



Differential components of reactivity and attentional control predicting externalizing behavior



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ABSTRACT

The present study examined the contribution of early reactivity and regulation on externalizing behavior in pre-adolescence. Moreover, subcomponents of attentional control (i.e., attention shifting and attention focusing) and negative reactivity (i.e., sadness and anger) were examined individually to test whether a specific combination of factors uniquely contributed to the outcome. A subset of data were utilized from the ongoing, longitudinal RIGHT Track project ($N = 404$), in which parents reported on individual factors at age 4 and teachers reported on externalizing behavior at age 10. A hierarchical linear regression analysis revealed a significant interaction between anger reactivity and attention shifting when controlling for early externalizing behavior, where children with high levels of anger and low levels of attention shifting experienced the greatest increase in externalizing behavior over time. An increased focus on specificity is needed in research on the interplay between reactivity and regulation in the prediction of externalizing behavior.

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Externalizing behavior is characterized by conduct problems, aggressive or disruptive actions, and antisocial behaviors; these behaviors represent a pervasive problem that negatively impacts current functioning and reliably predicts later psychopathology in adulthood, including antisocial behavior (Zhou et al., 2007). Early deficits in self-regulation have been implicated in externalizing outcomes; however, greater specificity is needed to understand the role of individual components of self-regulation in the development of externalizing behaviors. For example, Rothbart, Ahadi, and Evans temperament model (2000) suggests that self-regulation is best conceptualized as a dynamic interplay between biological reactivity and regulatory skill development. However, the specific components of reactivity and regulation, and their subcomponents, have not been thoroughly investigated in most research. Establishing the presence of an essential and unique interplay between subcomponents would assist in the identification of those children most at risk for developing externalizing problems in preadolescence. The present study adopts a developmental psychopathology perspective which emphasizes the importance of developmental tasks, as well as context, in the shaping of adaptive and maladaptive behavior (Cicchetti, 1984). Furthermore, we sought to examine the contribution of reactivity and one specific aspect of regulation (i.e., attentional control) at age 4 to the development of externalizing behaviors at age 10. Interactions between subcomponents were examined to determine which specific combination of reactivity and attentional control predicts

of externalizing behavior in preadolescence. Research questions were guided by Eisenberg and Fabes (1992) heuristic model, which suggests that externalizing behavior is associated with low levels of regulation, particularly for those children who experience negative emotions intensely.

Reactivity is defined as the arousability of motor, affective, and sensory response systems; more explicitly, it is the propensity to display emotions, either positive or negative (Rothbart, 1989). Negative reactivity consists of two primary components, one characteristic of hostile emotion (i.e., anger) and one of non-hostile emotion (i.e., sadness). Anger reactivity has been consistently linked to aggression and externalizing behavior (Betts, Gullone, & Allen, 2009; Eisenberg et al., 2001; Janson & Mathiesen, 2008). For example, Eisenberg et al. (2009) reported that both boys and girls who were high in anger reactivity were prone to later externalizing behavior from ages 6 to 10. There is less conclusive evidence for linkage of sadness reactivity to externalizing behavior, as many studies have linked this component to internalizing behavior (Clark, Watson, & Mineka, 1994; Janson & Mathiesen, 2008). Berkowitz (1990) has discussed the connection between different negative emotions and proposed that any negative emotion (i.e., sadness or anger) could give rise to aggressive inclinations. However, studies in support of this claim are inconclusive and have shown either no relation between sadness reactivity and externalizing behavior (Kim, Walden, Harris, Karrass, & Catron, 2007) or a marginal positive relation (Eisenberg et al., 2009). Zeman, Shipman, and Suveg (2002), in fact, have found sadness reactivity to be negatively associated with externalizing behavior, noting that behaviors such as crying and whining are not likely to be endorsed as the emotional communication style used by aggressive children. Taken together, anger reactivity appears to be

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strongly related to externalizing behavior, while the link between sadness reactivity and externalizing behavior is much less clear. Few studies, however, simultaneously consider anger and sadness reactivity as predictors of problem behavior (Kim et al., 2007). Thus, a noteworthy aim of the current study is to clarify the association between negative reactivity and externalizing behavior by examining both anger and sadness reactivity.

Another primary individual factor related to prediction of externalizing behavior is regulation, defined as “those behaviors, skills, and strategies, whether conscious or unconscious, automatic or effortful, that serve to modulate, inhibit, and enhance emotional experiences and expressions” (Calkins & Hill, 2007, p. 229). A specific regulation strategy that is present early in development and has been found to relate to externalizing behavior in preadolescence is attentional control. Attentional control is defined as the ability to shift and sustain attention, and it is one of the first regulation strategies that children can effectively manage (Derryberry & Rothbart, 1997). Attention networks become more organized and sophisticated as infants age (Rothbart & Rueda, 2005), and individual differences in attentional ability become more detectable throughout the toddler and preschool years (Kochanska, Murray, & Harlan, 2000). Since attentional control involves properly organizing incoming stimuli and focusing attention away from distressing stimuli, this strategy is often used to maintain a calm state (Rothbart, Ellis, & Posner, 2004). Furthermore, normative levels of attentional control allow one to tolerate change and delay gratification (Rothbart et al., 2004), which may contribute to creating an appropriate cognitive and behavioral response, as opposed to acting out. Thus, poor attentional control has been associated with externalizing behavior, conduct disorder, and aggression (Derryberry & Rothbart, 1988; Eisenberg, Fabes, Guthrie, & Murphy, 1996; Hart, Keller, Edelstein, & Hofmann, 1998; Moffitt, 1993; Muris, Mayer, van Lint, & Hofman, 2008).

