Abstract. Perception of risk to a stimulus associated with negative affect may depend on the level of emotional arousal it elicits. Sensation seeking is associated with a decreased level of arousal to risk stimuli. Individuals high in sensation seeking may require greater emotional arousal in order to induce harm avoidance. Poor control increases the salience of emotional cues, which may increase the magnitude of emotion associated with risk stimuli. In the present study, we found that, as sensation seeking decreased, high levels of poor control increased the likelihood of experiencing an emesis perception following disgust. The results support a harm avoidance system tied to emotions elicited from immediate threat that is potentiated by poor control.

Keywords: sensation seeking, dual-process models, disgust sensitivity

Over the past decade, research has begun to examine the evolutionary role of disgust as an emotional inhibitory potential tied to avoidance of potentially dangerous or maladaptive stimuli (Curtis, Aunger, & Rabie, 2004; Oaten, Stevenson, & Case, 2009). The strength of these sensations varies across individuals and has been referred to as “disgust sensitivity” (Olatunji & McKay, 2006). One of these sensations includes a gustatory or olfactory perception of emesis, often quantified as nausea (Olatunji, Sawchuk, Lohr, & de Jong, 2004). To date, very little research has examined this sensory perception in response to disgust. A study by Fessler, Eng, and Navarrete (2005) showed that this sensation, assessed as nausea, is tied to evaluations of risk and seems to fluctuate based on immunocompetence. The experience of disgust in this study, and most other studies, on the topic signals an avoidance of risk toward contracting disease. However, more recent research suggested that disgust may be tied to a general tendency toward harm avoidance.

Caseras and colleagues (2006) found that the magnitude of the emotional experience following disgust stimuli was significantly higher for individuals with a more reactive behavioral inhibition system. Recently, Olatunji and colleagues (2006; Olatunji, Unoka, Beran, David, & Armstrong, 2009) found that disgust is associated with numerous anxiety symptoms, only some of which are related to contamination or contracting disease. Furthermore, individual differences in harm avoidance fully or partially mediate the association between disgust sensitivity and anxiety symptoms (Olatunji et al., 2009). Experiencing a perception of emesis in response to disgust may be an emotional cue meant to elicit general harm avoidance behavior, possibly as a mechanism of reducing involvement in risky situations.

Theories of optimal level of arousal (OLA) suggest that some individuals require greater stimulation from stimuli in order to maintain self-regulatory homeostasis (Ajcardi & Therme, 2008; Zuckerman, Strelau, Farley, & Gale, 1985). Sensation seeking is derived from this class of theories (e.g., OLA theories) and posits that engagement in high-risk behavior is a product of a reduction in the magnitude of arousal experienced from a given stimulus (Zuckerman, 2007). This arousal spans a broad range. For example, relative to high sensation seekers, individuals low in sensation seeking show more fatigue during a handgrip task (Fink, Hamdaoui, Wenig, & Neave, 2010), higher sensitivity toward novelty detection in a target recognition task (Feij, Orlebeke, Gazendam, & Van Ziulen, 1985; LaRowe, Patrick, Curtin, & Kline, 2006; Smith, Perlstein, Davidson, & Michael, 1986; Zuckerman & Como, 1983). Additionally, research showed that individuals scoring higher on measures of sensation seeking are lower in harm avoidance (Giancola, Zeichner, Newbolt, & Stennett, 1994), poorer at evaluating risk (Rosenbloom, 2003), and engage in more high-risk behaviors (Zuckerman, 2007). Furthermore, individuals high in sensation seeking may
have a higher threshold for aversive emotional states making them less susceptible to subsequent risk cues (Lissek et al., 2005). The current study examines one aversive negative emotion (disgust) with the premise that ensuing risk cues will be most prominent for individuals low in sensation seeking. In addition, the likelihood of a risk cue may be associated with individual differences in self-regulatory abilities.

