who completed emotional engagement questionnaires on participating students in their classrooms.

## 5.2 | Procedures

All procedures with human participants were approved by the school district and university research board committees, including our use of student assent in addition to parent and teacher consent. We have no conflicts of interest, and this study received internal funding from our university. Students were recruited from all 27 upper elementary classrooms across the two schools. We recruited participants by visiting teachers during team meetings, visiting students in classes, and parent consent forms were handed out for students to bring home. Thirty-six percent of students agreed to participate. It is not clear why there were not more students who agreed to participate. The recruitment rate ranged from 12% to 67% per class. It is possible that some teachers may have provided more reminders to students to return consent forms, depending on the teachers' level of interest in this study. Therefore, analyses controlled for potential class cluster effects.

This study included student-reported questionnaires of anger regulation and emotional engagement, along with student-reported control variables. It also included a teacher-reported emotional engagement measure completed at the same time as student data collection. For emotional engagement, the benefit of multiple reporters—student- and teacher-report—is that the combination of the two may balance out potential bias associated with each type of report. The dataset for this study was part of a larger study. In the larger study, students completed questionnaires at three time points (March, April to May, and June of 2015). This study used the first of those time points (Time 1; T1). However, for the purposes of test–retest reliability, assessing internal consistency at two time points, and to repeatedly test the AR model fit, we used T1 and T3 data with an average of 3 months in between time points. Note that we refer to T3 data as T2 in this paper.

**TABLE 2** Demographics.

| | N | % |
|---|---|---|
| Child gender | | |
| Female | 151 | 60 |
| Age (years) | | |
| 8 | 23 | 9 |
| 9 | 83 | 33 |
| 10 | 93 | 37 |
| 11 | 52 | 21 |
| Ethnicity | | |
| Asian | 13 | 5 |
| Black | 25 | 10 |
| Latina/o | 14 | 6 |
| White | 155 | 62 |
| Multiracial | 29 | 12 |
| Dual language learner | 91 | 36 |
| Highly gifted center | 52 | 21 |
| Schools | | |
| School 1 | 122 | 49 |
| School 2 | 129 | 51 |
| Administration format | | |
| Group | 46 | 18 |
| Individual | 205 | 82 |

*Note*: Total *n* = 251.

Researchers read the surveys aloud one-on-one to each student during the school day. Surveys were read aloud to make sure that all students understood the questions given that 36% were emergent bilingual students. All participants could silently read the survey along with the researchers. Answer options were presented to the students on a large, printed scale so that they had the opportunity to point to their response. Eighteen percent of students' questionnaire data were collected in a small group setting due to time constraints; group administration was a control variable, as a result. Using Qualtrics, teachers completed online questionnaires of students' emotional engagement.

## 5.3 | Measures

### 5.3.1 | Anger regulation

AR was assessed using the Child Anger Regulation Measure (CARM) which was adapted from the adult emotions as a child—emotion regulation strategies (EAC-ER) scales; EAC-ER also has sadness, fear, and shame emotion regulation scales using the same items but different emotions (O'Neal & Magai, 1997a). The EAC-ER was originally

developed for adults to think back on how they regulated their emotions as a child, and the EAC-ER item development was informed by expertise in emotion regulation literature in addition to adult responses to the adult attachment interview in another study (Magai et al., 2001). The EAC-ER did not rely on a deficit-based assumption around anger. The EAC-ER was first tested with older adults across a variety of emotions (Consedine et al., 2002); it was then adapted for youth (O'Neal & Magai, 1997b), and then for children for this study.

CARM measures students' self-rated frequency of AR strategy use. First, anger frequency was assessed via one item asking how often they felt angry or frustrated over the past month (1 = *Never*, 5 = *Very often*). The anger frequency item was included as a control in this study. Second, AR strategy use was assessed by asking students to think about times they felt angry or frustrated over the past month and to rate how often they would, for example, pause their anger (e.g., "take a few deep breaths before reacting") (see Table 1 for examples of items in each scale). The AR scales included pause anger, anger withdraw, and expressive AR scales (i.e., anger express-caregiver, anger express-friend, and anger express-teacher). We added the scales of express friend and express teacher to the original EAC-AR scale with the goal of creating additional AR scales which might be relevant to the school context. The pause anger scale was also added to include items that reflect a "mindful" response to anger (i.e., waiting to respond to anger; Feldman et al., 2007). We also added the pause anger subscale due to schools' recent interests in mindful reactions to anger based on mindfulness techniques (e.g., Peace of Mind Curriculum; Diesner, 2019). The previous versions of the EAC-ER had adequate internal consistency and test–retest validity with adults (Consedine et al., 2002), and adequate internal consistency, test–retest validity, in addition to adequate predictive validity of internalizing and externalizing problems among urban, ethnic minority middle school-aged adolescents (O'Neal & Magai, 1997b). For this paper, the CARM's internal and test–retest reliability are reported in Section 6. See Table 3 for the alpha and omega. The five CARM scales were used as latent variables in this study's path model testing.

### 5.3.2 | Emotional engagement

Emotional engagement was assessed using the five-item T1 self-report emotional engagement (SR-EE) 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 at school on a five-point scale (1 = *Not at all*, 5 = *Very Much*). Emotional engagement items address students' positive feelings in school with a focus on interest and enthusiasm in learning (e.g., "I enjoy learning new things in class"). The emotional engagement measure has adequate internal consistency and test–retest reliability in elementary-aged samples (Fredricks & McColskey, 2012; Skinner et al., 2009). In this study, the self-reported emotional engagement scale had an $\alpha$ of .80.

Teachers in this study rated the same five-point scale as the student-reported version. In another study with Emergent Bilingual elementary-aged students, we found the teacher-reported emotional engagement (TR-EE) $\alpha$ to be .94, and in this study the $\alpha$ was .95 (e.g., O'Neal, 2018). The SR- and TR-EE were used as latent variables in this study's path model testing. Please see Table 3 for alphas and omegas.

