

ORIGINAL ARTICLE

## Sensation seeking and dosage effect: An exploration of the role of surprise in anti-cocaine messages

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### Abstract

This article examines emotional and cognitive responses to graphic illustrations of the effects of cocaine among a sample of low and high sensation seekers (LSS & HSS). Two-hundred-and-five ( $n = 205$ ) undergraduate students at a large northern university in the United Kingdom participated in the study and were randomly assigned to one of two conditions: low-image or high-image print adverts about the consequences of cocaine use. Results indicated that although high sensation seekers report greater cocaine use as compared with low sensation seekers, report less surprise and have less dominant cognitions than LSS, they do not differ from LSS in terms of other affective responses when exposed to anti-cocaine visual messages. However, the high-image advert was more successful than the low-image adverts in eliciting surprise, which has important theoretical and empirical implications for the design of effective messages targeting HSS.

**Keywords:** *Cocaine use, sensation seeking, emotions, visual messages, dosage effect.*

The personality trait sensation seeking is a biologically-based trait characterized by novelty seeking and risk taking (Zuckerman, 1994). Sensation seeking has been shown to be consistently associated with risky health behaviors, such as unsafe sex (e.g. Hoyle, Fejfar, & Miller, 2000), cigarette smoking (e.g. Glicksohn & Nahari, 2007), alcohol consumption (e.g. Greene, Krcmar, Walters, Rubin, & Hale, 2000), drug use (e.g. Ames, Sussman, Dent, & Stacy, 2005), and other delinquent behaviors (e.g. Greene et al., 2000). Beside association with risk-behaviors, high sensation seekers (HSS) also have distinct preferences for messages high in sensation value that are characterized by novelty, creativity, excitement, intensity, dramatization, or fast-pace (e.g. Palmgreen, Donohew, Lorch, Hoyle, & Stephenson, 2001). This means that typical prevention messages, which have lower message sensation value, fail to reach this group of high-risk individuals. Thus, the development of

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message strategies that are effective with high sensation seekers (HSS) remains a high priority within the field of substance abuse prevention.

One of the most difficult aspects of reaching HSS with substance use prevention messages is getting them to pay attention to the content of messages. This study builds on and extends research in persuasion suggesting that emotion-evoking images increase the level of attention people pay to persuasive messages. In particular, we set out to explore the effect of surprise-evoking visuals on HSS' attention to and processing of persuasive prevention messages as compared with their effect on low sensation seekers (LSS). We also experiment with different dosage of surprise-evoking visuals to determine an optimal dosage for engaging HSS with information processing of anti-drug messages. We do so in the context of cocaine use which remains widespread in much of the world, including the USA and the UK, despite numerous and multi-tiered prevention efforts.

### **Sensation seeking and message processing**

The message sensation value (MSV) approach (e.g. Palmgreen et al., 1991; Everett & Palmgreen, 1995) is increasingly utilized to guide the development of effective prevention messages to HSS adolescents and young adults. Simply put, MSV explains attention of HSS to messages as a function of the message's structural features, including video features (e.g. cuts, edits, unusual colors, etc.), audio features (e.g. sound effects, music, etc.) and content format features (e.g. surprise ending, etc.; Morgan, Palmgreen, Stephenson, Hoyle, & Lorch, 2003). Messages high in MSV elicit arousal. Because HSS actively seek arousal, they are more likely to pay attention to high MSV messages. This notion is formalized through the activation model of information exposure (AMIE; Donohew, Palmgreen, & Duncan, 1980). Empirical studies have supported the link between MSV and arousal through both psycho-physiological measures, such as heart rate and skin conductance (Lang, Bolls, Potter, & Kawahara, 1999; Lombard, Reich, Grabe, Bracken, & Ditton, 2000; Detenber, Simon, & Reiss, 2000), and self-reported measures (Everett & Palmgreen, 1995; Stephenson & Palmgreen, 2001).