Dual process models of self-regulation posit two separate systems of self-regulatory control (for a review, see Carver, 2005). Several factor analytic studies showed the two systems represent distinct latent constructs with low to moderate negative correlations (see Dvorak & Simons, 2009; Wills, Walker, Mendoza, & Ainette, 2006). In general these two systems comprise a deliberative system associated with effortful processing and an impulsive system associated with rapid heuristic processing. Research showed that the impulsive system moderates the association between affect and subsequent risky behavior. For example, Simons, Dvorak, Batien, and Wray (2010) showed that negative urgency, a construct associated with the impulsive system, potentiated the association between daytime anxiety and alcohol use. In a separate study, Simons, Gaher, Oliver, Bush, and Palmer (2005) found that impulsivity strengthened the association between daytime negative affect and nighttime alcohol-related problems. Thus, the affectively driven motivational potential to approach, and possibly avoid, may be strengthened by the impulsive system.

The second system of the dual process model is the effortful system. Although both systems must be considered, we would expect the impulsive system to be associated with emotional experiences, while the effortful system should operate relatively independent of emotions. Specifically, we propose that the impulsive system enhances the motivational potential produced by an affective state. Depending on the action potential of the negative affect, this system may enhance either approach or avoidance behavior. For example, anxiety may motivate approach toward substance use. This approach behavior may be potentiated by high levels of poor control, as was observed by Simons and colleagues (2010). In contrast, for emotions associated with a harm avoidance system (e.g., disgust), the impulsive system should potentiate avoidance. Here, we adopt the nomenclature of Wills and colleagues (2001) and included a 6-item scale for Poor Delay of Gratification (α = .81; Chen, Sheth, Elliott, & Yeager, 2004) and a 19-item scale for Impulsivity (α = .81; Eysenck, Pearson, Easting, & Allsopp, 1985). Previous research showed that these scales form a reliable measure of poor control (Dvorak & Simons, 2009; Wills et al., 2006).

Good self-control (α = .71) was a mean standardized variable assessed by four scales. The first three scales were adapted from Kendall and Williams (1982) and included a 6-item scale for Distractibility (α = .80) and a 7-item scale for Present Time Perspective (α = .63). Additionally, there was an 8-item scale for Poor Delay of Gratification (α = .81; Chen, Sheth, Elliott, & Yeager, 2004) and a 19-item scale for Impulsivity (α = .81; Eysenck, Pearson, Easting, & Allsopp, 1985). Previous research showed that these scales form a reliable measure of good self-control (Dvorak & Simons, 2009; Wills et al., 2006).

Methods

Participants

Participants were 180 undergraduate students, 18–32 years of age (M = 21.16, SD = 3.46). Women comprised 67% of the sample; 94.4% were White, 1.1% Native American, 2.2% Asian, and 2.2% were of other races. All participants received course credit for participation and were treated in accordance with APA ethical guidelines for research (Sales & Folkman, 2000).

Apparatus and Measures

Video from a common domain source, showing two adults vomiting on each other and subsequently consuming each other’s vomit, was used to evoke feelings of disgust. The video was viewed from a distance of 5 feet on a 27-inch color monitor.

Poor control (α = .79) was a mean standardized variable assessed by four scales. The first two scales were adapted from Wills and colleagues (2000) and included a 6-item scale for Future Time Perspective (α = .74; adapted from Kendall & Williams, 1982). Previous research showed that these scales form a reliable measure of good self-control (Dvorak & Simons, 2009; Wills et al., 2006).

Good self-control (α = .71) was a mean standardized variable assessed by four scales. The first three scales were from Wills and colleagues (2001) and included a 6-item scale for Problem Solving (α = .82), an 8-item scale for Cognitive Effort (α = .86), and a 3-item scale for Self-Reinforcement (α = .80). The fourth measure was a 7-item scale for Future Time Perspective (α = .74; adapted from Kendall & Williams, 1982). Previous research showed that these scales form a reliable measure of good self-control (Dvorak & Simons, 2009; Wills et al., 2006).

