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# Attention-Deficit/Hyperactivity Disorder symptoms in adults: Relationship to Gray's Behavioral Approach System

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## Abstract

Disinhibition has received considerable recognition as a primary deficit in Attention-Deficit/Hyperactivity Disorder (AD/HD). The goal of the present study was to investigate claims that Gray's Behavioral Approach System (BAS) is linked to a disinhibitory deficit and can account for hyperactive-impulsive AD/HD behaviors. A sample of 184 undergraduates responded to measures of Gray's and other personality dimensions. BAS scores were positively related to and were significant predictors of hyperactive-impulsive symptoms, and also appeared to be related to inattentive AD/HD symptoms in females. Behavioral Inhibition System (BIS) scores did not predict hyperactive-impulsive symptoms, suggesting that it is not a primary deficit for hyperactive-impulsive behaviors. Other disinhibitory pathways along Gray's model, such as a response modulation deficit, were supported. Overactive BAS functioning is offered as a contributor to hyperactive-impulsive symptoms in adults.

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*Keywords:* Attention-Deficit/Hyperactivity Disorder; Reinforcement Sensitivity Theory; Behavioral Approach System; Behavioral Inhibition System

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## 1. Introduction

Attention-Deficit/Hyperactivity Disorder (AD/HD) is a developmental disability with three core symptoms, they are inattention, hyperactivity, and impulsivity (American Psychiatric Association, 2000). Those diagnosed with AD/HD are categorized into Predominantly Inattentive, Predominantly Hyperactive-Impulsive, or Combined subtypes. Follow-up studies of children diagnosed with AD/HD report persistence of the disorder into adulthood (see Faraone et al., 2000, for a review).

One of the proposed primary deficits in AD/HD is a failure to inhibit goal irrelevant behavior. These disinhibition theories emphasize hyperactive-impulsive symptoms as the core symptom in AD/HD (Nigg, 2001). However, before a resolution can be reached whether disinhibition is a primary cause, it must first be defined. In a review of disinhibitory AD/HD accounts, Nigg (2001) provided a conceptual framework of inhibitory processes and a distinction between types: executive inhibition and motivational inhibition.

Executive inhibition processes refer to withholding cognitive and motor responses so that a goal that is internally represented in working memory may be reached at a later time (Nigg, 2001). An example of this inhibitory model is Barkley's (1997a, 1997b) theory which claims that AD/HD individuals are more likely to fail to suppress responses that are not directed towards an internally represented goal. The motivational account refers to the inhibition of cognitive or behavioral responses to environmental cues of reward or punishment that redirect attention to an unanticipated stimulus (Nigg, 2001). Gray's (1991) personality model is considered a motivational account and has a particularly long history of involvement in AD/HD deficit accounts (e.g., Quay, 1988, 1997).

A recent meta-analysis of the Stroop Task, an executive task, indicated performance between AD/HD and control groups does not differ (van Mourik, Oosterlaan, & Sergeant, 2005). Also, alternative accounts to executive disinhibition (i.e., motivational), have not been adequately explored (Nigg, 2001). Additionally, poor motivational inhibition mediates executive inhibition (Avila & Parcet, 2001), indicating that these two disinhibition processes are not distinct and the motivational account should be better understood so that it may be considered in defining the disinhibition process within AD/HD. Therefore, the purpose of the current study was to investigate the relationship between Gray's dimensions of personality and their relationship to AD/HD symptoms, particularly hyperactivity-impulsivity.

### 1.1. Reinforcement Sensitivity Theory

Gray's theory—Reinforcement Sensitivity Theory (RST)—emphasizes individual differences along the Behavioral Inhibition System (BIS) and the Behavioral Approach System (BAS) (Pickering & Gray, 1999). Individual differences result from a variation in sensitivity or reactivity along each dimension to specific reinforcing stimuli. The BAS responds to stimuli for reward or relief from punishment (Gray, 1991). The BAS activates the organism in response to cues of reward and is characterized by impulsivity (see Pickering & Gray, 1999, for a review). In past versions of RST, the BIS responds to conditioned stimuli for punishment and nonreward, as well as novelty and innate fear stimuli, to increase passive avoidance and extinction (Gray, 1991). For example, the BIS may cause an organism to stop any ongoing behavior, increase nonspecific

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