### 5.3.3 | Analyses

We used SPSS version 26 for descriptives, correlations, and initial psychometric analyses (internal and test–retest reliability), then Mplus version 8.2 (Muthén & Muthén, 1998–2019) for CFA, measurement invariance, and path analyses. We ran a CFA to assess if the AR data fit the theory-based, first-order correlated five factor structure at both T1 and T2, with items loading onto expected AR scale constructs (Figure 1). A single-factor CFA was also conducted for SR- and TR-EE.

To determine predictive validity, we employed latent variable path analyses (LVPA). In our path analysis model, latent AR strategies were set to predict concurrent latent SR- and TR-EE. We tested a model with all AR strategies

included as predictors of EE. In this model, we examined which AR strategies were the strongest predictors, while including the other AR predictors (Figure 2).

In addition to controlling for demographics and anger frequency, it was necessary to control for questionnaire format because student responses may differ depending on the individual or small group (18% of participants) questionnaire context. Finally, gifted status was a control because high academic performance may influence AR and EE. In addition, we adjusted for teacher cluster effects using Mplus code, type = complex.

Measurement invariance of the CARM five-factor structure between the gender groups was conducted by testing the (a) separate fit of the female and male CFA; (b) configural model (i.e., no parameters constrained to be equal); (c) metric model (i.e., factor loadings constrained to be equal); and (d) scalar model (i.e., factor loadings and item intercepts constrained to be equal) (Putnik & Bornstein, 2016). Note that the strict model was not tested because error invariances do not hold implications for this study's model. The omnibus $\chi^2$ difference test was used between each invariance model (i.e., configural-metric difference; metric-scalar difference) to determine if there was a significant difference indicating noninvariance. A latent means group difference test was conducted as part of the scalar phase.

Then, to test if there was a significant difference between the male and female CARM prediction of engagement paths (structural model), we first tested invariance between groups. Invariance between groups indicates that the paths between AR and engagement factors do not differ across groups. The measurement phase of comparing groups' latent variable path analysis models involves testing if the relations among the factors and indicators differ across groups to determine if the measurement variables across the two groups are functioning similarly. For the measurement phase of AR predicting engagement across groups, we tested the (a) separate fit of the female and male CFA of a model including five CARM and two engagement factors; (b) configural model (i.e., no parameters constrained to be equal); (c) metric model (i.e., factor loadings constrained to be equal); and (d) scalar model (i.e., factor loadings and item intercepts constrained to be equal) (Putnik & Bornstein, 2016). Again, the strict model did not need to be tested because error invariances do not hold implications for this study's model. And latent means were not tested for the path model group difference because it was not a research question for this study.

The structural phase tests if the paths among factors differ by group. For the structural phase, we employed a group difference test as part of the path model. A group difference test involves determining if there is a significant difference in the estimates of each path (e.g., pause anger predicting student-reported engagement) comparing the girls' to boys' estimates. Given that there were five latent AR predictors, there were five group difference tests with student-reported engagement as the outcome; there were also five group difference tests with teacher-reported engagement as the outcome (e.g., withdraw predicting teacher-reported engagement). Therefore, there was a total of 10 group difference tests conducted.

Restricted maximum likelihood robust standard error estimation (MLR) approach was used, which can handle non-normal data and small samples (Muthén & Muthén, 1998–2019). Regarding model fit, the recommended RMSEA cutoff is less than 0.06, CFI cutoff more than 0.95, and SRMR cutoff less than 0.08 (Hu & Bentler, 1999). BIC was used to judge if the model fit was similar for the T1 and T2 CARM CFAs; a smaller BIC indicates a better fit.

## 6 | RESULTS

### 6.1 | Descriptives, reliability, and correlations

Table 3 contains T1 descriptives, alphas, and correlations. The AR scales all had means close to three, on a scale from one to five; pause anger's mean was highest and express teacher's mean was lowest. A paired $t$ test indicated that the pause anger mean was significantly higher than withdraw ($t = 4.21[245]$, $p < .001$), express caregiver ($t = 3.35[246]$, $p < .01$), friend ($t = -12.97[246]$, $p < .001$), and teacher ($t = 17.93[247]$, $p < .001$). Withdraw was

**TABLE 3** T1 Bivariate correlations and descriptives.

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Pause anger | - | | | | | | | | |
| 2. Anger withdraw | −0.10 | - | | | | | | | |
| 3. Express anger caregiver | 0.24*** | 0.02 | - | | | | | | |
| 4. Express anger friend | 0.39*** | −0.11 | 0.34*** | - | | | | | |
| 5. Express anger teacher | 0.23*** | −0.06 | 0.40*** | 0.37*** | - | | | | |
| 6. SR-EE | 0.34*** | −0.13* | 0.16* | 0.20** | 0.19** | - | | | |
| 7. TR-EE | 0.15* | 0.02 | 0.01 | 0.05 | 0.06 | 0.34*** | - | | |
| Controls | | | | | | | | | |
| 8. Age | 0.00 | 0.07 | −0.01 | 0.09 | −0.22*** | 0.04 | −0.18 | - | |
| 9. Female | 0.04 | −0.07 | 0.04 | 0.13* | 0.00 | 0.18** | 0.27* | 0.09 | - |
| 10. White | −0.10 | −0.03 | 0.15* | −0.03 | 0.07 | −0.10 | 0.13* | 0.07 | 0.03 |
| 11. DLL | −0.02 | 0.06 | −0.12 | 0.00 | −0.04 | −0.03 | −0.13* | −0.07 | 0.02 |
| 12. HGC | 0.02 | 0.09 | −0.02 | 0.01 | 0.00 | 0.09 | −0.01 | 0.24*** | 0.06 |
| 13. School | 0.00 | 0.04 | 0.05 | −0.03 | −0.03 | 0.10 | 0.12 | 0.03 | 0.08 |
| 14. Group administration | 0.01 | −0.01 | −0.02 | 0.01 | −0.08 | −0.17** | −0.08 | −0.01 | −0.07 |
| 15. Anger frequency | −0.29*** | 0.28*** | 0.02 | −0.15* | −0.06 | −0.21** | −0.08 | −0.04 | 0.11 |

