Distinguishing BAS risk for university students' drinking, smoking, and gambling behaviors

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ARTICLE INFO

ABSTRACT

Individual differences in Gray's Behavioral Approach System (BAS) and Behavioral Inhibition System (BIS) have been associated with young adults' substance misuse and gambling. To clarify the distinct and common etiology of these behaviors, the current study examined the unique influence of BAS sub-components (Reward Responsiveness, Drive, Fun Seeking) and BIS on university students' drinking, smoking, and gambling behaviors. Participants included 533 (361 females) undergraduate students who completed self reports of BIS/BAS (Carver & White, 1994) and retrospective reports of frequency and quantity/money spent of alcohol use, cigarette use, and gambling. Drinking, smoking, and gambling status were identified based on past month behavior. Logistic regressions revealed that Fun Seeking was associated with increased risk for being a drinker or smoker. BAS and BIS were not supported as unique predictors of gambling status. Linear regressions revealed that Fun Seeking was positively associated with drinking, and Drive and Fun Seeking were positively and negatively associated with gambling, respectively. Findings suggest that different components of BAS sensitivity contribute to drinking and smoking compared to gambling, such that the tendency to seek out new potentially rewarding experiences puts individuals at risk for drinking/smoking, while the tendency to pursue appetitive goals increases risk for gambling.

1. Introduction

Rates of drinking among university students continue to be a concern, with 30–50% of those who drink engaging in heavy episodic use (e.g., Adlaf, Demers, & Gliksman, 2005). In addition, while the overall rates of cigarette smoking are declining (CDC, 2005), about 30% of university students smoke. Of these, almost 13% smoke at least a pack a day (Rigotti, Lee, & Wechsler, 2000). Gambling among university students also is a growing concern, with upwards of 42% of students gambling (LaBrie, Shaffer, LaPlante, & Wechsler, 2003), and more than 7% gambling at problematic levels (Shaffer, Hall, & Vander Bilt, 1999). Moreover, there is a high co-occurrence of these risk behaviors in undergraduates (e.g., Stuhldreher, Stuhldreher, & Forrest, 2007).

Personality has been identified as an important influence on drinking, smoking, and gambling during early adulthood (Gupta, Derevensky, & Ellenbogen, 2006; McChargue, Cohen, & Cook, 2004; Sher, Trull, Bartholow, & Vieth, 1999). Addiction models emphasize reinforcement as a critical factor, such that drinking, smoking, and gambling are motivated by either the desire to experience positive (e.g., euphoria) or decrease negative (e.g., offer escape) outcomes (Cooper, Frone, Russell, & Mudar, 1995; Doran, McChargue, & Cohen, 2007; Raylu & Oei, 2002). Accordingly, models of motivationally-relevant individual difference variables provide a useful framework for examining personality risk for addictive behaviors.

Gray's (1975) original reinforcement sensitivity theory attributes behavior to the relative strength of two motivational systems – the behavioral approach and behavioral inhibition systems (BAS and BIS). These are thought to be causal systems that underlie more secondary personality constructs (e.g., extraversion, neuroticism) and as such are important for understanding etiology of addictive behaviors (see Corr, 2008 for review). The BAS is an approach system that manifests itself in the active pursuit of reward. Those with a strong BAS are characterized by a sensitivity to cues signaling potential reward, thus may be more attentive to the potential rewarding effects of addictive behaviors, such as the euphoric effects of alcohol (Marlatt, 1987), the pleasurable effects of smoking (Doran et al., 2007), or the excitement about a potential win when gambling (Raylu & Oei, 2002). Accordingly, those with a strong BAS are at risk for engaging in addictive behaviors for positive reinforcement. Gray and McNaughton (2000); see Corr, 2008 for review) revised the BIS/BAS theory,

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and while the function of the BAS remained largely unchanged, a new conceptualization of the BIS was offered. Originally the BIS was thought to inhibit behavior in response to cues of potential punishment. However, the revised theory views the BIS as a conflict resolution system; one that moves an individual towards a decision of behavioral approach or avoidance by drawing attention to the potential dangers of a behavior. Thus, a high BIS individual will overattend to the warning signs of a behavior, leading to avoidance. A strong BIS gives rise to high levels of anxiety (Gray & McNaughton, 2000), which may lead to the inclination to self-medicate (Pihl & Peterson, 1995). Accordingly, those with a strong BIS may be at risk for engaging in addictive behaviors for negative reinforcement.

The BIS and BAS have been linked to many of the other personality constructs in the extant literature. For example, Eysenck's neuroticism and extraversion (Eysenck & Eysenck, 1991) are thought to map onto (although not directly) Gray's model (Corr, 2002). Extraversion is thought to reflect the balance of the BIS–BAS sensitivities, where an imbalance favoring BAS leads to elevated extraversion. Conversely, neuroticism is thought to reflect the strengths of the BIS–BAS, such that a strong BIS that disproportionably suppresses the BAS leads to elevated neuroticism.[1]

While there is theoretical support for the BAS and BIS risk pathways to addictive behaviors, the BAS pathway has received much more attention and consistent empirical support. A strong BAS has been associated with elevated risk for alcohol and illicit drug abuse (e.g., Franken, Muris, & Georgieva, 2006), as well as the sub-clinical levels of alcohol misuse that are prevalent on university campuses (e.g., O'Connor & Colder, 2005). Research examining BAS as a risk factor for smoking and gambling is more limited. One study identified BAS as a predictor of substance use including cigarette smoking, but the direct link to smoking could not be disaggregated (Knyazev, 2004). BAS has also been associated with gambling indirectly. For example, a strong BAS was associated with poor performance on the Iowa Gambling Task (Suhr & Tsanadis, 2007), however this is not a direct measure of gambling propensity. While there is a paucity of research examining the direct association between BAS and smoking and gambling, there is evidence to suggest that disinhibited behavior and low constraint – indicators of a strong BAS – are associated with risk for these behaviors (e.g., Slutske, Caspi, Moffitt, & Poulton, 2005; White, Pandina, & Chen, 2002). Together these data suggest that BAS may be a common personality risk for heavy drinking, smoking, and problem gambling, however, research incorporating direct measures of BAS is needed.

