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Understanding Personality and Predicting Outcomes: The Utility of Cognitive-Behavioral Probes of Approach and Avoidance Motivation

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Abstract

Approach and avoidance motivation may represent important explanatory constructs in understanding how individuals differ. Such constructs have primarily been assessed in self-reported terms, but there are limitations to self-reports of motivation. Accordingly, the present review concentrates on the potential utility of implicit cognitive-behavioral probes of approach and avoidance motivation in modeling and understanding individual differences. The review summarizes multiple lines of research that have documented the utility of such probes to the personality-processing interface. Although multiple gaps to our knowledge exist, and are acknowledged, the value of such implicit cognitive-behavioral assessments is emphasized both in modeling multiple sub-components of approach and avoidance motivation and in showing that such tendencies matter in ways that transcend momentary experiences or manipulations.

Keywords

Personality; Approach; Avoidance; BAS; BIS; Implicit

We conceptualize approach and avoidance, much as Lewin (1936) did, in terms of movements toward or away from stimuli in the environment. Such movements, however, are often inhibited by human beings (Lang, Bradley, & Cuthbert, 1997). Accordingly, it is useful to understand approach and avoidance in terms of operations of underlying systems. Gray (1981; 1982) theorized a Behavioral Activation System (BAS) that is sensitive to potential rewards and motivated to seek them and a Behavioral Inhibition System (BIS) that is sensitive to potential threats and motivated to avoid them. Such systems are understood in terms of real-time interactions with the environment, yet consist of multiple sub-components and tendencies. Individual differences in BAS, for example, should bias perceptions of appetitive stimuli, trigger other approach-related thoughts, and influence both the direction and intensity of movements.

If BAS and BIS are important, then they should prove to have widespread predictive value as *individual differences* (Underwood, 1975). The largest relevant body of work has assessed BAS and BIS with self-report (Carver & White, 1994). Self-reports of motivation can be suspect (McClelland, 1987) and, perhaps more to the point, do not assess *operations* of these systems in terms of real-time interactions with the environment (Gray, 1982). In our review, we therefore concentrate on strategies for assessing operations of the BAS and the BIS in objective or implicit cognitive-behavioral terms, with a particular focus on individual differences.

The review is broadly organized in terms of different sub-components (e.g., perceptual, cognitive, motoric) of BAS and BIS. Research from our own laboratory is primarily reviewed because it has been somewhat unique in bridging this personality-processing interface. To foreshadow, some significant progress has been made in modeling different sub-components of BAS and BIS and these performance-based measures have demonstrated value in understanding individual differences. Some gaps to our knowledge exist, however, and future directions of research will therefore be advocated.

BAS as Incentive Salience

Gray (1982) suggested that the BAS is closely linked to a reactive dopamine neurotransmitter system. In support of this point, it has been established, among other relevant findings, that animals bred to lack the ability to synthesize dopamine exhibit pronounced inactivity and anemic reward-pursuit (e.g., Robinson, Sotak, During, & Palmiter, 2006). On the basis of an extensive subsequent analysis of this literature, Berridge (2007) concluded that dopamine release, in animal models, seems to serve the goal of boosting the signal of potentially rewarding stimuli, a process termed *incentive salience*.

The incentive salience idea can be translated to mean that rewarding stimuli should receive a perceptual “boost” relative to threatening or neutral stimuli. Just such a pattern was evident in four word processing studies by Ode, Winters, and Robinson (2012). The font size of rewarding words was overestimated relative to threatening and neutral words (Study 1) and the duration of rewarding words was also overestimated (Study 4).

If perceptual estimates in such paradigms are valid indicators of BAS motivation, then individual differences in them should predict outcomes thought to be marked by particularly high levels of BAS motivation. This point was confirmed in a set of studies by Robinson, Ode, Palder, and Fetterman (in press). Individuals displaying such reward-primed size overestimates to a greater extent were higher in interpersonal arrogance, particularly when they were also extraverted. Although more preliminary at the present time, we have also shown that individuals displaying such perceptual biases to a greater extent are angrier in their daily lives, results consistent with approach-related theories of anger (Carver & Harmon-Jones, 2009).

