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Perceptual negativity predicts greater reactivity to negative events in daily life

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ABSTRACT

Reinforcement sensitivity theory includes the idea that people differ in their sensitivity to negative events, but relevant process-based assessments have not been developed. The present studies assessed sensitivity to negative events in terms of the extent to which negative word stimuli were perceived to be larger than neutral word stimuli. There was a general tendency to overestimate the size of negative relative to neutral words, but individuals differed substantially in this form of what is termed *perceptual negativity*. Of more importance, two studies (total $N = 151$) found systematic relationships between individual differences in perceptual negativity and reactivity to negative events in daily diary protocols. Study 1 found that within-person variations in the occurrence of daily negative events undermined goal-related optimism to a greater extent at higher, relative to lower, levels of perceptual negativity. Study 2 conceptually replicated this interaction in the context of within-person associations between the occurrence of daily negative events and antisocial behavior. These findings are important in advancing reinforcement sensitivity theory, in operationalizing a particular component of it, and in extending it to reactivity processes in daily life.

1. Introduction

Gray (1981, 1982, 1987) sought to understand the motivational and affective dynamics underlying propensities toward impulsive behavior and anxiety. In doing so, he proposed reinforcement sensitivity theory (RST). Of most importance in the present context, he suggested that individuals are likely to be differentially sensitive to threatening events in the environment and reactive to them for this reason, functions ascribed to a Behavioral Inhibition System (BIS). This system is activated by threats or negative events and orchestrates a possible defense by generating arousal, anxiety, and preparing for the organism for potential avoidance (Gray, 1987). It is worth noting that such functions might be ascribed to the fight-flight-freeze system (FFFS) rather than to the BIS in a revised version of RST; in revised RST, BIS plays a more internal monitoring function related to conflict management (Gray & McNaughton, 2000).

Reinforcement sensitivity theory has proven generative in thinking about variations in personality and clinical outcomes (Corr, 2008). Much of this work has involved self-reports of personality that have uncertain relations to the neurocognitive sorts of processes that Gray (1982, 1987) emphasized as well as to how an individual might react to negative events when they are actually encountered (Robinson, Boyd, & Liu, in press). In this connection, given that BIS is activated by negative events, a good portion of the system is likely related to "front-end" processes such as how negative events are attended to and perceived. Indeed, the term "sensitivity" in RST would seem to emphasize perceptual processes and particularly those that would enhance or boost the signal of negative stimuli when they occur. This perceptual component of the BIS has not been directly modeled, at least in the context of Gray's (1987) original RST framework.

There are, however, reasons for focusing on perceptual processes in assessing the impact of negative stimuli and, by extension, operations of the BIS of the original RST. Bruner and Postman (1948) found that tokens inscribed with negative affective symbols (e.g., a swastika) were perceived to be larger than those inscribed with neutral symbols. Cole, Balcetis, and Dunning (2013) found that people perceived a lesser distance between the self and an apparently dangerous person relative to two control conditions. Fessler, Holbrook, and Snyder (2012) found that others with weapons were perceived to be more muscular and taller than those without weapons. It is further evident that the brain prioritizes negative stimuli over neutral ones at an early level of processing (150–300 ms subsequent to exposure), a time course consistent with processing within the visual cortex (Bublatzky, Flaisch, Stockburger, Schmälzle, & Schupp, 2010). These results have not involved individual differences, but there are suggestions that at

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least certain forms of anxiety, such as simple phobias, may be characterized by what is termed "loomingness" – perceptions that negative stimuli are more dynamic and quickly approaching the self (Riskind, Rector, & Taylor, 2012). Further, it has been established that anxious people tend to selectively attend to threatening information (Frewen, Dozois, Joanisse, & Neufeld, 2008). What is yet to be determined is whether: (a) some people are more sensitive to negative over neutral events in strictly perceptual terms, (b) using non-phobic stimuli, and whether (c) such perceptions can allow us to understand individual differences in the sort of negative reactivity processes ascribed to BIS sensitivity (Corr, 2008).

In the context of limitations to current knowledge, we introduce an assessment intended to model a perceptual component of the (original) BIS (Gray, 1987) that we term *perceptual negativity*. It is defined and operationalized as a tendency to perceive negative stimuli to be larger than neutral stimuli. This operationalization is consistent with several studies in which size estimates have been shown to vary by motivational and affective factors (Bruner & Postman, 1948; Veltkamp, Aarts, & Custers, 2008). It is also consistent with biological models in which higher levels of motivation are thought to boost the "salience" of motivation-consistent stimuli (Berridge, 2007). Words were used as stimuli because they do not elicit strong arousal (Fazio, 2001), generate consensual ratings of valence (Osgood, Suci, & Tannenbaum, 1957), typically result in larger effect sizes (relative to pictures) in the anxiety and threat-selective attention literature (Frewen et al., 2008), and because the size of such stimuli can be precisely controlled (Ode, Winters, & Robinson, 2012). We predicted that, on average, negative words would be perceived to be larger in font size than neutral words.[1]

