



Negative emotionality, emotion regulation, and achievement: Cross-lagged relations and mediation of academic engagement[☆]



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ABSTRACT

Relative to the research interest on the role of emotional functioning in children's achievement, less focus has been on the interplay between the two. Based on a short-term longitudinal sample, we tested the bidirectional relations between negative emotionality, emotion regulation, and achievement. We also tested if academic engagement mediated the link from negative emotionality and emotion regulation to achievement. The study sample consisted of 199 third through sixth grade students (wave 1) who participated in two waves of the study (14 months apart, on average). Teachers rated children's emotional functioning and engagement, and reading achievement was assessed by state-wide standardized tests. Results of cross-lagged path analyses indicated significant directional effects from negative emotionality and emotion regulation to achievement, but not vice versa. Also, results supported that the link from negative emotionality and emotion regulation to achievement was mediated through academic engagement. Findings indicate that promoting children's academic skills might have a broader positive impact on children's emotional development.

A growing body of literature indicates children's emotions and regulatory functioning play an important role in learning. Based on a developmental neurobiological perspective, Blair (2002) explains that young children's emotionality is heavily influenced by biologically-based temperament, which emerges prior to the development of higher order mental processes and regulatory functioning. Accordingly, children's emotions are theorized to contribute to the development of cognition and cognitive control of behavior, which in turn, has significant implications for learning. Children's ability to regulate their behaviors and emotions is a strong predictor of success in school, independent of cognitive abilities (Blair, 2002).

Based on a temperament perspective, researchers have shown that children's dispositional emotionality, with a focus on negative emotionality, and regulatory functioning are linked to academic achievement (Valiente, Lemery-Chalfant, & Swanson, 2010; Zhou, Main, & Wang, 2010). It has been further suggested that the link might be partly explained by the fact that negative emotions and poor regulatory functioning interfere with processes critical to academic success, such as higher order thinking, motivation (including engagement), interpersonal relationships, and social behavior (Valiente, Swanson, & Eisenberg, 2012; Zhou et al., 2010).

Relatively recently, a bidirectional relation between emotional

functioning and learning has received increased research attention (Hernández et al., 2018; Pekrun, Lichtenfeld, Marsh, Murayama, & Goetz, 2017). This bidirectional relation demonstrates that emotional functioning not only contributes to learning, but it is also shaped by learning-related experience. Understanding the bidirectional relation has the potential to advance theories and inform the focus of intervention. Further, the majority of studies illustrating the link between dispositional emotional functioning and academic functioning have focused on kindergarten to early elementary years (e.g., Hernández et al., 2016; Trentacosta & Izard, 2007; Valiente et al., 2010). Academic demands continue to increase as children grow older, and the association between emotional functioning and achievement warrants an investigation for children beyond the early elementary years.

1. Negative emotionality and emotion regulation

As one of the key temperament traits, emotionality concerns individual differences in emotional arousal and reactivity (Rothbart, Ahadi, Hersey, & Fisher, 2001). Although closely related, emotion regulation is distinct from emotionality in that the former involves physiological, cognitive, and behavioral processes in one's reaction to an activated emotion (Cole, Martin, & Dennis, 2004; Rydell, Berlin, &

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Bohlin, 2003). That is, a child's ability to manage negative emotional arousal (e.g., anger, frustration, sadness), not the emotion per se, determines the reactions or outcome of such emotional arousal (Cole et al., 2004). For example, unregulated anger likely leads to aggressive acts as opposed to more acceptable and constructive solutions.

Intuitively, negative emotionality and regulatory functioning are negatively related such that children who express higher levels of negative emotions are less likely to regulate their emotions and/or behaviors. Interestingly, evidence has documented a wide range of correlations between emotionality and regulation (Murphy, Shepard, Eisenberg, & Fabes, 2004; Rydell et al., 2003; Valiente et al., 2010), which are attributable to different age groups, type of measurement, and reporters. For example, the correlations between negative emotionality and emotion regulation were in the $-.50$ s to $-.30$ s range as reported by parents (Rydell et al., 2003). Based on the same instrument, the correlations between the two constructs across three years were much larger as reported by teachers, ranging from -0.90 to -0.62 (Bengtsson & Arvidsson, 2011). Several factors may help explain the stronger correlations evidenced by teacher report. For emotion regulation, parents or teachers were asked how easily they could calm a child down when he or she was experiencing a strong negative emotion (Bengtsson & Arvidsson, 2011; Rydell et al., 2003). Compared to parents, teachers might have fewer direct opportunities to help children regulate emotions and, thus, more readily equate negative emotionality with poor emotion regulation.