BAS as Behavioral Facilitation

Also building on dopamine-related animal models, Depue and Collins (1999) suggested a different marker of BAS functioning. Specifically, individuals higher in BAS motivation may be characterized by higher levels of what we term behavioral facilitation – a tendency toward more vigorous goal-directed efforts over time. Robinson, Meier, Tamir, Wilkowski, and Ode (2009) sought to model this process in choice reaction time tasks. In such tasks, an individual first encounters a goal – namely, to categorize stimuli as quickly as possible. To the extent that an individual “locks on” to this goal, his/her reaction times should exhibit greater speed as the task progresses. Just such a measure of behavioral facilitation was quantified, specifically by the creation of residual scores contrasting individuals whose processing speed increased or decreased relative to their earlier task performance.

Depue and Collins (1999) suggested that behavioral facilitation is a marker of BAS functioning. If so, the residual scores computed in the Robinson et al. (2009) studies should possess value in understanding outcomes theoretically linked to BAS functioning. Three studies supported such ideas. For example, Study 1 found that higher levels of behavioral facilitation were predictive of greater optimism, Study 2 found that higher levels of behavioral facilitation were predictive of observer reports of positive affect, and Study 3 found that higher levels of behavioral facilitation were predictive of having a higher

frequency of approach goals in daily life. It would seem important to extend these results to non-affective domains. For example, higher levels of behavioral facilitation may predict greater goal persistence and achievement, variables often emphasized in the goal literature (Elliot & Fryer, 2008).

BAS-Related Theories of Extraversion

Higher levels of the personality trait of extraversion are marked by assertiveness, positive emotionality, and more frequent social interactions (McCrae & Costa, 1999). The correlates of extraversion are well-established, but the processes responsible for such individual differences are not. Gray (1981) suggested that BAS-related processes are involved, a suggestion that has not been the focus of a great deal of personality-processing work (Matthews & Gilliland, 1999).

According to animal models of BAS motivation (Berridge, 2007; Depue & Collins, 1999), higher levels of it should predict the extent to which a rewarding stimulus triggers other thoughts of a rewarding type. This view of BAS motivation might be profitably examined in affective priming paradigms, which seek to assess spreading activation from one affective thought to another (Fazio, 2001). However, in doing so, it is important to examine affective priming effects for negative and positive targets separately, as only the latter type of priming effect would be consistent with a BAS-related mechanism.

Across four studies using affective words as well as pictures, Robinson, Moeller, and Ode (2010) found a systematic relationship between extraversion levels and positive affective priming effects, but not negative affective priming effects. For example, in Study 3, personality differences in extraversion were a strong predictor of the extent to which positive target evaluations were faster following positive primes, $r = .54$, but a non-significant predictor of the extent to which negative target evaluations were faster following negative primes, $r = -.23$. Such results are not only novel, but support theories of extraversion linking it to BAS operations. Of course, it would be useful to extend these results to other implicit probes of BAS motivation, an ongoing focus of research in our lab.

BIS-Related Theories of Neuroticism

Operations of the BIS are thought to underlie individual differences in neuroticism (Elliot & Thrash, 2002), though implicit evidence for this point has been sparse until recently. Robinson, Ode, Moeller, and Goetz (2007) found that neuroticism predicted negative but not positive affective priming effects, a spreading activation among negative thoughts consistent with BIS' proposed negativity (Gray, 1981; 1982). Higher levels of BIS should also result in greater reactivity to error feedback (Gray & NcNaughton, 2000). Such processes were modeled by Moeller and Robinson (2010). In Study 2 of that paper, participants were told that their choice predictions (whether the letter q or p would appear) were either correct or in error. Reactivity to error feedback was quantified in terms a greater frequency of switched predictions following error than correct feedback. Individuals high, but not low, in neuroticism exhibited this form of reactivity to error feedback.