Individual differences in perceptual negativity were of more interest. We expected to be able to contrast individuals who exhibit this negativity bias versus those who do not. One might determine whether traits predict the magnitude of this bias, but in fact self-reported personality traits do not often predict the processing tendencies that they might reasonably be expected to predict (Robinson & Neighbors, 2006). Accordingly, we have advocated research in which implicit measures are treated as predictors of reactions to daily life events because such designs can examine ecologically valid reactions in which the issue is not what people believe to be generally true of the self (Robinson & Wilkowski, in press). If perceptual negativity is a component of the BIS system, as we contend, it should predict greater reactivity to negative events in daily life. Findings of this type would illustrate the value of adopting a process-oriented experimental approach to assessing a motivational system whose operations are theoretically important but empirically underdetermined. Both studies assessed the extent to which negative events occurred on a particular day. The daily outcome measures, however, were varied across studies in order to support a more general set of conclusions.

2. Study 1

In Study 1, we focused on the extent to which within-person (across-day) variations in the occurrence of negative events undermined goal-related optimism. There is considerable evidence for inverse relations of this type (Carver & Scheier, 1998), but we hypothesized that this inverse relationship would be stronger at higher levels of perceptual negativity.

[1] Previous studies have shown that size estimates can also vary by other psychological dimensions such as value (Bruner & Postman, 1948), perceived power (Schubert, Waldzus, & Giessner, 2009), and motivational salience (Veltkamp et al., 2008). In addition, van Ulzen, Semin, Oudejans, and Beek (2008) found that negative pictures were estimated to be larger than neutral or positive pictures.

2.1. Method

2.1.1. Participants and procedures

Undergraduate participants signed up for a two-part daily diary study. The perception task was completed in the laboratory in groups of 6 or less on 17 inch CRT monitors at a viewing distance of approximately 60 cm. At the end of this week, an 18-day reporting protocol commenced. Reports were to be completed after 8 p.m. and before 3 a.m. Participants completing less than half of the daily reports were deleted, leaving 90 people (53% female; 87% Caucasian; *M* age = 19.7; *M* number of reports = 12.9).

2.1.2. Perceptual negativity

A font-size matching task was created. Each of 80 trials began by presenting a vertical array of letter "Z"s along the left side of the computer screen. They varied in size from 8- to 24-point font in either an ascending or descending order, with array order counterbalanced across participants. A word was then presented toward the middle right side of the screen, vertically centered. To encourage effort in the task, its size was varied from 12- to 22-point font in a randomized trial-to-trial manner. Both fonts (for the word and the Z array) were presented in Courier-New, which preserves equal spacing for all letters. Participants categorized the word as "bad" or "neutral" by voicekey. This procedure was used to draw attention to the evaluative nature of the stimuli. When a vocal response was registered, a mouse cursor appeared at center screen and participants were given 6 s to make a mouse click on the "Z" matching the font size of the word. A small minority of trials (1.31%) was deleted because participants were too slow. The task involved 20 neutral words (e.g., SEAT, DOOR) and 20 negative words (e.g., HARM, PAIN) that were matched in terms of their number of letters ($M = 6.68$), $F(1, 38) = 1.54$, $p > .20$. Stimuli were rated by 8 graduate students along a 1 (very negative) to 9 (very positive) scale. With word as the unit of analysis, the negative words were decidedly more negative ($M = 2.02$) than the neutral words ($M = 5.21$), $F > 500$, $p < .01$.[2]

For each participant and trial, we subtracted the actual font size from the font size chosen, with higher numbers reflecting size overestimations. People generally overestimated the size of negative words ($M = 1.05$; SD = 0.99; alpha = .93) more than neutral words ($M = 0.83$; SD = 0.99; alpha = .87), $F(1, 89) = 15.77$, $p < .01$. That both bias scores were positive might reflect a tendency for task-relevant stimuli to be generally salient, thereby seeming larger than they are in actuality (Ode et al., 2012). In any case, perceptual negativity was quantified in a way such that this general tendency toward size overestimations was not an issue. Specifically, perceptual negativity was quantified by subtracting the participant's overestimation for neutral words from his/her overestimation for negative words ($M = 0.22$; SD = 0.52). For descriptive purposes, we performed a median split along this perceptual negativity dimension. Above the median, there was a pronounced tendency toward perceptual negativity (*M* difference = 0.63 font units), $F(1, 44) = 226.67$, $p < .01$. Below the median, there was a reversal such that negative stimuli were perceived to be smaller than neutral stimuli (*M* difference = −0.20), $F(1, 44) = 18.24$, $p < .01$. In other words, perceptual negativity is somewhat particular to certain people relative to others and therefore a pronounced individual difference. In the results section, perceptual negativity will be treated as a continuous rather than dichotomous predictor.

[2] Positive words were also presented and generally seen to be larger than neutral words (also see Ode et al., 2012), *ps* < .05, but the present theoretical and empirical focus was on perceptual negativity and reactions to negative events. A positive minus neutral difference score did not interact with negative events in either study, *ps* > .10, and the cross-level interactions reported remained significant when controlling for this other difference score, *ps* < .05.