



Being hot-tempered: Autonomic, emotional, and behavioral distinctions between childhood reactive and proactive aggression

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ABSTRACT

Reactive aggression (RA) is an angry response to perceived provocation. Proactive aggression (PA) is a pre-meditated act used to achieve some goal. This study test hypotheses that (1) individuals high in RA and PA will differ in resting levels of autonomic arousal and (2) RA will be related to emotional and behavioral problems, while PA only to behavioral problems.

Parents of 68 children (age 6–13) reported on child symptoms, reactive/proactive aggression, and behavior problems. Resting heart rate (HR), skin conductance (SC), and HR variability (HRV) were measured in 42 of the children. RA was significantly related to decreased HRV and a trend for decreased SC, while PA was significantly related to increased SC and HRV. RA was significantly related to increased internalizing behaviors and attention deficits, while PA was significantly related to increased hyperactivity/impulsivity and delinquent behavior problems.

Findings support a distinction between child reactive (hot-tempered) and proactive (cold-tempered) aggression in autonomic, emotional (i.e., internalizing problems), and behavioral (i.e., attention deficits, hyperactivity/impulsivity, and delinquent behavior) functioning, and are discussed in relation to theories of antisocial behavior.

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Based on the distinction between defensive and predatory aggression in the animal literature (e.g., Moyer, 1976), two corresponding dimensions of aggression in children have been identified (Vitiello and Stoff, 1997). Reactive aggression (RA) is a visceral defensive response to perceived threat or provocation within the context of associated intense fear, anger, or frustration (i.e., hot-tempered). Proactive aggression (PA), on the other hand, involves a relatively non-emotional display of aggression used to intimidate others or to obtain a specified goal (i.e., cold-tempered). It is more often pre-meditated and manipulative.

Proactive and reactive aggressive behaviors are often highly correlated in children, and this correlation has been explained in two ways. First, the two functions often co-occur within aggressive individuals; second, questionnaires may confound form with function, such that common properties of physical/overt forms of aggression may be captured rather than the motivational distinctions between reactive and proactive aggression (Card and Little, 2006; Polman et al., 2007). Despite the intercorrelation, several investigators have found the distinction to be reliable and to be related to a variety of social and cognitive variables (Kempes

et al., 2005; Merk et al., 2005). For example, using confirmatory factor analysis, Poulin and Boivin (2000) found that a two-factor model of proactive and reactive aggression fit the data better than a one-factor model, and each factor contributed uniquely to predictions of peer reports of the child's aggression. Further, the two-factor model has been found to be consistent across gender and age (Kempes et al., 2006). As such, it may be important to understand the different risks and causal pathways of these two factors, RA and PA. The current study was undertaken to examine the autonomic, emotional, and behavioral distinctions between these two functions of child aggressive behavior.

1. Theoretical models

RA and PA have been explained by two primary theoretical models. Specifically, RA is rooted in the frustration–anger theory of aggression (Dollard et al., 1939; see Vitaro et al., 2006 for review) such that the motive is to react to the anger–frustration stimulus and injure the perpetrator of the real or perceived threat or provocation. Thus, RA is often described as 'hot-tempered,' capturing the essential feature of strong negative emotion. In contrast, PA is considered to be more instrumental or goal-driven in nature. It is often planned or pre-meditated, and is described as 'cold-tempered' due to a general lack of emotional arousal. Rather

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than an act of frustration, therefore, PA is thought to be rooted in social learning (Bandura, 1973) in that aggressive behavior is regulated by learned reinforcement contingencies.

These two general theories have been expanded in recent years, though the general principles remain. For example, Berkowitz (1990, 1993) extended the frustration–anger theory with the Cognitive Neo-Associationistic (CNA) theory (Berkowitz and Harmon-Jones, 2004), suggesting that through a spreading of activation across the associative network (i.e., thoughts, memories, physiological responses, and feelings) of anger, negative affect can automatically elicit an angry and potentially aggressive response. Similarly, the General Aggression Model (GAM; Anderson and Bushman, 2002) proposes that a primary contributor to anger and aggression involves the spreading of activation. However, it distinguishes between automatic and controlled stages of processing, and proposes that perseverating on hostile information (i.e., a controlled process) can increase the intensity of initially automatic reactions of hostility, anger, and aggression. Like the frustration–anger theory, however, CNA theory and GAM both focus on negative affect as an instigator of RA.

The social learning model has been expanded in social cognitive theories. For example, according to social information-processing (SIP) theory (Crick and Dodge, 1994), both RA and PA are related to cognitive processes in social contexts but may be associated with different temporal stages of processing. Specifically, RA is related to early stages of information processing that are associated with attending to and encoding hostile cues in a social situation as well as making hostile attributions of intent. These are considered automatic processes and theoretically may be consistent with the frustration–anger models noted above. Recently, like the notion of automatic and controlled processes noted in GAM, SIP theory has been extended in models that suggest that anger and/or hostile attributions are automatic processes that can only be inhibited if the individual then engages in effortful control (Dodge, 2006; Wilkowski and Robinson, 2008). PA, on the other hand, is associated with biases in later stages of processing, specifically valuing instrumental over social goals and believing that aggression will lead to positive outcomes (Crick and Dodge, 1996). These latter processes are consistent with the social learning model of Bandura (1973) in emphasizing reinforcement learning patterns that lead to greater self-efficacy for aggressive behavior.