Carver, Sutton, and Scheier (2000) highlighted another potential feature of BIS motivation. From a self-regulation perspective, BIS motivation may be associated with maximizing the distance between the self and objects in the environment (also see Lewin, 1936). As stated previously, such tendencies would be unlikely to result in overt escape behaviors in laboratory tasks involving human participants (Lang et al., 1997). On the other hand, such distancing dynamics might be evident in perceptual terms. Specifically, higher levels of neuroticism might be predictive of perceptions consistent with greater distancing. Such hypotheses were examined by Liu, Ode, Moeller, and Robinson (2012).

In Studies 1 and 2 of Liu et al. (2012), participants were asked to determine whether ambiguous temporal phrases (e.g., “moved forward”) suggested that an impending event was more proximal or more distal in time. Neurotic (but not stable) individuals inferred that such events were further in the future. In Study 3, participants were asked to estimate the font size of presented words (following Ode et al., 2012). Individuals higher in neuroticism estimated the words as smaller, consistent with the fact that moving away from objects reduces their retinal image (Gibson, 1966). In Study 4, word stimuli grew (toward the self) or shrank (away from the self) and participants estimated these rates of change. Participants high, but not low, in neuroticism perceived stimuli to be shrinking faster than they were growing, even when this was not the case. We have yet to show that extraversion predicts distance-reducing perceptions or that perceptual distancing predicts other theoretical correlates of BIS motivation, though such research directions can be encouraged on the basis of the Liu et al. (2012) findings.

BAS Dominance in a Movement Paradigm

Gray (1982) suggested that BAS and BIS should support distinct movement directions, either toward rewards (BAS) or away from threats (BIS). In an influential set of studies, Chen and Bargh (1999) instructed participants to move a joystick forward or backward and found that forward movements were initiated faster in the context of negative stimuli, consistent with pushing such stimuli away, whereas backward joystick movements were initiated faster in the context of positive stimuli, consistent with pulling such stimuli toward the self. Since then, it has become apparent that there is no hard-wired tendency to move forward in the case of undesirable stimuli in that task conditions can reverse the Chen and Bargh effect (e.g., Markman & Brendl, 2005). It therefore might be more informative, at least for some purposes, to ask people to move toward desirable stimuli and move away from undesirable stimuli. Such instructions essentially render a task suited to examine a distance-regulating account of approach and avoidance (Carver et al., 2000), as outlined by Eder and Rothermund (2008).

Accordingly, we (Boyd & Robinson, 2012; also see De Houwer, Crombez, Baeyens, & Hermans, 2001) asked individuals to move a joystick cursor toward desirable stimuli and away from undesirable stimuli which were presented up or down on the computer screen. We used the single words “reward” and “threat” as stimuli because they are equal in their number of letters, admirably simple, and readily understood. Many trials involved correct answers. For example, upward movements should be made when the word “reward” is presented toward the top of the computer screen and when the word “threat” is presented toward the bottom of the computer screen. Interspersed with such trials were critical trials in which the words “reward” and “threat” were placed in the same location – either high or low. This condition represents a classic approach-avoidance conflict (Miller, 1944). To the extent that BAS (BIS) predominates, movements should occur toward (away from) the conflicted area.

The same individuals in the Boyd and Robinson (2012) study subsequently completed a 14 day experience-sampling protocol. The focus was on anger experiences because anger is viewed as an approach-related affect (Carver & Harmon-Jones, 2009). As hypothesized, BAS-dominant individuals – i.e., those who more often moved toward rather than away from such conflict locations – experienced greater anger on days associated with higher levels of frustration or criticism (see Figure 1). These results should be extended to the prediction of other outcomes – such as impulsiveness, addictive behaviors, or psychopathy – often thought to result from a BAS that is strong in relation to a BIS that is weak (Corr, 2010). In any case, we emphasize the utility of this movement-related probe in assessing individual differences in BAS dominance.

The Potential Importance of Classes of Incentives

Gray (1981; 1982) suggested that some individuals are higher in BAS than others. This may well be true in general, but individuals almost certainly *also* differ in which sorts of incentives trigger BAS-related processes. In particular, there is general agreement that power and affiliation are two fundamental social motives, but motives that almost certainly differ in strength between individuals (McClelland, 1987). If so, power-oriented individuals might be expected to respond in a BAS-related manner particularly when power incentives are involved.