2. Negative emotionality, emotion regulation and achievement

Evidence indicates that negative emotionality is negatively associated with achievement (Gumora & Arsenio, 2002; Hernández et al., 2016). Gumora and Arsenio further found that the association between negative affect (e.g., irritability, distress) and GPA remained significant after controlling for academic-specific negative affect (e.g., being frustrated writing essays). This indicates that dispositional negative affect plays a unique role in achievement. Beyond general negative emotionality, some researchers focused on specific types of negative emotionality. For example, teacher-reported anger, sadness, and shyness were negatively associated with achievement, although the association was significant for anger only based on parent report (Valiente et al., 2010). In a different study, peer-assessed anger, but not sadness, was negatively associated with achievement (Kwon, Hanrahan, & Kupzyk, 2017). The differential patterns of association might be partly due to variability in age group and reporters. In the case of teacher report, however, study findings indicated strong correlations between anger and sadness, and the link to achievement was similar between the two emotions (Valiente et al., 2010).

Regulatory functioning is a broad construct, and we identified only a few studies that focused on regulation of emotions specifically in relation to achievement. Emotion regulation was positively related to effective academic behavior in the classroom (e.g., work completion and accuracy) as well as literacy and math skills among kindergarten students (Graziano, Reavis, Keane, & Calkins, 2007). Also, children's emotion regulation in preschool predicted academic performance on a standardized test in kindergarten (Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003). These findings indicate that children's ability to regulate emotion might facilitate learning-related behaviors and achievement. However, the study samples involved kindergarten students and there is a lack of empirical evidence for older students.

3. Bidirectional relations between emotional functioning and achievement

In terms of directional relations, the existing conceptual framework tends to focus on the contribution of emotions to achievement (Pekrun, Goetz, Titz, & Perry, 2002; Valiente, Swanson, & Eisenberg, 2012). However, evidence also indicates that academic achievement might

contribute to subsequent emotional difficulties (i.e., negative emotions). For example, Morgan, Farkas, and Wu (2012) examined whether poor reading skills are associated with later emotional difficulties. They found that children who had reading difficulties in third grade were at a higher risk for feeling angry, sad/anxious, and not getting along with peers in fifth grade, compared to children who did not have reading difficulties. Similarly, children with math difficulties were at a higher risk of feeling sad/anxious. However, Morgan and colleagues focused on unidirectional relations, and bidirectional relations between emotional functioning and reading skills cannot be inferred.

Recently, the bidirectional relation between emotional functioning and achievement has received more conceptual and empirical attention. Whereas temperament research highlights the biological basis of emotionality and regulation, socialization also plays a role in children's emotional development (Fox & Calkins, 2003; Salisch, 2001). Learning and academic achievement is a major part of school-age children's experience, which likely contributes to emotional reactions and regulation. In fact, findings from a five-year longitudinal study that involved German adolescents indicated a bidirectional relation between achievement emotions (i.e., enjoyment, pride, anger, anxiety, boredom) and achievement (Pekrun et al., 2017). By definition, academic/achievement emotions refer to those directly relevant to learning and achievement. Across waves, positive achievement emotions and math performance were positively and reciprocally related whereas negative reciprocal relations were found between negative achievement emotions and math performance.

Bidirectional relations between emotions and academic-related functioning have not been supported in some other studies. For example, among upper elementary school age children, perceived positive engagement in small group tasks (e.g., working well together) was associated with later positive affect (e.g., more excited than tired; more happy than sad); however, children's affect was not related to later positive engagement (Linnenbrink-Garcia, Rogat, & Koskey, 2011). Similarly, regarding the bidirectional relations between emotions and school adjustment, school engagement in kindergarten predicted negative emotionality in first grade whereas the opposite relation was not significant (Hernández et al., 2018). Given the limited number of studies and variability in study constructs and samples, it is difficult to draw a conclusion. However, findings from these two studies highlight the role of children's learning experiences in emotional development, which has received relatively little research attention.

4. Academic engagement as a mediator

Research has indicated that academic engagement is a potential mechanism by which children's emotionality and emotion regulation are linked to achievement. Academic engagement is a strong predictor of achievement (Fredricks, Blumenfeld, & Paris, 2004) and is inferred by effortful participation and persistence in learning activities (Skinner, Kindermann, & Furrer, 2009). Conceptually, intense or frequent negative emotions might interfere with students' ability to direct mental and physiological energy to engage in learning tasks (Pekrun et al., 2002). Indeed, evidence indicates that negative emotion is negatively associated with academic engagement (Diaz et al., 2017; Valiente, Swanson, & Lemery-Chalfant, 2012). Similarly, difficulty with regulating emotions might impede children's ability to engage in learning (Howse et al., 2003). For example, effortful control or temperamental regulation was positively related to academic engagement (Diaz et al., 2017).

Although limited, some empirical evidence documented the mediating effect of academic engagement regarding the relation between regulatory functioning and achievement. For example, the relation between regulation (effortful control or emotion regulation) and achievement was mediated through self-directed and cooperative learning (Valiente, Swanson, Lemery-Chalfant, & Berger, 2014) and attention to academic tasks (Trentacosta & Izard, 2007). Whereas academic engagement was measured differently across studies, the

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