Empirical research examining BIS as a risk factor for substance misuse and problem gambling is similarly limited. While there is an emerging literature supporting use of cigarettes and gambling for negative reinforcement purposes (e.g., Doran et al., 2007; Raylu & Oei, 2002) there appears to be no direct examination of the relations of BIS to smoking and gambling. Furthermore, examination of BIS-related constructs as risk factors for substance use and gambling have yielded inconsistent findings. Some evidence supports an anxiety-related pathway to heavy drinking, smoking, and problem gambling (e.g., Audrain, Lerman, Gomez-Caminero, Boyd, & Orleans, 1998; see Carrigan & Randall, 2003; el-Guebaly et al., 2006), while other findings do not support BIS and BIS-related constructs as significant predictors (e.g., O'Connor & Colder, 2005). Moreover, there is some theoretical support for a negative relation between BIS and these problem behaviors, such that those with a weak BIS are at greater risk for engaging in impulsive behaviors (Corr, 2002).

Research examining both BAS and BIS as predictors of problematic alcohol use suggests that a strong BAS may be particularly important among undergraduates (O'Connor & Colder, 2005). Accordingly, the primary goal of the current study was to directly examine BAS as a risk factor for heavy drinking, smoking, and high levels of gambling in university students. Research suggests that global BAS is comprised of distinct components (e.g., Carver & White, 1994), such that there are three lower-order BAS components: Reward Responsiveness (positive response to reward or anticipation of reward), Drive (pursuit of rewarding goals), and Fun Seeking (seeking out new rewards). Fun Seeking and (to a lesser degree) Drive, but not Reward Responsiveness, are associated with risk-taking and novelty seeking behavior (Carver & White, 1994; Smillie, Jackson, & Dalgleish, 2006). Moreover, only Fun Seeking and Drive have been linked to alcohol misuse and illicit drug use (Franken & Muris, 2006; Franken et al., 2006). These data suggest that there may be utility in considering the distinct lower-order BAS constructs when modeling risk for addictive behaviors. No research to date has elucidated the unique and shared associations between these three BAS constructs and smoking and gambling behavior. In the current study, Reward Responsiveness, Drive, and Fun Seeking were examined as unique predictors of undergraduates' drinking, smoking, and gambling behavior. This allowed us to consider the common and possibly distinct etiology of these behaviors. We hypothesized that like alcohol use, Fun Seeking and/or Drive would be important predictors of smoking and gambling. In addition, a secondary goal was to examine BIS as a predictor of these three behaviors.

2. Method

2.1. Participants and procedure

Participants included 533 (361 females) undergraduate students enrolled at an Eastern Canadian university. On average, participants were 18.9 years old ($SD = 3.0$), the majority (84%) were in their first year, and 58% were Euro-Canadian and 30% identified as "other". Minority groups included Aboriginal, Asian-Canadian, and African-Canadian. The measures for this study were completed as part of the Psychology Department's mass screening questionnaire battery. Participation was compensated with course credit.

2.2. Measures

BIS/BAS. Carver and White's (1994) 20-item measure, which is based on Gray's (1975) original BIS/BAS theory, includes one BIS scale (7 items, e.g., *I worry about making mistakes*) and three BAS scales: Reward Responsiveness (5 items, e.g., *When I get something I want, I feel excited and energized*), Drive (4 items, e.g., *If I see a chance to get something I want, I move on it right away*), and Fun Seeking (4 items, e.g., *I crave excitement and new sensations*). Responses were made on 4-point scales (1 = *strong disagreement* to 4 = *strong agreement*), and were totaled to form scale scores. The psychometric properties of these scales are well supported (e.g., Heubeck, Wilkinson, & Cologon, 1998; Ross, Millis, Bonebright, & Bailley, 2002). In the present study, the Cronbach's alpha for the BIS scale was .75, and for the BAS scales the alphas were .81 for Reward Responsiveness, .88 for Drive, and .82 for Fun Seeking.

Drinking, Smoking, and Gambling. Behaviors over the past 30 days were assessed. Four-point scales were used to assess frequency of alcohol use (*Did Not Drink* or 1 = *once* to 4 = *6 or more times*), cigarette use (*Did Not Smoke* or 1 = *1 or 2 days* to 4 = *15–30 days*), and gambling (*Did Not Gamble* or 1 = *once* to 4 = *more than 6 times*) in the past 30 days. Five-point scales were used to assess quantity of alcohol use (*Did Not Drink* or 1 = *one [drink]* to 5 = *10 or*

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[1] Providing a full review of the theoretical links between Gray's model and the many other existing personality constructs is beyond the scope of this paper. The reader is referred to the very recently published book by Corr (2008) which provides an excellent review.