As a test of these ideas, we (Fetterman, Robinson, & Ode, 2012) assessed individual differences in interpersonal arrogance, with high arrogance reflective of behaviors (and possible motivations) favoring power over affiliation (Wiggins & Broughton, 1991). We hypothesized that people higher in interpersonal arrogance would exhibit BAS-related implicit tendencies particularly when power incentive stimuli (words like “status”) relative to affiliation incentive stimuli (words like “love”) were involved. Such interactive predictions were supported. Study 1 found that arrogant individuals, but not low arrogant individuals, categorized power words faster than affiliation words. Study 2 found that arrogant individuals, but not low arrogant individuals, overestimated the font size of power words relative to affiliation words. Study 3 asked individuals to move a joystick cursor toward or away from power or affiliation words. It was found that movement times favored approaching power stimuli and disfavored avoiding power stimuli, relative to affiliation stimuli, only at high levels of interpersonal arrogance.

On the basis of the Fetterman et al. (2012) findings, the approach-avoidance literature might be served by contrasting different rewards to be approached or punishments to be avoided. Wentura, Rothermund, and Bak (2000), too, made this point by showing that equally positive or negative words captured attention to a greater extent when such words suggested greater consequences for the self as an interaction partner. In addition, the Fetterman et al. (2012) findings suggest some future directions of research of an individual differences type. For example, we might expect drinkers relative to non-drinkers to display strong BAS-related tendencies particularly when exposed to alcohol cues relative to more generic reward stimuli.

Conclusions and Future Directions

Gray (1981) made an invaluable contribution to the personality literature by suggesting that BAS and BIS may underlie several important trait-related tendencies. It is clear, however, that Gray (1982) thought of BAS and BIS in terms of real-time interactions with the environment and his analysis also highlighted multiple sub-components of BAS and BIS – e.g., perceptual, cognitive, and motoric. Implicit or performance-based assessments, we believe, are flexible in modeling such processes and perhaps ideally suited in doing so.

Our review summarizes a number of findings in relation to a number of distinct measures and the reader is likely to desire more general conclusions. Our results, we think, suggest two bottom-line conclusions. First, if theories concerning operations of BAS and BIS (e.g., Gray, 1982) are important, then cognitive-behavioral assessments of these operations should prove to have utility in understanding individual differences. Our review documents multiple successes along such lines. Second, although it is common to suggest that personality traits can be understood in terms of underlying cognitive-behavioral processes, it is remarkable how rare relevant sources of evidence are presented. The research reviewed is thus important in part because we were able to point to evidence in favor of processing contributions to several traits.

Reliable assessments are important in understanding individual differences and we have found that many of the cognitive-behavioral assessments reviewed possess good levels of internal reliability (e.g., Liu et al., 2012; Robinson et al., 2009; Robinson et al., in press). There are gaps in our current knowledge, however. For example, we have yet to show that higher levels of extraversion are predictive of distance-reducing perceptual dynamics (Liu et al., 2012). In addition, we have yet to examine whether the different cognitive-behavioral measures reviewed covary with each other or interact with each other in predicting relevant traits or outcomes. Additionally, it seems probable that different assessments of BAS may predict different facets of extraversion. For example, behavioral facilitation might better predict assertive behavior, whereas positive affective priming might better predict positive emotional experiences.

Three additional directions of future research can be advocated. Our general focus has been on individual differences, but state-related manipulations might be valuable as well. For example, it is intuitive to suggest that manipulations of anxiety might influence whether people approach or avoid conflicted stimulus locations (Boyd & Robison, 2012). Further, a focus on pathological outcomes – e.g., depression, social phobia, addictive behaviors, etc. – seems important in extending the present work. Finally, process-oriented measures of BAS and BIS should, in principle, be trainable (MacLeod, Koster, & Fox, 2009). If so, manipulations of the processes highlighted in our review can be advocated in understanding their causal status as predictors of emotions and behaviors thought to result from variations in BAS and BIS.

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Figure 1.
Daily Anger as a Function of BAS Dominance and Daily Frustration (Top Panel) or Daily Criticism (Bottom Panel)