However, higher levels of arousal and liking in response to high MSV messages do not guarantee that HSS will process the information contained in the message in a manner conducive to attitude and behavior change (i.e. through the investment of more mental effort, see Chaiken, 1980; Petty & Cacioppo, 1986). Because people have a limited capacity of cognitive processes (Lang, 2000), and since significant cognitive resources are expended when people experience arousal (Lang et al., 1999), high MSV messages may actually decrease the likelihood that HSS will process the information contained in the message systematically. Empirical findings of recent studies (e.g. Kang, Cappella, & Fishbein, 2006) are consistent with this hypothesis. Therefore, it seems prudent to include in messages targeting HSS an additional message design element that will direct HSS' attention to the message itself, rather than to the superficial features of the high MSV message. This additional element, we argue, is the inclusion of an emotion-evoking image.

### *Role of emotions in persuasive messages' processing*

There is ample reason to hypothesize that affect-evoking stimuli can do a better job securing HSS' attention and putting it to productive work. Numerous studies have previously examined the impact of emotions and emotional appeals on attitude and behavior change (e.g. Dillard & Peck, 2001; Dillard, Shen, & Vail, 2007; Rains & Turner, 2007), and their findings suggest that emotions may serve a number of key functions in persuasion processes.

Among others, emotions have been shown to serve as means for increasing attention to messages, fill an information function (much like attitudes do), provide frames of reference for making sense of situations and stimuli, guide more systematic or superficial processing of information, and motivate action (Dillard & Nabi, 2006). Importantly, this line of research suggests that different emotions serve different functions, therefore act to activate different cognitive and/or behavioral motivations (Nabi, 1999). For example, fear leads to danger appraisal thus inducing protection motivation. This means that messages that induce different emotional states in recipients will likely result in different levels of attention and motivation to process the information contained in the message.

One emotional reaction that may have HSS both pay attention to and systematically process substance use prevention messages is surprise. Dillard and Peck (2001) have argued that 'surprise functions to allocate attention to a stimulus, thereby encouraging subsequent analysis of its implications for the individual' (p. 43). That is, when we experience surprise we infer that a novel element is present and, therefore, are motivated to pay closer attention to the novel stimulus. One of the benefits of a novel stimulus is that it does not automatically activate an easily accessible response stored in our memory, which may lead us to process the information contained in the message in a biased manner. This may work well to influence HSS who are more inclined to experiment with drugs to fill their need for sensation, and who hold attitudes and values that are inconsistent with the information contained in anti-drug messages (Ames et al., 2005; Low & Gendaszek 2002). If they do engage in cognitive processing of anti-drug messages, it is likely that this process will be counter-attitudinal (or resistant) to the anti-drug message. Indeed, prior research provides evidence that HSS engage in counter-attitudinal message processing when exposed to anti-drug PSAs (e.g. Stephenson & Palmgreen, 2001). Inducing a feeling of surprise in HSS may neutralize this defense mechanism (at least temporarily), replacing the motivation to engage with counter-attitudinal or defensive processing with the motivation to orientate one's attention toward the information in the message. Previous prevention work with HSS supports this notion indirectly. For instance, Banerjee and Greene (2006) proposed that novelty or surprise may be a contributing factor in predicting greater participant involvement in anti-smoking media literacy workshops, but they did not measure emotions evoked. This study will directly assess how HSS respond to surprise-evoking anti-drug messages.

### *Surprise-evoking message features*

The underlying rationale of the MSV approach supports our expectation that HSS will be attracted to surprise-evoking message features, but it does not tell us which message feature will successfully elicit this response. We suspect that the use of visuals or graphic illustrations can successfully elicit emotional reaction from audiences. Research has demonstrated that intense images may evoke discrete emotional responses, which may contribute to message effectiveness (e.g. Stephenson, 2002, 2003; Biener, Ji, Gilpin, & Albers, 2005; Niederdeppe, Davis, Farrelly, & Yarsevich, 2007). For instance, Biener et al. (2005) concluded that visual images that graphically depict death and disease caused by smoking increase emotional response to messages (in particular, fear, anger and sadness). In addition, there is evidence that graphic presentation of risk information is more effective than simply providing numerical, statistical or text-based information (e.g. Edwards, Elwyn, & Mulley, 2002; Chang, 2006).

