



# Deep roots? Behavioral Inhibition and Behavioral Activation System (BIS/BAS) sensitivity and entrepreneurship

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## ABSTRACT

A growing number of studies suggest a link between disinhibition and entrepreneurship. Separately, psychology literature has theorized and empirically shown that the roots of disinhibition can largely be traced to two psychophysiological systems – the behavioral inhibition system (BIS) and behavioral activation system (BAS). Despite BIS/BAS sensitivity underlying constructs linked to venturing (e.g. impulsivity, clinical profiles, personality, motivation), and the existence of validated self-report scales for BIS/BAS operationalization, research has almost entirely yet to examine the connection between BIS/BAS sensitivity and entrepreneurship. We explore whether BIS and BAS sensitivities are related to entrepreneurial action and performance. Two studies are presented, and serve as a basis for further inquiry. Our examination of BIS/BAS (and associated Reinforcement Sensitivity Theory) in entrepreneurship adds to prior research that has largely looked to higher-order constructs. This work further opens and substantiates emerging research in entrepreneurship involving for example impulse-driven action, clinical constructs such as attention deficit/hyperactivity disorder, and underlying drivers of individual differences.

## 1. Introduction

A number of entrepreneurship studies have recently suggested the relevance of behavioral disinhibition (Lerner, 2016), of acting on impulse/impulsivity (Wiklund et al., 2016, 2017b), and of related constructs such as ADHD (Lerner et al., 2018c; Thurik et al., 2016; Verheul et al., 2015, 2016). Building on these, Lerner, Hunt and Dimov (2018a: 56) suggest suggest disinhibition is an important yet illusive “alternative logic [of] entrepreneurial action.” Implicated in, and underlying the aforementioned constructs, are two psychophysiological systems: the *behavioral inhibition system* (BIS) and the *behavioral activation system* (BAS) (Gray, 1970, 1982, 1994; Nigg, 2000). The two systems form the essence of Reinforcement Sensitivity Theory<sup>1</sup> (Carver and White, 1994; Corr, 2004; Gray, 1991), which suggests the following: 1) BIS is the aversive motivational system, largely inhibiting behavior in response to

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<sup>1</sup> The existence of the theorized systems has been verified extensively in humans as well as in animals (e.g., Carver and White, 1994; Gray, 1970, 1982, 1991). Note: A third system characterized by *fight-or-flight* has also been conceptualized. In this paper, we limit our focus to the core original BIS/BAS systems, considering the data available and that behavioral inhibition and behavioral activation sensitivities reason to be more central to entrepreneurship. As such, inquiry into *fight-or-flight* as well as later sub-delineations of the original BIS, are among many future research opportunities.

potential threat; 2) BAS is the appetitive motivational system, activating behavior in response to potential reward; 3) the more sensitive a system, the more likely it is to be triggered/activated and the stronger the response.

To briefly elaborate on each system: BIS is sensitive to stimuli associated with punishment and threat posed by novelty; it is related to anxiety, risk assessment, uncertainty avoidance and inhibition of movement (e.g., Gray and McNaughton, 2000). BAS, on the other hand, is sensitive to potential reward; it is related to excitement, goal drive, novelty seeking (Cloninger, 1987), and hyperactive-impulsive ADHD behaviors (Nigg, 2000). BAS can be parsed into three sub-dimensions: Reward Responsiveness (BAS-RR) focuses on the strength of the reaction to the occurrence or anticipation of a reward; Drive (BAS-D) involves the primacy of moving to get what is desired; Fun Seeking (BAS-FS) captures the “desire for new rewards and a willingness to approach a potentially rewarding event on the spur of the moment” (Carver and White, 1994: 322). Individual differences in BIS sensitivity and BAS sensitivity are understood to be stable (e.g., Carver and White, 1994; Gray, 1994).

The relevance and potential connection of BIS/BAS sensitivity to entrepreneurship looms large. Entrepreneurship is characterized by uncertainty and novelty (McMullen and Dimov, 2013), with myriad environmental cues of potential threat and reward. Thus, interpersonal differences in BIS and BAS sensitivities may affect not only entrepreneurial intent (Geenen et al., 2016), but may also underlie and shape entrepreneurial action and outcomes. Related to this and a growing conversation in entrepreneurship, Lerner and colleagues (2018a) present three cases of entrepreneurs appearing to act in line with high-BAS/low-BIS, and suggest its relevance in less-reasoned pathways to entrepreneurship.