Sensation seeking was assessed via a 16-item version of Zuckerman’s Sensation Seeking Scale (α = .82; Donohew et al., 2000; Zuckerman, 1994).

Emesis perception was assessed following the disgust video by asking participants: “Could you taste or smell vomit while watching the video?” This was used as a binary outcome variable. An emesis perception was reported by 11.11% (n = 20) of the sample.
Procedures

This study was part of a larger experiment examining individual differences in self-control. Participants reported to the lab and were randomly assigned to a self-control depletion condition for the experiment (i.e., watch normally or restrict emotions while watching). There were no effects of condition on any of the variables evaluated (see Results section below), so the data between conditions were pooled for the current analysis, and condition was added as a covariate. Participants completed a series of surveys assessing aspects of self-control and sensation seeking, and then watched the disgust video. At the conclusion of the video, participants were asked if they could taste or smell vomit while watching the video. One previous study has been published from this dataset, which includes more detailed experimental procedures (Dvorak & Simons, 2009).

Results

Continuous predictors were mean centered to aid in interpretation of interaction effects (Aiken & West, 1991). Men reported experiencing an emesis perception more often than women, $\chi^2(1) = 4.75$, $p = .03$. There were no differences in good self-control ($t(178) = 1.81$, $p = .07$, Cohen’s $d = 0.29$) or poor control ($t(178) = 1.26$, $p = .21$, Cohen’s $d = 0.20$). Sensation seeking differed by gender with men ($M = 57.43$, $SD = 1.24$) scoring higher than women ($M = 51.68$, $SD = 0.94$), $t(178) = 3.60$, $p < .001$, Cohen’s $d = 0.55$. There were no gender differences in good self-control ($t(178) = 0.18$, $p = .96$), poor control ($t(178) = 1.85$, $p = .07$), or sensation seeking ($t(178) = 0.10$, $p = .92$) across conditions. Nor were there differences in gender distribution ($\chi^2[1] = 0.90$, $p = .34$) or frequency of experiencing an emesis perception ($\chi^2[1] = 0.57$, $p = .45$) across conditions; hence, data for both conditions were pooled and condition was added as a covariate.

Descriptive and bivariate statistics are presented in Table 1. There was a moderate negative correlation between good self-control and poor control. Numerous studies supported a 2-factor structure of self-control over a single-factor structure with the variables used in this study (e.g., Wills et al., 2006). Furthermore, previous analysis of this data set supported a 2-factor over a 1-factor structure (e.g., Dvorak & Simons, 2009). Poor control was positively associated with poor control (3.00 vs. 0.00), and negatively associated with good self-control (0.00 vs. 2.83).

Table 1. Descriptive and bivariate statistics

<table>
<thead>
<tr>
<th>Predictor</th>
<th>M (SD)</th>
<th>Range</th>
<th>Skew</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>–</td>
<td>120W/60M</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Poor Control</td>
<td>0.00 (0.78)</td>
<td>–1.46–2.05</td>
<td>0.34</td>
<td>.10</td>
<td>.79</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Good Self-control</td>
<td>0.00 (0.73)</td>
<td>–1.79–1.47</td>
<td>–0.38</td>
<td>–.14</td>
<td>–.41</td>
<td>.71</td>
<td>–</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>53.60 (10.43)</td>
<td>27–76</td>
<td>–0.26</td>
<td>.26</td>
<td>.43</td>
<td>–12</td>
<td>.82</td>
</tr>
<tr>
<td>Emesis Perception</td>
<td>–</td>
<td>20Y/160N</td>
<td>–</td>
<td>16</td>
<td>.07</td>
<td>–.05</td>
<td>–.01</td>
</tr>
</tbody>
</table>

Notes. Gender coded 1 = Men, 0 = Women; Emesis Perception coded 1 = Yes, 0 = No. 1 $p \leq .10$; 2 $p \leq .05$; 3 $p \leq .001$. Cronbach’s $\alpha$s are on the diagonal.