*Note*: *n* was between 246 and 251; SR-EE and TR-EE are student-reported and teacher-reported emotional engagement.

significantly higher than express friend ($t = -5.76[245]$, $p < .001$) and teacher ($t = 11.35[246]$, $p < .001$). Express caregiver was higher than express friend ($t = 8.14[247]$, $p < .001$); express caregiver was also higher than express teacher ($t = 15.22[248]$, $p < .001$); and express friend was higher than express teacher ($t = 6.79[248]$, $p < .001$). It may be possible when the source of anger is the caregiver, friend, or teacher (perhaps due to their blocking a student's goal), then the participant may consider those people to be less helpful with their anger, so they may be less likely to express their anger to caregivers, friends, or teachers, compared to pause anger or withdraw. The children may also feel like it is inappropriate to share their anger with a teacher or other authority figure. Girls reported higher express-friend than boys ($t = -2.04[240]$, $p < .05$); whites reported higher express-caregiver than non-whites ($t = -2.39[247]$, $p < .05$); and fifth graders reported lower express-teacher compared to those in younger grades ($F = 4.34[3]$, $p < .01$).

The internal reliabilities of T1 scales were adequate, except for anger withdraw which had an $\alpha$ of .56; interestingly, the $\alpha$ of the male group for T1 anger withdraw was .39 while the $\alpha$ of the female group was .64. However, the T2 $\alpha$ was adequate for anger withdraw. But, in a similar pattern as at T1, the boys' T2 anger withdraw $\alpha$ was .57 and the girls' was .72. The test–retest correlations of T1 with T2 for each of the AR strategies were moderate and all significant at $p < .001$ (anger frequency test–retest: $r = .40$; pause anger: $r = .62$; withdraw: $r = .55$; express caregiver: $r = .61$, friend: $r = .61$; teacher: $r = .47$).

The correlations among the AR strategies indicated they all had significant relations with each other, except for withdraw. The correlation of the anger frequency item was significant and negative with pause anger, express teacher, and express friend but positive with withdraw, confirming the importance of controlling for anger frequency in this study given the significant relations of anger frequency with AR strategies in this study. All AR

| 10 | 11 | 12 | 13 | 14 | Mean | SD | T1 α | T2 α | T1 Omega | T2 Omega |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 3.58 | 0.84 | 0.67 | 0.78 | 0.68 | 0.79 |
| | | | | | 3.24 | 0.84 | 0.56 | 0.67 | 0.58 | 0.68 |
| | | | | | 3.32 | 1.00 | 0.82 | 0.87 | 0.83 | 0.88 |
| | | | | | 2.74 | 0.98 | 0.71 | 0.79 | 0.74 | 0.82 |
| | | | | | 2.25 | 1.01 | 0.89 | 0.90 | 0.89 | 0.90 |
| | | | | | 4.09 | 0.65 | 0.80 | - | 0.81 | - |
| | | | | | 4.13 | 0.88 | 0.95 | - | 0.95 | - |
| | | | | | | | | | | |
| | | | | | 9.69 | 0.90 | - | - | - | - |
| | | | | | - | - | - | - | - | - |
| - | | | | | - | - | - | - | - | - |
| −0.50*** | - | | | | - | - | - | - | - | - |
| 0.06 | −0.12 | - | | | - | - | - | - | - | - |
| 0.06 | −0.08 | 0.50*** | - | | - | - | - | - | - | - |
| −0.05 | 0.05 | −0.25*** | 0.49*** | - | - | - | - | - | - | - |
| 0.07 | 0.03 | 0.10 | −.03 | 0.06 | 3.08 | 0.90 | - | - | - | - |

Abbreviations: DLL, dual language learner; HGC, highly gifted center.
*$p$ < .05; **$p$ < .01; ***$p$ < .001.

variables had significant, positive correlations with self-reported emotional engagement (SR-EE), except for withdraw which had a negative relation with engagement; only pause anger had a significant correlation with teacher-reported emotional engagement (TR-EE; Table 3).

## 6.2 | Factor structure

### 6.2.1 | CFA

A CFA was conducted to test if the data fit the expected first-order correlated five-factor structure (Figure 1). We conducted a CFA at Time 1 (T1) and retested the CFA at Time 2 (T2) to see if model fit was adequate at both time points. The CFA results indicated that the data fit the expected factor structure of five factors with three items loading onto each factor. All of the standardized loadings in the final T1 model were 0.40 or higher and significant, except one anger withdraw item with a nonsignificant standardized loading estimate of 0.34 (Table 4). Another anger withdraw item had a high loading magnitude but was not significant; however, both of these items had significant loadings on withdraw at T2. It is important to note that when T1 anger withdraw was tested by itself as a sole latent factor in a CFA without the other AR latent factors (e.g., pause anger), all three of the withdraw items had significant loadings onto latent anger withdraw and the model fit was adequate.

The T1 CFA fit was adequate, RMSEA = 0.04, CFI = 0.97, SRMR = 0.06; BIC = 10,664. The fit was also adequate at T2, RMSEA = 0.03, CFI = 0.99, SRMR = 0.04; BIC = 8226; indeed, the smaller BIC at T2 indicated a bit better fit

than T1. Overall, model fit was adequate at both T1 and T2. Based on the CFA results, we used the theorized five AR strategies model throughout this paper: pause anger, anger withdraw, anger express-caregiver, anger express-friend, and anger express-teacher.

## 6.3 | Predictive validity: T1 AR prediction of T1 SR- and TR-EE

When all T1 latent AR factors were predictors in a LVPA model, including controls, with T1 student- and teacher-reported emotional engagement as latent outcomes, pause anger was the strongest and sole significant AR predictor of T1 SR-EE and TR-EE (Table 5). This result is striking given that all five strategies were included at once as predictors in this model, so pause anger was significant as a predictor above-and-beyond the other four AR strategies. The model fit was adequate (RMSEA = 0.04, CFI = 0.96, SRMR = 0.05).