In this study, we are particularly interested in the ability of image exemplars to elicit surprise from HSS. Zillmann and Brosius (2000) have defined an exemplar as a personified

example that is used to illustrate a particular threatening condition (e.g. Natasha had been smoking pot since she was in 10th grade, but did not think she had a problem until she passed out). Exemplification through images may be a powerful tool of changing attitudes and/or intentions because relevant exemplars are easily retrieved from memory and influence people's judgments (see Zillmann, 2006). Although most of the work cited above has examined the impact of visual imagery in audio-visual medium, the present study focuses on visual print messages to isolate the effect. In addition, we are interested in the dosage effect of image exemplars, i.e. the effect of audiences attending a number of visual exemplars rather than a single one. Persuasion research on dosage effects has included a range of manipulations including manipulating the number of words in a message (see O'Keefe, 2003), the number of stylistic features in adverts (e.g. Niederdeppe et al., 2007), and number of testimonials on anti-drug websites (e.g. Hersh, Cappella, Fishbein, Appleyard, & Barrett, 2004). In this study, we examine how number of image exemplars relates to different emotions evoked and dominant cognitions generated by participants.

### Research questions and hypotheses

The current study deviates from the traditional approach to tailoring effective risk messages to HSS in that it goes beyond the cognitive processing of such messages to explore the role of emotional reactions to visual cues in messages. Therefore, our first research question concerns differences between the emotional responses of HSS and LSS to visual exemplars. As explained above, because HSS are more attentive than LSS to the use of novel images in a message, we expect visual exemplars (even a single one) to elicit more surprise from HSS than from LSS:

*H1:* HSS will be more likely than LSS to report feeling surprised by a single visual exemplar of the consequences of cocaine use.

In testing H1, we are mindful of people's tendency to experience several discrete emotional reactions to stimuli (Dillard & Nabi, 2006). For this reason, additional emotional reactions were measured in this study, and differences between HSS and LSS on these emotional responses were compared.

Our next hypothesis concerns the effect of emotion-evoking images on the cognitive response of HSS to the anti-cocaine message. We expect that novel images will cause HSS to expend more cognitive responses on orientating toward the new stimulus and the emotional response they experience, thus temporarily disabling their tendency to process anti-cocaine messages in a biased manner. If this is true, HSS should demonstrate less dominant cognitions (i.e. cognitions that tends to concentrate at the positive or negative end of the attitude continuum) than LSS. Thus,

*H2:* Sensation seeking will be negatively related to cognitions evoked by a single visual exemplar pertaining to cocaine use such that HSS will report less dominant cognitions than LSS following exposure.

Our second research question pertains to dosage effect of visual exemplars. Research on dosage effects generally suggests that higher dosage of messages or stylistic features generates a greater impact on audiences' recall of information and cognitions (e.g. Niederdeppe et al., 2007; Sly, Trapido, & Ray, 2002). By logical extension, we expect that a higher dosage of

visual exemplars will generate a more intense emotional reaction from HSS than will a lower dose and, consequently, even less dominant cognitions among HSS following exposure (presumably, because a more stimulating image places a greater burden on HSS available cognitive resources, further distracting them from activating their pro-cocaine bias). Specifically, we hypothesize that:

*H3:* A high-image anti-cocaine message will elicit higher degree of surprise among HSS compared with the degree of surprise elicited by a low-image message.

*H4:* A high-image anti-cocaine message will elicit less dominant cognitions among HSS than will a low-image message.