Table 2. Logistic analysis predicting likelihood of experiencing gustatory or olfactory emesis perception

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR (SE)</th>
<th>$\chi^2$</th>
<th>95% CI</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1 Model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>3.30 (1.53)</td>
<td>4.67</td>
<td>1.10–8.14</td>
<td>.031</td>
</tr>
<tr>
<td>Condition</td>
<td>1.62 (0.81)</td>
<td>0.93</td>
<td>0.60–4.32</td>
<td>.336</td>
</tr>
<tr>
<td>Sensation Seeking (SS)</td>
<td>0.97 (0.03)</td>
<td>1.24</td>
<td>0.92–1.02</td>
<td>.266</td>
</tr>
<tr>
<td>Poor Control (PC)</td>
<td>1.60 (0.58)</td>
<td>1.65</td>
<td>0.78–3.25</td>
<td>.200</td>
</tr>
<tr>
<td>Good Self-control</td>
<td>1.11 (0.40)</td>
<td>0.09</td>
<td>0.55–2.24</td>
<td>.760</td>
</tr>
<tr>
<td><strong>Final Model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>3.28 (1.74)</td>
<td>5.08</td>
<td>1.16–9.29</td>
<td>.025</td>
</tr>
<tr>
<td>Condition</td>
<td>1.71 (0.88)</td>
<td>1.10</td>
<td>0.62–4.69</td>
<td>.299</td>
</tr>
<tr>
<td>Sensation Seeking (SS)</td>
<td>0.96 (0.03)</td>
<td>1.62</td>
<td>0.91–1.02</td>
<td>.205</td>
</tr>
<tr>
<td>Poor Control (PC)</td>
<td>1.69 (0.61)</td>
<td>2.16</td>
<td>0.84–3.42</td>
<td>.144</td>
</tr>
<tr>
<td>Good Self-control</td>
<td>1.25 (0.47)</td>
<td>0.35</td>
<td>0.60–2.61</td>
<td>.557</td>
</tr>
<tr>
<td>PC $\times$ SS</td>
<td>0.91 (0.04)</td>
<td>6.71</td>
<td>0.85–0.99</td>
<td>.018</td>
</tr>
</tbody>
</table>

Notes. SS = Sensation Seeking; PC = Poor Control; Gender coded Men = 1, Women = 0. Step 1 Model: LR $\chi^2(5, n = 180) = 7.23$, $p = .204$, Cragg-Uhler $R^2 = .08$; Final Model ($\Delta$ LR $\chi^2[1] = 6.71$, $p = .010$, $\Delta R^2 = .07$): LR $\chi^2(6, n = 180) = 13.94$, $p = .030$, Cragg-Uhler $R^2 = .15$. 

with sensation seeking. Men scored significantly higher in sensation seeking than women (see Table 1).

In Step 1, we regressed the likelihood of experiencing an emesis perception onto gender, condition, sensation seeking, good self-control, and poor control, LR $\chi^2(5, n = 180) = 7.23, p = .20$, Cragg-Uhler $R^2 = .08$, see Table 2. In Step 2, we added 2-way interactions between sensation seeking, good self-control, and poor control, $\Delta LR \chi^2(3) = 8.11, p = .043$. There was a significant interaction of Poor control $\times$ Sensation seeking ($OR = 0.92, p = .05$), but not Good self-control $\times$ Sensation seeking ($OR = 1.04, p = .33$) or Good self-control $\times$ Poor control ($OR = 0.72, p = .44$). In Step 3, we added a three-way interaction of Good self-control $\times$ Poor control $\times$ Sensation seeking, this interaction was not significant ($OR = 0.94, p = .23$). For the final model we dropped all nonsignificant interactions, see Table 2. The final model accounted for a significant amount of the variance in the likelihood of experiencing an olfactory or gustatory emesis perception, LR $\chi^2(6, n = 180) = 13.94, p = .03$, Cragg-Uhler $R^2 = .15$. We calculated the simple slopes of sensation seeking on emesis perception at high and low values of poor control (see Figure 1). At $+1$ SD poor control, the association between sensation seeking and emesis perception was stronger ($OR = 0.90, p = .02$), while at $-1$ SD poor control, the association was weaker and not significant ($OR = 1.03, p = .39$).