### 6.3.1 | Gender differences

Regarding the question of whether or not girls were different from boys in the AR CFA, we tested multigroup measurement invariance of the AR model. There was noninvariance between groups for the $\chi^2$ difference between the configural and metric models ($\chi^2$ difference between configural and metric models = 28.61; $df$ difference = 11; critical value = 19.68; $p < .05$). There was invariance between groups for the $\chi^2$ difference between the metric and scalar models ($\chi^2$ difference between metric and scalar models = 8.92; $df$ difference = 10; critical value = 18.21; $p > .05$). Therefore, there was partial invariance between groups on the CARM CFA. Note that the configural model modification indices indicated that an error covariance needed to be added and two loading constraints needed to be released for the female group, and one error covariance needed to be added for the male group. In addition, the latent mean difference between boys and girls was nonsignificant for four of the five CARM factors; however, the express-friend factor evidenced a significant latent mean difference between girls and boys (unstandardized estimate = 0.48[0.18], $p < .01$, standardized estimate = 0.34[0.13]; effect size = 0.34).

We also tested if there were gender differences in the predictive power of T1 CARM latent factors on the outcomes of T1 latent SR-EE and TR-EE. There was invariance between groups for the $\chi^2$ difference between the configural and metric models ($\chi^2$ difference between configural and metric models = 21.11; $df$ difference = 18; critical value = 28.87; $p < .05$). There was noninvariance between groups for the $\chi^2$ difference between the metric and scalar models ($\chi^2$ difference between metric and scalar models = 46.36; $df$ difference = 25; critical value = 37.65; $p > .05$). Therefore, there was partial invariance in AR prediction of engagement across both groups.

After establishing measurement invariance between girls and boys in the measurement and structural models, we found no significant gender differences in the predictive power of T1 CARM latent factors on the outcomes of T1 latent SR-EE and TR-EE. For example, the gender difference test of the latent pause anger path on latent engagement was nonsignificant (unstandardized estimate = 0.27[.20], $p = .18$). In sum, girls and boys did not differ in the prediction of emotional engagement by AR.

## 7 | DISCUSSION

This study provided a novel, theory-based measurement of anger-specific regulation in elementary school, in addition to the measure's psychometrics, prediction of student- and teacher-reported emotional engagement, and gender differences. The CARM is an anger-specific scale that is relevant for school. The measure is phrased to capture use of recent anger regulation strategies (i.e., a state-based approach), which is in contrast to personality-driven anger regulation measures which are framed as a stable, trait-like tendency to experience and regulate anger

(Spielberger et al., 1985). The CARM measure relies on Tomkins' (1963, 1991) and Izard's (1977) emotions theories, as it focuses on one discrete emotion. There is an empirical need for anger-specific assessment of regulation (e.g., Izard, 1977). This study's results offered support of CARM's psychometric strength in the elementary school context—(a) student responses to AR items fit the expected AR theoretical model (Figure 1) at both T1 and T2; (b) adequate test–retest reliability and internal consistency at T1 and T2, other than the T1 internal consistency of
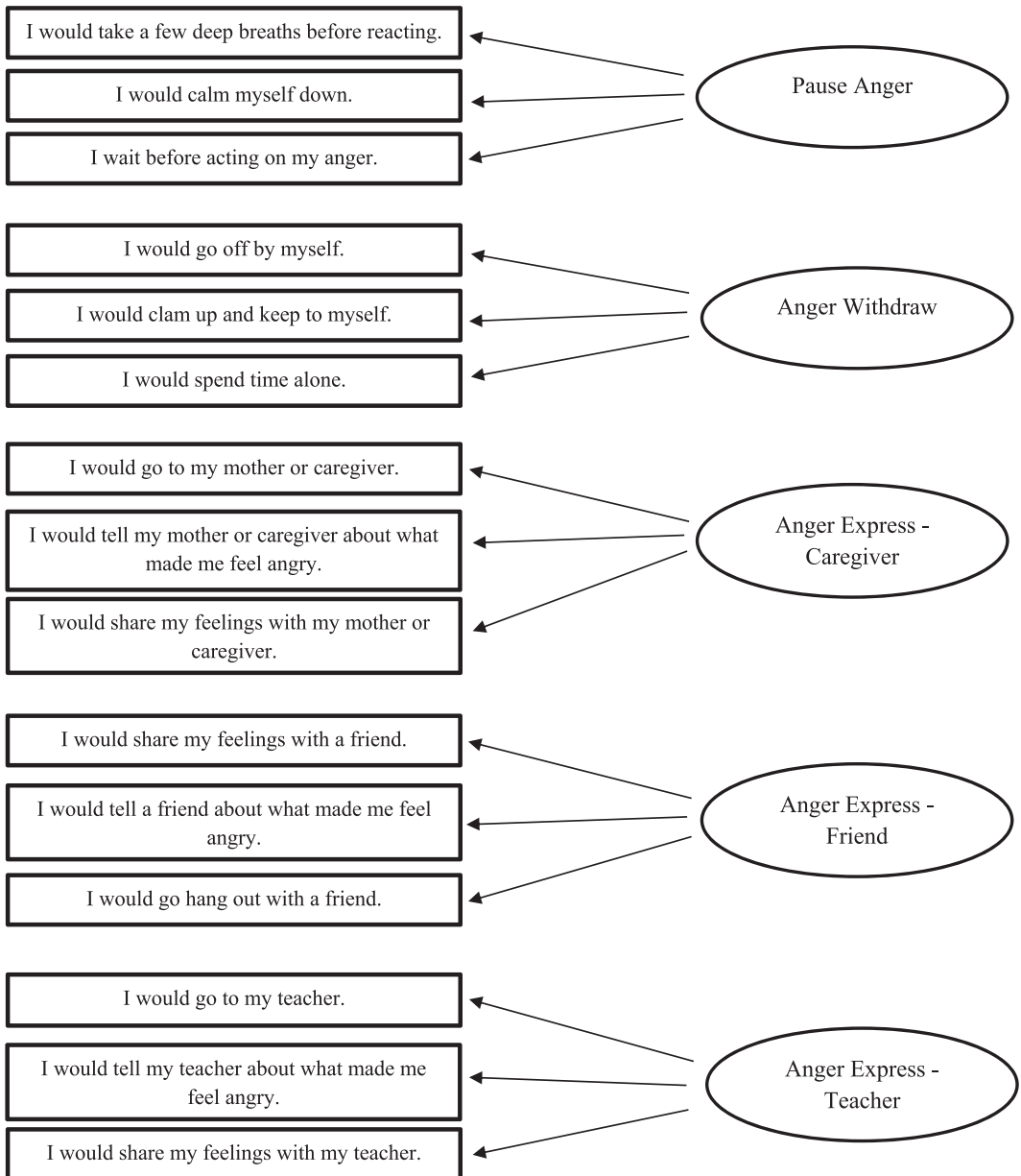