## Method

### *Participants and procedure*

Two-hundred-and-five students from undergraduate courses at a large northern university in the United Kingdom participated in the study after receiving approval from the University Review Board. Eighty-five per cent of the participants were female. The mean age of participants was 22.35 years ( $SD = 5.95$ ), and about 95% participants were Caucasian. Data collection took place outside of class and was anonymous.

Participants were randomly assigned to one of two conditions: low-images print advert (consisting of vertically placed two pairs of before/after images) or high-images print advert (consisting of vertically placed eight pairs of before/after images).<sup>1</sup> The experimental procedure consisted of three segments. In the first segment, the participants filled out a baseline questionnaire. The second section included message exposure. The third segment consisted of measures that tapped participants' reactions to the adverts.

### *Selection of images*

The images used in creating the adverts were collected from anti-drug websites depicting photographs of people addicted to illegal drugs, particularly focusing on the visible/apparent effects of drugs on the person's appearance both before and after s/he became addicted to drugs. The images used in the study were selected from an equivalent pool that consisted of photographs of people of similar weight, scars, emaciation, etc. Each of the photographs had two variants: before and after. The advert had a caption at the bottom that specified the duration of cocaine use (e.g. 'Used cocaine for 4 years'; images are available from the first author).

### *Measurement instruments*

The present study measured sensation seeking, affective responses, open-ended cognitive responses and prior cocaine use.

*Sensation seeking.* A short measure of sensation seeking (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002), based on Form V of Zuckerman's (1994) sensation seeking

<sup>1</sup>We created two versions of the low-image advert to address potential order effects. Independent sample *t*-tests were conducted to identify differences in affective responses and cognitive responses, with results showing no differences in the two adverts with respect to any of the dependent variables. Thus, data for the two versions of the low-image advert were combined into one category.

scale, was used in this study. This measure is a 5-point Likert-type scale with eight items and responses ranging from 1 (strongly disagree) to 5 (strongly agree). Reliability was acceptable ( $\alpha = 0.76$ ), and participants' responses were summed and averaged to create a composite score, with a higher score indicating a higher level of overall sensation seeking. A median-split on this variable ( $Mdn = 3.375$ ) was used to divide the sample into HSS and LSS.

*Affective responses.* Data on participants' affective responses to the adverts were measured using the affective responses scale from Dillard and Peck (2001). This scale consists of a series of closed-ended items, with responses ranging from 1 (none of this feeling) to 4 (a great deal of this feeling). Responses were summed and averaged to arrive at a composite score for *surprise* (surprised, startled, astonished;  $\alpha = 0.81$ ), *anger* (irritated, angry, annoyed, aggravated;  $\alpha = 0.88$ ), *fear* (fearful, afraid, scared;  $\alpha = 0.89$ ), *sad* (sad, dreary, dismal;  $\alpha = 0.60$ ), *guilt* (guilty, ashamed;  $\alpha = 0.60$ ), *happiness* (happy, elated, cheerful, joyful;  $\alpha = 0.86$ ) and *contentment* (contented, peaceful, mellow, tranquil;  $\alpha = 0.78$ ).

*Cognitive responses.* Procedure for coding cognitive responses was adapted from the coding scheme outlined by Dillard et al. (2007). Participants were asked to write down their thoughts after they had finished viewing the advert. The resulting data were coded in three steps by two trained coders. First, the coders segmented the data into psychological thought units. A thought unit was defined as the smallest unit possible that was meaningful by itself (oftentimes, it could be a clause; Cohen's kappa = 0.81).

Secondly, because we had already measured affective responses, affective responses were identified and removed by using a list of feelings terms identified by Shaver, Schwartz, Kirson, and O'Connor (1987). A unit was classified as affective if any of the feeling terms appeared in the unit and cognitive otherwise (Cohen's kappa = 0.87).