Figure 1. Simple slopes of the probability of experiencing an emesis perception on sensation seeking at $\pm 1$ SD poor control.

Discussion

The current study examined the role of a dual process model of self-control and sensation seeking in the experience of potentially risky stimuli. We hypothesized that the experience of an emesis perception, following a disgusting video, would be negatively associated with sensation seeking, and that this association would be moderated by poor control. Consistent with hypothesis, there was a significant inverse association between sensation seeking and the likelihood of an emesis perception; however, this only occurred at high levels of poor control.

The most interesting finding in the current study was the moderating effects of poor control on sensation seeking. Consistent with our hypothesis, we found that a high level of poor control potentiated the negative association between sensation seeking and experiencing a perception of emesis, making it more likely. In contrast, at low levels of poor control, the association between sensation seeking and experiencing a perception of emesis was not significant. An interesting area of future research might be examining the role of poor control as a moderator of sensation seeking in situations of varying risk, emotions, and intensity.

As hypothesized, good self-control did not moderate sensation seeking. This is consistent with the idea that good self-control is thought to be the “cool system,” influenced by deliberative processing rather than rash emotionality. This finding adds to a growing literature on dual mechanisms of self-control, with one system (e.g., poor control) being associated with current affective processes and the other (e.g., good self-control) being associated with future goals. Poor control, as a function of affective processes, may result in either impulsive approach or inhibition (Carver, 2005). In the current context, there was a negative association between sensation seeking and perception of emesis among those high in poor control, a process potentially tied to avoidance behavior.

There is an alternative explanation for these findings. The current study did not assess nausea directly, but rather assessed whether a person could taste or smell vomit while watching a disgusting video. Thus, these findings may represent associations between personality and vivid imagery rather than negative emotionality. Previous research showed that stimuli that evoke negative emotion also produce more vivid imagery (Bywaters, Andrade, & Turpin, 2004), which in turn has been associated with hallucinations among the general population (López Rodrigo, Paño Piñeiro, Martínez Suárez, Caro, & Lemos Giráldez, 1997). Thus, it is possible that individuals who reported experiencing an olfactory or gustatory sensation of emesis may be more prone to hallucinations. Individuals prone to hallucinations also tend to have a higher likelihood of personality pathology (López Rodrigo et al., 1997), though in the current study there were no differences in trait self-control or sensation seeking and whether or not a person experienced an emesis perception. Future research could examine the role of vivid imagery and hallucination as a function of sensation seeking and dual processes of control.

Several limitations of this study should be noted. First, this was a secondary analysis and was thus not the primary focus in the design of this study. A more focused study is warranted designed to discriminate transient versus basic forms of negative affect as well as the effects of poor control on sensation seeking with regard to these emotions.
Second, the experience of an emesis perception was relatively low in this study. Utilizing a condition that would evoke disgust to a varying degree among all participants may be particularly beneficial, although the use of emesis perception did allow for discrimination among those most likely to be affected by a general harm avoidance system. Finally, this was a young college student population, so generalization should be done with caution.

In conclusion, the current study supports research suggesting that sensation seeking is associated with the magnitude of emotional arousal – at least for emotions associated with sensory or interoceptive cues. We found that poor control modulated the negative association between sensation seeking and emesis perception. We propose that this mechanism may lead to avoidance behavior, via effects on the level of arousal of emotional experience, tied to potentially risky stimuli. Overall, the results of this study support an optimal level of arousal theory and extends this line of research to include the effects of poor control in the experience of emotion and subsequent experience of potentially risky cues.

References


Smith, B. D., Perlstein, W. M., Davidson, R. A., & Michael, K.


