



## Reinforcement sensitivity theory predicts positive and negative affect in daily life

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### ABSTRACT

Laboratory studies of Reinforcement Sensitivity Theory have associated sensitivity to punishment (SP) with negative affect and sensitivity to reward (SR) with positive affect. However, few studies have examined the expression of these systems and their response to cues of reward in daily life. The current study employed experience sampling methodology (ESM) to assess the association of SP and SR with affect and perceptions of situations in daily life. SP was positively associated with negative affect and negatively associated with positive affect in daily life, whereas SR was associated with positive affect and one aspect of negative affect, irritability/anger. Furthermore, high SP participants experienced smaller increases in positive affect and smaller decreases in negative affect in some situations that were perceived as positive, in comparison to low SP participants. In contrast, high SR participants experienced greater decreases in negative affect in some situations that were perceived as positive, in comparison to low SR participants.

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### 1. Introduction

Reinforcement Sensitivity Theory (RST; Gray, 1991; Gray & McNaughton, 2000) is a biologically-based personality model proposing that three major brain systems underlie normal mood and appetitive functioning: the Behavioral Approach System (BAS), the Behavioral Inhibition System (BIS), and the Fight–Flight–Freeze System (FFFS). BAS is an appetitive system that activates reward-seeking behavior, feelings of elation, and desire for reward (Pickering & Gray, 1999). Conversely, BIS causes orienting, inhibition, arousal, and passive avoidance to cues of punishment and novel stimuli, and has been conceptualized as an anxiety system (Gray, 1991). Recent RST revisions emphasize that BIS inhibits prepotent conflicting behaviors, assesses risk, and scans memory to resolve goal conflict and activate the FFFS (Corr, 2004; Gray & McNaughton, 2000). Finally, the FFFS motivates avoidance and escape behaviors and produces the emotion of fear. The combined

action of BIS and FFFS produce sensitivity to punishment (SP) whereas BAS produces sensitivity to reward (SR).

According to Gray, SP is related to negative emotion and SR to positive emotion (Gray, 1990, 1994). Consistent with these predictions, SP has been associated with self-reported negative affect (Jorm, Christensen, & Henderson, 1999; Leen-Feldner, Zvolensky, Feldner, & Lejuez, 2004; Sutton & Davidson, 1997) and negative responses to stressful or punishing situations (e.g., Carver & White, 1994; Gomez, Cooper, & Gomez, 2000). Conversely, SR has been associated with self-reported positive affect (Carver & White, 1994; Jorm et al., 1999; Sutton & Davidson, 1997) and positive responses to rewarding situations, including social situations (e.g., Carver & White, 1994; Gomez et al., 2000; Kashdan & Roberts, 2006). However, SR is also associated with anger and frustration (Carver, 2004; Harmon-Jones, 2003), perhaps resulting from frustration in the effortful pursuit of goals. SP and SR, respectively, have also been shown to predict negative and positive expectancies of success and judgments about situations and the self (e.g., Avila, Molto, Segarra, & Torrubia, 1991; Heimpel, Elliot, & Wood, 2006; Noguchi, Gohm, & Dalsky, 2006).

The previous studies do not, however, indicate how SP and SR are expressed in reaction to experiences in daily life. Experience sampling methodology (ESM) is a method to explore affect and

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cognitions in the context of daily life experiences. ESM is a within-day, self-assessment technique in which participants are prompted at random intervals to report about their current experiences. ESM offers several advantages over traditional data collection procedures. Specifically, ESM: (1) repeatedly assesses participants in their normal daily environment, thereby enhancing ecological validity; (2) assesses participants' experiences in the moment, thereby minimizing retrospective bias; and (3) allows for an examination of the context of experiences.

Gable, Reis, and Elliot (2000) conducted a daily diary study examining SP and SR in the prediction of affect in response to positive and negative social and achievement events in college students. As hypothesized, SP predicted overall negative affect and SR predicted overall positive affect. SP was also inversely associated with positive affect, a finding that the authors attributed to increased negative affect suppressing positive affect. However, this finding is not predicted by Gray's theory, as SP and SR are orthogonal, and warrants further investigation. In terms of affective reactivity to rewards and punishments, SP predicted greater negative reactivity to stressful events but, contrary to laboratory studies, SR did not predict greater positive reactivity to positive events. Thus, further examination of the relationship of SP and SR to positive affect and affective reactivity to rewarding or pleasant events is necessary. Additionally, this study sampled participants only one time per day (e.g., with questions such as "How happy did you feel today?"). Thus, the methodology did not provide a fine-grained temporal analysis and raised the possibility that retrospective bias may have confounded the results.