Thirdly, the remaining data were coded either as (a) favorable thoughts, (b) unfavorable thoughts, or (c) neutral thoughts (Cohen's kappa = 0.86). Favorable thoughts were defined as responses that expressed agreement with the advert or positive evaluations of the advert, the message source, or the advocated position (e.g. 'I liked this advert' and 'These images are shocking. Cocaine can really harm you'). Unfavorable thoughts were defined as responses that express disagreement with the advert, intention to engage in the risky behavior, derogation of the source, and so on (e.g. 'These are exaggerated images' and 'These are made up'). Neutral thoughts were defined as non-evaluative responses to the message (e.g. 'I have seen similar pictures before,' and 'It's their own fault'). Finally, an index of dominant cognition response was computed by subtracting the sum of each subject's negative thoughts from the sum of his/her positive thoughts.

*Prior cocaine use.* Prior cocaine use was measured by a single item that asked, 'On an average, how often do you use Cocaine?' The responses were in a 7-point semantic differential format with 'never' and 'very frequently' as end points ( $M = 1.16$ ,  $SD = 0.66$ , Range = 1–6). This variable was dichotomized into 0 (never used) and 1 (ever used).

### Data analyses

A zero-order correlation matrix for all variables is presented in Table I. In order to test our hypotheses, we employed t tests (for H1 and H2) and a series of analysis of covariance



Table I. Zero-order correlation matrix for all variables

	1	2	3	4	5	6	7	8	9	10
1. Number of images <sup>a</sup>	1.00									
2. Sensation seeking	0.06	1.00								
3. Surprise	0.27**	0.06	1.00							
4. Anger	0.08	0.14	0.11	1.00						
5. Fear	0.05	-0.06	0.30**	0.40**	1.00					
6. Sadness	0.06	0.03	0.17*	0.40**	0.57**	1.00				
7. Guilt	-0.02	0.01	0.15	0.28**	0.42**	0.42**	1.00			
8. Happiness	-0.06	-0.02	-0.01	0.21*	0.19*	0.20*	0.25**	1.00		
9. Contentment	0.00	0.03	-0.10	0.05	0.05	0.06	0.16	0.62**	1.00	
10. Dominant cognitions	0.10	-0.17*	0.07	-0.10	0.17*	0.18*	0.02	-0.02	-0.00	1.00

\* $p \leq 0.01$ , \*\* $p \leq 0.001$ .

<sup>a</sup>Low image message was coded as 0 and high-image message as 1.

(ANCOVA)<sup>2</sup> (for H3 and H4). The level of significance was set at  $p \leq 0.05$  for all tests except for correlations, where  $p \leq 0.01$  was utilized to protect against Type I error.

## Results

As expected based on the general pattern of associations between sensation seeking and risk behaviors, HSS in our sample were significantly more likely to report ever using cocaine than LSS. Given that cocaine use was not normally distributed within this sample, we employed a non-parametric equivalent of the independent sample  $t$ -test (Mann-Whitney) with cocaine use as the dependent variable and the dichotomous sensation seeking measure as the independent variable. The results revealed a statistically significant difference ( $z = -2.69$ ,  $p < 0.01$ ) between LSS (mean rank = 77.88) and HSS (mean rank = 87.23) on cocaine use.

### *Emotional reaction of HSS to an emotion-evoking visual anti-cocaine advert*

Two independent samples  $t$ -tests were utilized to compare the effect of visual exemplars on HSS and LSS emotional and cognitive response to anti-cocaine adverts. Our H1 predicted that an advert with a single visual will elicit more surprise from HSS than from LSS. Independent sample  $t$  tests, for the sub-sample randomized to receive the single image indicated that there was a statistically significant difference on surprise,  $t(102.30) = 2.04$ ,  $p < 0.05$  such that LSS ( $M = 1.93$ ,  $SD = 0.71$ ) reported greater surprise than HSS ( $M = 1.67$ ,  $SD = 0.60$ ). This finding contradicts the prediction of our H1 and may suggest that a single visual stimulus alone may not be sufficient to elicit surprise from HSS. A second independent samples  $t$ -test was utilized to test our H2 according to which HSS will demonstrate less dominant cognitions about cocaine use than LSS following exposure to the advert. The results of this analysis showed a statistically significant difference on dominant cognitions,  $t(79.87) = 2.47$ ,  $p < 0.05$  such that LSS ( $M = 2.57$ ,  $SD = 2.26$ ) reported higher