**FIGURE 1** Expected CFA loadings of AR items onto respective latent AR factors. The items are introduced with the preface, "Think of a few times when you felt ANGRY or FRUSTRATED during the past month. When you felt ANGRY or FRUSTRATED over the past month, how often would you respond in these ways?" Note that the latent factors were set to be correlated with each other.

withdraw for the male group although the latent withdraw factor had an adequate fit and magnitude of its item indicators across the sample; (c) predictive validity of concurrent student- and teacher-reported emotional engagement; and (d) no significant gender differences in CARM's prediction of emotional engagement, although there was partial measurement invariance across gender. The following discussion links the psychometric and predictive validity results with literature and theory.

## 7.1 | AR theoretical model fit

Tomkins' (1991) and Izard's (1977) emotions theories offer a unique framework for elementary-aged anger regulation. CARM is underpinned by emotions theories' focus on discrete emotions, such as the provocative
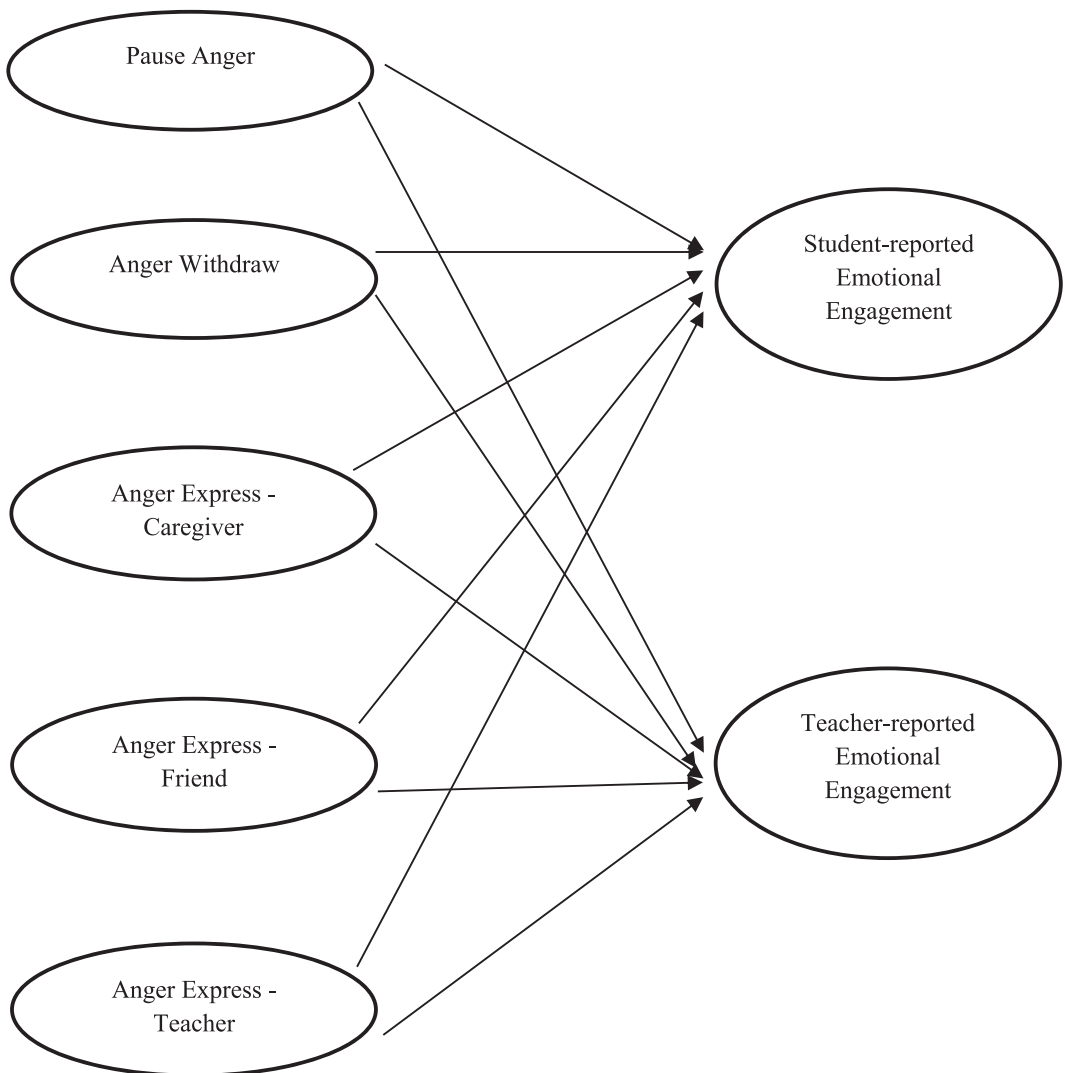