Previous literature has underscored the importance of regulation and reactivity when predicting behavioral outcomes. In addition to their individual contributions, researchers have also postulated that these factors operate in concert (Blair, Denham, Kochanoff, & Whipple, 2004; Eisenberg et al., 2000). This idea was prominent in Eisenberg and Fabes (1992) heuristic model, which stated that individual differences in reactivity and regulation often have multiplicative effects. In reference to externalizing behavior, children who are prone to intense negative emotion and who are also low in regulation would be expected to be especially high in externalizing behavior (Eisenberg & Fabes, 1992). While such theorized interactive effects are intuitive, these findings have not always been demonstrated in the literature or when found, have been dependent on factors such as reporter and regulation strategy (Eisenberg et al., 1996, 1997). Rydell, Berlin, and Bohlin (2003) examined relations between reactivity, emotion regulation, and children's behavioral adaptation and concluded that, most consistently, reactivity and regulation did not interact in their sample. The researchers, however, supported the theoretical argument for interactive effects and encouraged future research to examine the combined contribution of reactivity and regulation (Rydell et al., 2003). Attentional control is the regulation strategy that has most consistently been found to interact with measures of reactivity to predict behavioral outcomes. For example, Eisenberg et al. (2000) revealed that attentional control predicted externalizing behavior only for those children with high anger reactivity; this association was true for both sexes. Thus, there is theoretical and empirical support to examine interactive effects between attentional control and reactivity. Moreover, replication of previous findings would provide stronger evidence for multiplicative effects.

Increased specificity of the attentional control variable is also important. Attentional control consists of two components (attention shifting and attention focusing); however, most consistently, they have not been analyzed separately. This is surprising since attention focusing and attention shifting represent two distinct cognitive tasks (Posner, Walker, Friedrich, & Rafal, 1987). Furthermore, different underlying

neural mechanisms for focusing and shifting attention have been suggested (Derryberry & Rothbart, 1988). fMRI studies show that shifts in attention are mediated by superior regions, and sustained attention is mediated by more lateral regions (Thakral & Slotnick, 2009). These differentiating processes have also been referred to as “top-down” cognitive control processes, which are responsible for focusing attention and “bottom-up” stimulus-driven processes, which are responsible for rapid attentional shifts (Miller, Miller, Healey, Marshall, & Halperin, 2013). Indeed, measures used to assess attentional control consistently produce two correlated, yet separate, factors that correspond to attention focusing and attention shifting (see the Attentional Control Scale [ACS]; Derryberry & Reed, 2002, and Child Behavior Questionnaires [CBQ]; Rothbart, Ahadi, & Hershey, 1994).

One reason for lack of differential analyses of the two components of attentional control may be because early work assessing focusing and shifting found similar associations with outcomes, particularly shyness (Eisenberg, Shepard, Fabes, Murphy, & Guthrie, 1998). More recently, however, differential associations have been noted. For example, Gilliom, Shaw, Beck, Schonberg, and Lukon (2002) found that shifting attention away from frustrating sources was associated with low externalizing problems, and focusing attention on sources of frustration was associated with high externalizing problems over time from ages 3 to 6. Furthermore, Ólafsson et al. (2011) found attention focusing and attention shifting differentially related to anxiety and depression. Additionally, these processes have been differentially linked to symptoms of AD/HD (Miller et al., 2013).

For externalizing behavior, previous literature has theoretically and empirically underscored the importance of attention shifting. For example, Crick and Dodge's (1994) social information-processing model outlines how children cognitively process information in the context of social interactions, and an initial step in this process is selective attention. Selective attention is a related construct to attention shifting, as both allow for appropriate filtering of environmental cues. Wilson (2003) states that shifting attention is an especially difficult task for children who display aggressive behavior. This is because aggressive children are more likely to focus on environmental cues, particularly ones that are hostile, and less likely to shift their attention to other cues (Gouze, 1987). In fact, Wilson (2003) found that aggressive children had significantly more difficulty on the Children's Attentional Shifting Task compared to their nonaggressive peers. Such difficulty may be foundational for the development of hostile attributional bias, defined as the tendency to attribute hostile intent in ambiguous situations (Gouze, 1987). It has also been argued that attention shifting represents attempts to control intake of stimuli (Gilliom et al., 2002), which is the foundation of distraction as a regulatory skill. Thus, deficits in attention shifting, particularly in the context of social interactions, may serve as a unique risk factor for later attentional biases and may impede the development of more adaptive regulation strategies.

Previous literature has also established that attentional deficits become more pronounced in the presence of negative affect (Dodge & Somberg, 1987). In fact, Lemerise and Arsenio (2000) articulated an integrated model of emotion processes and cognition in social information processing to extend Crick and Dodge's (1994) model and highlight the importance of cognitive processes in the context of negative reactivity. Indeed, the propensity to display negative emotions may exacerbate the relation between poor attention shifting and externalizing behavior. This may be especially true for children with high anger reactivity, given the strong link between anger and externalizing behavior. However, no work to date has examined if the interplay between anger reactivity and poor attention shifting is essential and unique.

In summary, components of reactivity and regulation have emerged in the literature as predictors of behavioral outcomes, with anger reactivity and attentional control (as a composite) most consistently predicting externalizing behavior (Betts et al., 2009; Derryberry & Rothbart, 1988; Eisenberg et al., 2001; Hart et al., 1998; Janson & Mathiesen, 2008; Moffitt, 1993; Muris et al., 2008). Considering the

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