<sup>2</sup>Before conducting ANCOVAs, the homogeneity-of-slopes assumption was first tested (see Green, Salkind, & Akey, 2000). This test evaluates the interaction between the covariate and the factor in predicting the dependent variable. A significant interaction suggests that the differences on the dependent variable among groups vary as a function of the covariate and not the factors. ANCOVA was carried out only when the interaction was not significant. In instances where the interaction was significant, group-by-covariate interaction was evaluated instead of ANCOVA. More details are available from the first author.

dominant cognitions than HSS ( $M = 1.24$ ,  $SD = 3.06$ ). While this finding is consistent with our H2's prediction, it does not appear to be consistent with the rationale underlying this hypothesis, namely that HSS may be using more cognitive resources to attend to the visual element of the advert than do LSS, since H1 was not supported. A possible alternative explanation is that HSS demonstrated less dominant cognitions than LSS because they were less motivated to process the information in the advert. Lastly, a series of independent samples  $t$ -tests comparing other possible affective responses experienced by LSS and HSS revealed no statistically significant differences between LSS and HSS participants on emotional reactions other than surprise following exposure to an advert with a single visual.

### *Effect of image dosage*

We employed a series of ANCOVAs to test H3 and H4 because we were interested in comparing dosage effects both within and between subjects. Our H3 predicts that high-image anti-cocaine message will elicit higher degree of surprise among HSS compared with the degree of surprise elicited by a low-image message. To test this hypothesis, we first estimated an ANCOVA model predicting level of surprise from experimental condition (low/high dose) as independent variable and prior cocaine use as covariate. The results of this analysis revealed a significant main effect for image dosage on surprise,  $F(1, 159) = 8.58$ ,  $p < 0.01$ , eta-square = 0.05 such that high-image messages ( $M = 2.26$ ,  $SD = 0.86$ ) were rated greater than low-images messages ( $M = 1.91$ ,  $SD = 0.68$ ). We estimated the same model for all other affective responses, but found no dosage effects on these emotions. These findings clearly suggest that (1) surprise increase with image dosage and (2) that, as intended, our adverts elicited surprise, but not other emotions in subjects. To answer the question of whether or not dosage effects on surprise will be more pronounced among HSS than among LSS, we estimated an additional ANCOVA model with an interaction term for sensation seeking and message dosage. The interaction effect on surprise was statistically significant,  $F(1, 159) = 4.01$ ,  $p \leq 0.05$ , eta-square = 0.03, but not in the direction predicted by H3. For LSS participants, the high-image message ( $M = 2.29$ ,  $SD = 0.60$ ) generated more surprise,  $t(82.31) = -4.01$ ,  $p < 0.001$  than low-image message ( $M = 1.67$ ,  $SD = 0.60$ ). However, for HSS participants, there was no statistically significant difference,  $t(100.44) = -1.81$ ,  $p = 0.07$  between low-image ( $M = 1.93$ ,  $SD = 0.71$ ) and high-image ( $M = 2.19$ ,  $SD = 0.80$ ) messages in terms of level of surprise induced. This finding suggests that high-dosage of visuals does little to elicit greater surprise from HSS compared with the use of a single visual and that the inclusion of other message elements (such as audio) may be needed to increase the appeal of such messages to HSS.