**FIGURE 2** Expected latent AR strategies' prediction of concurrent latent student- and teacher-reported emotional engagement. The figure does not depict controls which include anger frequency, age, gender, ethnicity, dual language status, questionnaire format, school, and gifted status.

emotion of anger. CARM is also informed by emotions theories' deemphasis on a deficit-focused conceptualization of emotion regulation (Tomkins, 1963, 1991); an example of a deficit-focused AR item is "I say mean things when angry" (Jacobs et al., 1989). This study found that the data fit the expected five-factor AR theoretical structure at both T1 and T2 (i.e., pause anger, anger withdraw, anger express-caregiver, -friends, and -teacher). The CFA fit confirmed that elementary school students differentiated all of the five subscales from each other. Participants distinguished between recipients (i.e., caregiver, friend, teacher) with whom they shared their anger, which offers a new contribution of identifying recipients with whom students may share and regulate their anger; the anger express-teacher scale was a novel AR strategy. Therefore, how a child regulates anger may be dependent on whether or not the child shares their anger with a friend, teacher, or caregiver. In addition to students' differentiation of their expressive responses, students systematically differentiated between pause anger and anger withdraw. Unlike the STAXI's "anger-in" inhibitory scales, which implied a deficit-based framing of anger suppression leading to psychopathology, CARM's pause anger and anger withdraw items do not focus on deficit-based behaviors that may lead to psychopathology. Rather, they are largely items which do not have an explicit positive or negative valence.

Given the need for theory- and empirically driven anger regulation measures in elementary school, these results underscore the potential use of CARM for research with similar elementary-aged populations. Surprisingly, the only options for anger regulation assessment in school are the two child adaptations of the STAXI, which we view as limited by its scales' primary focus on deficit-based AR. CARM's pause anger and anger withdraw scales may fit better in tone with interventions promoting a more mindful approach to anger regulation (e.g., Peace of Mind Curriculum; Diesner, 2019). State-based strategies similar to pause anger are rarely assessed in the context of anger regulation, to our knowledge, perhaps due to other AR measures being more focused on trait and risk assessment. The socioemotional literature is shifting over time towards valuing self-regulation strategies which are not framed as deficit-based (Durlak et al., 2015), and CARM's subscales may contribute toward a movement offering a different approach than deficit-oriented models.

## 7.2 | Internal and test–retest reliability

The internal reliability of the CARM subscales was adequate, except for T1 anger withdraw items for boys; however, latent withdraw had a good fit and magnitude of item loadings. T2 anger withdraw alpha was adequate. Note that latent withdraw was used for all of this study's model testing. Kerr and Schneider (2008) observed that anger expression may have stronger internal reliability than "internalized anger." It is possible that internalized anger is similar to anger withdraw, as both are self-contained and internally focused, although CARM's anger withdraw item phrasing is more neutral than internalized anger. Kerr and Schneider (2008) posited that it is easier to judge outward expression than it is to judge less salient behaviors, like one's own withdraw-related behaviors. These considerations may explain the relatively higher internal consistency among the expressive scales compared to anger withdraw.

Test–retest reliabilities were all moderate suggesting that participants responded to CARM items in a somewhat consistent manner from the first assessment to the second assessment about 3 months later. The fact that test–retest reliabilities were moderate, but not too strong, suggests that anger regulation may be somewhat malleable, temporary, and state-based. One advantage of a state-based measure with moderate stability is that it may be better able to detect anger-focused intervention effects than a trait-based measure which would likely have higher stability over time. Given the CARM's possible, potential sensitivity to change, future studies may consider pilot testing the CARM's ability to detect change in anger regulation (e.g., use of "pause anger") following an anger-focused intervention, like the training of parents in cognitive behavioral management of their child's anger (e.g., Sukhodolsky et al., 2016). It is important to note, though, that more research on the CARM is necessary before using it in any intervention evaluations.

## 7.3 | AR predictive validity of self- and teacher-reported emotional engagement

Pause anger, operationalized as taking a break before responding to anger, predicted concurrent self- and teacher-reported emotional engagement, when adjusting for the other AR strategies. The unique relation of pause anger to both SR-EE and TR-EE is a novel contribution. Given that existing anger regulation measures typically predict negative outcomes, it is also a unique contribution to find an anger regulation subscale to be related to a positive academic outcome like engagement. Pause anger's relation with EE fits evidence that mindful management of child and adolescent emotions, like waiting before reacting to anger, may reduce negative emotions (e.g., Biegel et al., 2009). A reduction of negative emotions, like anger, may leave room for experiencing the positive emotions associated with emotional engagement. Indeed, Pekrun et al. (2017) have argued that an interaction of positive and negative emotions may influence learning and achievement. Pause anger's relation with EE could be viewed as similar to the positive relation of inhibitory effortful control with the outcomes of school liking and participation, which are similar to academic engagement (Valiente et al., 2007). Above and beyond expressing or withdrawing from anger, this study found that taking a break before responding to anger (i.e., pause anger) holds the strongest implications for engaging in school—therefore, it could be possible that if children are taught to pause before responding to anger in the classroom (Anderson et al., 2006), then they might be more positively engaged in the classroom. Again, additional CARM research needs to be done before any "pause anger" intervention development based on these findings. Also, it should be noted that, in contrast to pause anger, the four other CARM strategies did not predict engagement, when adjusting or not adjusting for the other strategies. This finding may reflect a weakness of the four strategies' predictive power of engagement, and it is worth testing the predictive power of these particular CARM strategies with similar or different outcomes. It also be worth testing the predictive power in other populations.

Strikingly, our hypothesis that there would be gender differences in AR prediction of self- and teacher-reported emotional engagement was not supported by the results, despite other studies finding significant gender differences in AR (e.g., Chaplin & Aldao, 2013); other studies have found significant gender differences in emotional engagement (Wang et al., 2011). In addition, there was partial multigroup measurement invariance between boys and girls in the CFA and relation of AR to EE; so there may only be partial evidence for consistency in the meaning that girls versus boys give to the constructs of AR and EE. Perhaps future studies using observed emotional engagement in class, rather than self- or teacher-report, may find gender differences in AR prediction of emotional engagement. It is also possible that the AR items in our measure may not elicit enough differences in boys' versus girls' responses to the CARM items to find gender differences in prediction of engagement.