2. Emotional and behavioral functioning and reactive/proactive aggression

Consistent with an association found between youth aggression and emotional problems (e.g., depression and anxiety; Zoccolillo, 1992), the frustration–anger model suggests that RA is related to negative affectivity, especially emotions that increase frustration/irritability and perceptions of threat. In support of the notion of increased emotionality in relation to RA, Dodge et al. (1997) found that reactively aggressive children were more likely to display depression than proactively aggressive children. Additionally, Raine et al. (2006) found that adolescents who engaged in RA were more socially anxious. In a recent meta-analysis, Card and Little (2006) concluded that RA, but not PA, was related to internalizing problems and emotional dysregulation. With regard to threat perception, only RA has been associated with perceptual distortion and information-processing abnormalities (i.e., ideas of reference and hostility; Raine et al., 2006), such as making inaccurate hostile attributions of others' behaviors (Crick and Dodge, 1996; Dodge and Coie, 1987; Orobio de Castro et al., 2005). Overall, these findings support the notion that emotional difficulties are associated with reactive but not proactive aggression.

With the exception of SIP theory and encoding, however, the theoretical models do not appear to indicate clear relationships of

reactive or proactive aggression with behavior problems, such as attention problems, attention-deficit/hyperactivity disorder (ADHD), or delinquency, and empirical findings in this regard have also been mixed. For example, some studies found that RA was associated with increased problems in attention and impulsivity, whereas PA was not (Atkins and Stoff, 1993; Conner et al., 2003; Dodge et al., 1997; Kempes et al., 2006). Dodge and colleagues (Crick and Dodge, 1996; Dodge and Coie, 1987) also noted that RA was related to biases in early stages of information processing, which involve reduced attention and encoding of relevant situation cues. Others, however, found that both aggressive functions were related to ADHD-type symptoms (see review by Card and Little, 2006; Conner et al., 2004), or that hyperactivity was uniquely related to PA (Raine et al., 2006). Similarly, some researchers found a specific association between delinquent behaviors and PA. For example, Vitaro et al. (1998) found that proactive, but not reactive, aggressive behaviors at age 12 predicted delinquency and disruptive behavior in mid-adolescence; and Raine et al. (2006) characterized proactively aggressive adolescents as psychopathy-prone and seriously violent. However, in their meta-analytic review, Card and Little (2006) found that delinquency was related to both reactive and proactive aggression. Similarly, disruptive behavior disorders (i.e., Oppositional Defiant Disorder, Conduct Disorder, and ADHD) were related to both RA and PA in a study conducted by Conner et al. (2004). According to Brendgen et al. (2001), PA was predictive of later delinquency-related violence when they receive poor parental supervision, whereas RA was predictive of future dating violence in conditions of low maternal warmth and caregiving. As such, while RA is clearly associated with emotional difficulties, it is not clear if reactive and proactive aggression can be distinguished in terms of behavior problems.

3. Autonomic functioning and reactive/proactive aggression

The autonomic nervous system (ANS) has parasympathetic and sympathetic branches to regulate critical life functions and control the “fight or flight” stress reaction (e.g., Porges, 2007). The sympathetic nervous system (SNS) is concerned with preparing the body for fight or flight in situations of threat or danger; it is associated with responses such as increased heart rate (HR), blood pressure, cardiac output, and skin conductance (SC). The parasympathetic nervous system (PNS) is concerned with the conservation of energy and restoration to a calm state; it is associated with vagally mediated responses such as decreased HR and blood pressure, and increased heart rate variability (HRV; defined as the variation in intervals between heart beats that varies as a function of respiration). While the SNS and PNS are often viewed in terms of their functions under conditions of threat, sympathetic and parasympathetic tone in a resting state may reflect individual differences in the capacity to respond adaptively to internal and external demands placed upon the system. That is, resting activity of the SNS may reflect the individual's preparedness for responding to threat, and resting activity of the PNS may reflect the ability to restore the body's functions after a danger has occurred. In this way, the SNS and PNS are often thought to act reciprocally. In Bernston's model of autonomic space (Bernston et al., 1991), however, it is also noted that the SNS and PNS branches do not always conform to the classical reciprocal pattern (i.e., coupled and coactive), suggesting a multidimensional nature of autonomic responding.

In a review of the literature on the psychophysiology of anger and biological findings on crime, Scarpa and Raine (1997, 2000) proposed that autonomic hyper-arousal may underlie RA. The frustration–anger models are consistent with this notion that RA is associated with heightened emotional and physiological arousal,

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