To test H4 according to which a high-image anti-cocaine message will elicit less dominant cognitions among HSS than will a low-image message, we estimated similar ANCOVA models, but this time with cognitive response as the dependent variable. The model without the interaction effect between sensation seeking and dosage showed no difference between low- and high-image messages on dominant cognitions following exposure,  $F(1, 159) = 1.57$ ,  $p = 0.21$ , eta-square = 0.01. However, for the model with the interaction effect we observed a statistically significant interaction effect on dominant cognitions,  $F(1, 159) = 11.47$ ,  $p \leq 0.001$ , eta-square = 0.07. For LSS participants, the high-image message ( $M = 3.00$ ,  $SD = 3.13$ ) generated more dominant cognitive responses,  $t(91.96) = -2.76$ ,  $p < 0.01$  than did the low-image message ( $M = 1.24$ ,  $SD = 3.06$ ). Counter to our H4, for HSS participants, there was no difference,  $t(104.89) = 1.16$ ,  $p = 0.25$  between low-image ( $M = 2.57$ ,  $SD = 2.26$ ) and high-image ( $M = 2.06$ ,  $SD = 2.34$ ) messages in terms of effect



on dominant cognitions. Once again, it appears that the dosage of the visuals included in the anti-cocaine advert did little to alter HSS processing of the information in the advert beyond what can be accomplished with a single visual, although for LSS more images resulted in more dominant anti-cocaine cognitions.

## Discussion

This study examined the effectiveness of visual exemplars of the harmful effects of cocaine use on HSS cognitive and emotional processing of anti-cocaine print adverts. Also examined was the effect of different dosages of such images. The results indicate that, as expected, the use of visual exemplars was successful in eliciting surprise (and no other emotional reaction) from both LSS and HSS, but that increasing the dosage of visual exemplars in an advert elicits more surprise from LSS, but not from HSS. In terms of cognitive processing HSS demonstrated less dominant cognitions than LSS following exposure to the adverts, as expected. However, counter to our expectation, increasing the dosage of visual exemplars in the advert did not generate less dominant cognitions among HSS, although it had the effect of increasing dominant anti-cocaine cognitions among LSS. Thus, HSS cognitive and emotional processing of anti-cocaine messages appear to be unaffected by the dosage of visual exemplars that accompany the message.

### *Sensation seeking and visual message effectiveness*

Our findings indicate that HSS have less dominant cognitions about cocaine use than LSS following exposure to visual exemplars about cocaine use. However, the fact that both the single- and multi-visuals adverts elicited more surprise from LSS than they did from HSS (rather than the other way around) is inconsistent with our rationale that such images, to the extent they are novel and arousing, will decrease HSS' biased processing of risk information by commanding more of their cognitive resources. Put differently, the intervention appears to have achieved its objective among HSS (i.e. decreasing their bias toward pro-cocaine cognitions), but how it works remains open to interpretation. It may be that LSS and HSS experience surprise differently. LSS appear to experience surprise in the way described in the literature, namely using this feeling to orient their thoughts toward the information in the message and to reflect on its implications for self, leading them to form a stronger anti-cocaine sentiment. HSS, in contrast, may feel completely gratified by experiencing surprise and therefore are not motivated to reflect on the implications of the information in the message for self. This explanation is consistent with the argument in the MSV literature (see Kang et al., 2006) that novel and exciting message features may distract HSS from the task of systematically processing the information contained in the message.

Another potential explanation of this partially counterintuitive finding may involve the intensity of the images used in the advert. Morgan et al. (2003) defined intense images as horrifying images such as injecting needles into arms, guns pointed at heads or death. Research has shown that if the exemplars influence the perception of severity of the trouble or risk, participants perceive the exemplars to be more effective (see Hoeken & Hustinx, 2007). In the present study, the before-after visuals of cocaine users depicted facial sores, and dramatic loss of weight and hair loss, that most participants were expected to perceive as intense. However, it is possible that HSS have a higher threshold in this respect such that images that most people find intense or even shocking are only mildly shocking or

even boring to HSS who intentionally seek to expose themselves to intense stimuli and, therefore, have 'seen it all'. Unfortunately, we cannot directly test this proposition because we did not measure the perceived intensity of the visuals used in the adverts, but the fact that the increased dosage of images generated no more surprise from HSS than did a single image, may indirectly lend credibility to this alternative explanation. At a minimum, this is a notion worth exploring in future studies.