## 7.4 | Limitations

There were some design limitations to the present study. Given the high percentage of emergent bilingual students, the researchers read the CARM items aloud to each participant, rather than participants reading items silently on their own; however, some researchers might view the reading aloud of questions as a strength. Although participants could look at hard copies of the survey and read along with the researchers, future studies of students reading AR questions silently to themselves before responding are needed. Another limitation is that a longitudinal design would be a better test of the predictive power of AR on engagement. In an ideal world, it would be best to conduct a multimodal assessment of AR, despite the challenge of observing the typically infrequent moments of anger and its regulation in the classroom. With only 36% of students in the schools participating, that is also a limitation. Future studies should evaluate the predictive validity of this measure with other assessments of anger regulation using an incremental predictive validity design with CARM predicting an outcome above and beyond a similar AR measure as a predictor.

**TABLE 4** T1 anger regulation CFA.

| Latent variables | Items | Unstandardized estimate (SE) | Standardized estimate (SE) | Unstandardized estimate (SE) p Value | Unstandardized estimate (SE) confidence interval |
|---|---|---|---|---|---|
| Pause anger | When I was angry, I would take a few deep breaths before reacting. (ar20) | **1.00 (0.18)** | **0.68 (0.07)** | **.00** | **(0.44, 1.05)** |
| | When I was angry, I would calm myself down. (ar21) | **0.86 (0.21)** | **0.71 (0.07)** | **.00** | **(0.65, 1.35)** |
| | When I was angry, I would wait before acting on my anger. (ar22) | **0.75 (0.16)** | **0.55 (0.07)** | **.00** | **(0.44, 1.28)** |
| Anger withdraw[a] | When I was angry, I would go off by myself. (ar2) | **1.41 (0.39)** | **0.43 (0.28)** | **.00** | **(0.64, 2.18)** |
| | When I was angry, I would clam up and keep to myself. (ar7) | 0.72 (0.20) | 0.34 (0.27) | .49 | (−0.71, 1.50) |
| | When I was angry, I would spend time alone. (ar14) | 1.80 (2.29) | 0.95 (0.61) | .43 | (−2.70, 6.28) |
| Express anger caregiver | When I was angry, I would go to my mother or caregiver. (ar3) | **0.76 (0.07)** | **0.64 (0.05)** | **.00** | **(0.62, 0.90)** |
| | When I was angry, I would tell my mother or caregiver about what made me feel angry. (ar13) | **1.00 (0.07)** | **0.84 (0.04)** | **.00** | **(0.86, 1.14)** |
| | When I was angry, I would share my feelings with my mother or caregiver. (ar16) | **1.32 (0.13)** | **0.86 (0.04)** | **.00** | **(1.08, 1.60)** |
| Express anger friend | When I was angry, I would share my feelings with a friend. (ar5) | **1.93 (0.25)** | **0.64 (0.10)** | **.00** | **(0.71, 1.68)** |
| | When I was angry, I would tell a friend about what made me feel angry. (ar9) | **1.10 (0.28)** | **0.64 (0.10)** | **.00** | **(0.55, 1.65)** |
| | When I was angry, I would go hang out with a friend. (ar11) | **0.84 (0.17)** | **0.53 (0.07)** | **.00** | **(0.50, 1.18)** |
| Express anger teacher | When I was angry at school, I would go to my teacher. (ar17) | **0.91 (0.07)** | **0.81 (0.05)** | **.00** | **(0.77, 1.06)** |
| | When I was angry at school, I would tell my teacher about what made me feel angry. (ar18) | **1.06 (0.07)** | **0.89 (0.03)** | **.00** | **(0.93, 1.18)** |
| | When I was angry at school, I would share my feelings with my teacher. (ar19) | **1.10 (0.09)** | **0.86 (0.03)** | **.00** | **(0.92, 1.27)** |

*Note:* Bolded are significant.

[a]Anger withdraw has expected factor structure and item loadings when it is tested in a CFA by itself. So, when anger withdraw is tested by itself in a CFA without the other AR latent factors (e.g., pause anger), as a sole latent factor in the model, all three of the items have significant loadings onto latent anger withdraw and the model fit is adequate. Also, note that correlated errors were set across the factors in the CFA.