The current study examined the relation of SP and SR with the experience of affect in daily life and the affective impact of participants' perceptions of current situations in their daily lives. We attempted to measure two kinds of situations that might produce positive affect: interpersonal situations, such as being with close others, and activity situations, such as enjoying, being successful in, and perceiving one's current activity to be important. Based on past research and theory, we predicted that SP would be related to baseline negative affect, whereas SR would be related to baseline positive affect and one aspect of negative affect, specifically irritability/anger. We further predicted that SR would be related to positive affect while perceiving that one's current situation is positive, such as when spending time with close friends, or engaging in an enjoyable or important activity, whereas SP would not be differentially related to affect in these situations.

## 2. Method

### 2.1. Participants

Undergraduates enrolled in an introductory psychology course ( $n = 180$ ) voluntarily participated in this study for course credit. The sample (mean age = 19.6,  $SD = 3.4$ ) was predominantly female (81%) and Caucasian (77%).

### 2.2. Materials

The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Avila, Molto, & Caseras, 2001) is a binary response, self-report measure that contains two 24-item scales assessing Sensitivity to Punishment (SP) or BIS (e.g., "Comparing yourself to people you know, are you afraid of many things?") and Sensitivity to Reward (SR) or BAS (e.g., "Do you generally give preference to those activities that imply an immediate gain?"). Both scales have good reliability and validity (.79 for SR and .87 for SP in the current sample). Distributions of scores on the scales were unimodal and covered the range of possible scores (SP

range = 1–24; SR range = 1–23). Mean scores on SP were 11.3 ( $SD = 5.7$ ) and SR were 11.2 ( $SD = 4.6$ ), similar to those found in previous studies at this university (e.g., Hundt, Kimbrel, Mitchell, & Nelson-Gray, 2008).

The 36-item ESM questionnaire inquired about affect and perceptions about activities and social contact at the time of the signal. Sample items included "I feel happy right now," "I like the person(s) I am with right now," and "I am successful in my current activity." Participants rated agreement with these statements on a Likert scale from 1 (not at all) to 7 (very much). To increase the chance that our participants would endorse items, we attempted to measure common positive situations that young adults might find themselves in, such as spending time with close others, instead of more rare positive situations like getting a better than expected grade or attending party. Fifteen items from the ESM questionnaire were designed and included for use in a different study. Thus, only 21 of the 36 ESM questions (13 affect questions and 8 situation questions) were analyzed in the present study.

In order to reduce the number of analyses and the rate of Type I error, composite variables were constructed based upon principal components analysis (PCA). A PCA of the 13 affect variables with a promax oblique rotation extracted two factors with eigenvalues above 1 that together explained 69.8% of the variance: a negative affect factor (eigenvalue 5.8), with high loadings of the individual items *frustrated*, *angry*, *irritable*, *sad*, *uncertain*, *gloomy*, *self-conscious*, and *anxious*; and a positive affect factor (eigenvalue = 3.7), with high loadings from items *excited*, *enthusiastic*, *energetic*, *happy*, and *confident* (Table 1). Cross loadings were minimal (below .30) and the two factors were not significantly correlated ( $r = .02$ ,  $p = .58$ ).

A PCA was also conducted on the variables regarding perceptions of the current situation. Three factors with eigenvalues over 1 emerged, together explaining 73.0% of the variance. The first factor (eigenvalue = 3.8) had high loadings from the following items: *I like the person(s) I am with*, *I am important to the person(s) I'm with*, and *I am close to the person(s) I'm with*. This factor was labeled Interpersonal Closeness. The next factor (eigenvalue = 1.6) had high loadings from the items *I'm successful in my current activity*, *I have the ability to do my current activity*, and *I like my current activity*. This factor was labeled Successful Activity. The third factor (eigenvalue = 1.3) had high loadings from the items *My current activity is important* and *My current activity takes effort*. This factor was labeled Important/Effortful Activity. Although there are some substantial cross-loadings, these are as would be expected. For example, liking one's activity loads substantially on the interpersonal closeness factor, indicating that participants reported liking their activity when they were with close others.

**Table 1**  
Principal component analysis of affect variables.

Variable	NA factor loading	PA factor loading
Frustrated	<b>.92</b>	-.06
Angry	<b>.90</b>	-.06
Irritable	<b>.87</b>	-.04
Sad	<b>.87</b>	-.17
Uncertain	<b>.85</b>	.01
Gloomy	<b>.86</b>	-.14
Self-conscious	<b>.72</b>	.08
Anxious	<b>.67</b>	.29
Excited	.11	<b>.92</b>
Enthusiastic	.15	<b>.91</b>
Energetic	.10	<b>.90</b>
Happy	-.29	<b>.83</b>
Confident	-.29	<b>.64</b>

Note: Bolded loadings are above .30.

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