However, beyond early and overly abbreviated explorations (Lerner, 2010; Lerner and Fitza, 2012), there appears to be only one published article empirically examining BIS/BAS in entrepreneurship – Geenen and colleague's (2016) study of entrepreneurial intent. Accordingly, further examination of BIS/BAS in entrepreneurship is important for grounding and shaping emerging conversations. Overall, BIS/BAS Reinforcement Sensitivity Theory (RST) offers a general, parsimonious framework for understanding and integrating a diversity of recent research. For example, with reinforcement sensitivity being able to explain the origin and magnitude of an impulse, and at the root of stable differences in impulsivity (Gray, 1994) and personality (e.g. Corr, DeYoung, & McNaughton, 2013), RST is capable of integrating disparate entrepreneurship research. More fine-grained reasons why a look through the BIS/BAS RST lens is important and has the potential to further stimulate research and theory development in entrepreneurship include the following.

First, motivational theories explaining and predicting the direction, amplitude, and persistence of individuals' behavior (Kanfer, 1992) – such as attempting to start a business venture as well as running one – are important to understanding entrepreneurship (e.g., Locke and Baum, 2007). Prior research, largely focusing on higher-order human psychology, has advanced the understanding of top-down reasoned goal selection, pursuit, and associated entrepreneurial behavior. Such research has indeed made important contributions, based on the premise of higher-order reasoning preceding and underlying action (e.g., deliberate assessments of one's aptitudes and their mesh with the skills needed of venturing, of feasibility, and/or of goals) (Lerner et al., 2018a). We fully agree that reasoned, consciously held goals often motivate and direct complex human behavior. Concurrently, motivation and behavior can also originate from uninhibited bottom-up appetitive impulses (Carver and White, 1994; Carver, 2005). In contrast to top-down, bottom-up pathways refer to that which is not directed by intentional thought and associated top-down (prefrontal neocortex) circuitry – but rather involves more basic and reactive psychophysiology and upward neurocircuitry and responding (Carver 2005; Phelps, 2006; Phelps et al., 2001). The possibility of motivation and behavior being fueled to some degree by uninhibited bottom-up appetitive impulses may be particularly relevant in an entrepreneurial context where individuals have to act quickly and under uncertainty (Lerner et al., 2018a; Wiklund et al., 2017b). Consequently, it is worthwhile to look into BIS/BAS sensitivities as they specifically address the deeper, bottom-up hedonic part of motivational theory.

Second, entrepreneurship is understood as a process involving motives, actions, and venturing outcomes (McMullen and Dimov, 2013). BIS/BAS sensitivity might differentially affect different aspects of entrepreneurship. For example, the role of BIS/BAS might vary depending on specific components or aspects of the entrepreneurial process because of the diverse nature of entrepreneurial venturing itself (e.g., Baron, 2008; Lerner et al., 2018b; Shane, 2003). The perception of and reaction to stimuli associated with *developing entrepreneurial intentions*, versus *actually attempting to start a venture*, versus *ultimately generating sustained entrepreneurial profit* are apt to differentially involve behavioral inhibition and behavioral activation systems (cf. Lerner et al., 2018b). For example, in terms of entrepreneurial intentions in individuals with no prior venturing experience, Geenen and colleagues (2016) found that reward responsiveness (BAS-RR) was negatively related to entrepreneurial intentions, while fun seeking (BAS-FS) was positively associated with entrepreneurial intentions. This makes sense given, respectively, the immediacy of rewards in wage-employment and the thrilling *idea* of venturing (e.g., Baron, 2007). Yet to take action under uncertainty – on multiple fronts ranging from creative prototyping, to raising finance, to dealing with regulations, to recruiting employees and so forth (Hatak and Snellman, 2017; Lerner et al., 2018b) – different sensitivities may be more relevant, such as high BAS-Drive. Finally, given competitive pressures and that entrepreneurial rents do not last indefinitely, what serves long-term venture performance: a desire for new rewards (BAS-FS) while also keeping at the currently rewarding opportunity (BAS-RR), high drive (BAS-D), and/or a sufficiently limited sensitivity to threat to be willing to take the risk of innovation (low BIS)? Suffice to say, the role of BIS/BAS sensitivity in venturing is unknown and may change according to the particular entrepreneurial context (e.g. stage of the entrepreneurial process) (cf. Baron and Markman, 2005; McMullen and Dimov, 2013).

Third, BIS/BAS sensitivity has been related to deviant workplace behavior (Diefendorff and Mehta, 2007; Hogan and Holland, 2003). Additionally, research in clinical psychology indicates that BIS/BAS can be used to analyze sub-clinical as well as clinical behavior (Bijtebier et al., 2009). Accordingly, BIS/BAS Reinforcement Sensitivity Theory can be useful in entrepreneurship, as it is able to accommodate and integrate recent scholarly inquiries involving ADHD and other clinical and non-clinical constructs – based on a common neurological underpinning. For example, high BAS (particularly BAS-FS and BAS-RR) is associated with addiction and

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