**TABLE 5** Latent T1 AR path estimates predicting T1 student- and teacher-reported emotional engagement.

| Predictors | Student-reported emotional engagement | | | | Teacher-reported emotional engagement | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Unstand. Estimate (SE) | Standardized estimate (SE) | Unstand. Estimate p Value | Unstand. Estimate (SE) CI | Unstand. Estimate (SE) | Standardized estimate (SE) | Unstand. Estimate p Value | Unstand. Estimate (SE) CI |
| Pause anger | **0.33(0.10)** | **0.41 (0.12)** | **.001** | **(0.13, 0.53)** | **0.26 (0.13)** | 0.22 (0.10) | **.049** | **(0.001, 0.52)** |
| Anger withdraw | −0.10(0.13) | −0.13 (0.13) | .44 | (−0.38, 0.16) | 0.18 (0.10) | .15 (0.10) | .08 | (−0.02, 0.38) |
| EA caregiver | 0.10(0.09) | 0.12 (0.11) | .28 | (−0.08, 0.28) | −0.14 (0.13) | −0.11 (0.10) | .28 | (−0.39, 0.11) |
| EA friend | −0.12(0.11) | −0.13 (0.13) | .25 | (−0.34, 0.09) | −0.05 (0.13) | −0.05 (0.12) | .71 | (−0.30, 0.21) |
| EA teacher | 0.09(0.06) | 0.12 (0.08) | .13 | (−0.03, 0.20) | −0.02 (0.08) | −0.02 (0.07) | .84 | (−0.17, 0.13) |
| Controls | | | | | | | | |
| Age | 0.02(0.06) | −0.03 (0.08) | .68 | (−0.09, 0.136) | −0.23 (0.08) | **−0.230 (0.07)** | **.00** | **(−0.38, −0.08)** |
| Female | **0.25(0.10)** | **0.20 (0.08)** | **.02** | **(0.04, 0.459)** | **0.60 (0.14)** | **0.32 (0.08)** | **.00** | **(0.32, 0.87)** |
| White | −0.16(0.10) | −0.13 (0.08) | .09 | (−0.35, 0.03) | **0.25 (0.11)** | **0.13 (0.05)** | **.02** | **(0.05, 0.46)** |
| DLL | −0.04(0.08) | −0.03 (0.07) | .63 | (−0.21, 0.12) | −0.21 (0.16) | −0.11 (0.08) | .18 | (−0.52, 0.10) |
| HGC | 0.067(0.11) | 0.04 (0.07) | .58 | (−0.15, 0.27) | −0.14 (0.19) | −0.06 (0.09) | .45 | (−0.52, 0.23) |
| School | −0.04(0.09) | −0.03 (0.07) | .67 | (−0.20, 0.13) | 0.22 (0.15) | −0.12 (0.08) | .15 | (−0.08, 0.52) |
| Group admin. | **−0.30(0.08)** | **−0.19 (0.05)** | **.00** | **(−0.46, −0.14)** | −0.01 (0.21) | 0.00 (0.09) | .98 | (−0.42, 0.40) |
| Anger frequency | −0.05(0.06) | −0.07 (0.09) | .42 | (−0.18, 0.07) | −0.10 (0.07) | −0.10 (0.07) | .16 | (−0.24, 0.04) |

*Note:* Bolded are significant.

There were other psychometric limitations to the study—the T1 anger withdraw alpha was low for boys; however, the alpha for boys' anger withdraw was better at T2. When questioning T1 anger withdraw's psychometrics, one has to also keep in mind that when latent anger withdraw is tested by itself in a CFA, all three of the withdraw items have significant loadings onto latent anger withdraw and the model fits well. This study's model testing only employed latent modeling of T1 anger withdraw, which minimized measurement error (Hancock & Mueller, 2013) and lends support to the use of latent anger withdraw. At the same time, the internal consistency of anger withdraw deserves further investigation. Some might view the CARM subscales consisting of three items as a limitation; however, three items are viewed as adequate for a latent factor (El-Den et al., 2020), although more than three items would be ideal. Also, future researchers of the CARM might want to consider additional or substitute items that have been found to be used by children, like adding an item that addresses how children sometimes avoid the person that makes them angry. It is also possible that social desirability could have influenced these results given that the participants answered questions in the presence of an adult research assistant. In addition, as described earlier, pause anger was the sole predictor of engagement, so the predictive power of the other CARM strategies needs to be tested in other studies. Finally, generalizability of this study's findings should be tested across different populations.

## 8 | CONCLUSIONS AND IMPLICATIONS

This study provided evidence for the psychometric strength of an anger-specific regulation questionnaire, the CARM, among upper elementary school students. The CFA results indicated that the AR data fit the expected AR theoretical model. Other psychometrics were adequate, like internal and test–retest reliability. Also, the pause anger subscale was found to be related to how emotionally engaged a student feels in school, based on both student- and teacher-reported emotional engagement. Pause anger was related to EE, above and beyond the other AR strategies. No other study, to our knowledge, has examined the anger regulation-emotional engagement link, and few have studied the relation of emotion regulation with engagement. It should be noted, though, that the other AR strategies were not related to EE, and further research on these other AR strategies' relations to EE should be conducted with additional populations. This study is novel in testing emotion regulation's prediction of both self- and teacher-reported engagement, as recommended for socioemotional skills, like engagement, to be measured via multi-informant report (Skinner et al., 2008). Further, although teaching students to pause before acting on their anger is often used in school-based practice, empirical peer-reviewed research on and assessment of pause anger is lacking. Additional validation of the CARM is necessary to determine its utility in testing mindfulness and emotion-informed intervention effects.

These results hold implications for how anger regulation strategies can be conceptualized, assessed, and how AR strategies like pause anger may have positive relations with EE. Unlike existing anger regulation measures (e.g., STAXI-C/A), CARM is not intended to be used as an anger regulation "risk assessment" measure, given that CARM strategies are not framed as deficit-based. It is striking, if not concerning, that existing self-report AR measures seem to be framed and advertised as useful for school risk assessment and threat procedures to prevent school violence (e.g., as a "complement [to] threat assessment measures" in schools; STAXI-2 C/A, 2019). This concern holds ethical implications for AR assessment, its promotion, and its, perhaps, misguided application as a possible way to label and identify students as predisposed toward school violence (e.g., Smith et al., 2012). Indeed, concerns have been raised that some school staff already treat children they view as having an "anger problem" as toxic for the school climate, rather than trying to understand the possible systemic, multilevel ecological sources of the student's anger or helping the student employ different anger regulation strategies (Smith et al., 2012). CARM is not a trait-based, deficit-focused anger regulation approach to assess how students regulate their anger. Given that CARM is more of a state- than trait-focused measure, it may be more appropriate for use in schools because children's anger in schools can often be thought of as a short-term state of arousal that depends on the

environment or temporary frustrations with peers (e.g., Dodge, 1991). Moreover, after more CARM psychometric research, the CARM might be useful in intervention evaluations. This study's results holds implications for assessment and psychoeducation in which schools educate students on a variety of ways they can manage their anger, with some strategies holding implications for emotional engagement in school.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data is available upon request from the corresponding author.

## ETHICS STATEMENT

The ethics of the procedures used by this project were approved by the Institutional Review Board of University of Maryland, College Park (503093-11).

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