#### *Number of image exemplars and visual message effectiveness*

The present study demonstrates that a higher dose of images in an advert is more successful in eliciting surprise than a single image, but that this effect is limited to LSS. HSS experienced no increase in surprise with increasing dosage of visual exemplars. Theoretically, it is possible to predict that the inclusion of too many similar exemplars in a message (or using similar exemplars in multiple messages) can have a 'boomerang effect' on HSS as the initial novelty of this stimulus wears off and its repeated use induces reactance in these individuals. At the same time, the element of surprise appears to have worked well for LSS, motivating them into more systematic processing of the information accompanying the images. Thus, while we agree with Zillmann (2006) that exemplification through images, particularly when the images are evocative, can be used effectively in health promotion efforts, we also believe that it is important to first experiment with the optimal dosage of such images to maximize their impact on target audiences and to decrease the potential for negative effects. Moreover, since our visual manipulation only elicited surprise from audiences (largely because this was the emotion we wanted to elicit), it is important to identify through research visual exemplars that are capable of eliciting other desired affective responses, both positive and negative.

#### *Implications of the study*

This study suggests that visual messages designed to motivate young adults to refrain from cocaine use/experimentation can benefit from including an element of surprise. For instance, visuals could show striking images or present shocking exemplars of the physical, emotional or social effects of drug use. Additionally, because fear and dominant cognitions play an important role in perceived message effectiveness, the visual messages should be pretested for the kinds of emotions they elicit from young adults. Finally, exploration of individual differences (beyond sensation seeking) may be beneficial in targeting prevention messages effectively, and this could be explored in future research.

#### *Limitations and future research*

The current study has several limitations. First, the sample used in this study was heavily populated with Caucasian females. Besides limiting the generalizability of our findings to a relatively homogeneous sub-population of college students, this particular sample only permitted conservative tests of our hypotheses because both sensation seeking tendencies and substance use are more typically found among males. It is reasonable to believe that the effect of the visual exemplars on the emotional and cognitive processing of the anti-cocaine adverts would have been more pronounced with a predominately male sample.

Secondly, this study utilized manipulation of one visual message feature only (number of images in the adverts), which limits the generalizability of the study to other visual message

features. Future research should explore the effect of other visual message features, such as vividness, use of colors and size of images to examine how they may influence message effectiveness. Additionally, we only used print adverts instead of video messages. Although most of the research on sensation seeking message effectiveness has utilized high intensity video images, we focused on print adverts as a way of examining appeal to audiences differing in their levels of sensation seeking. It is likely that video images elicit more arousal from HSS, and for this reason the current study may offer a conservative test of the effect of arousing images on the emotional and cognitive processing of anti-drug messages by HSS and LSS alike.

Thirdly, this study measured participants' emotional responses to the message only after the exposure. Future research could examine participants' emotional states both before and after the exposure to conclusively make an argument about the specific emotions that were changed or elicited by the visual message. Fourthly, this study tapped only one participant characteristic (sensation seeking), yet recent research on sensation seeking (see Harrington, Lane, Donohew, & Zimmerman, 2006) has highlighted the importance of studying need-for-cognition as another important individual difference factor, particularly for designing preventive health messages. Future research on examining persuasiveness of visual messages needs to consider both sensation seeking and need-for-cognition of participants to understand how preventive health messages can be targeted more effectively. This continues to be an important area for research with implications for both message design and public health.

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### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

### References

- Ames, S. L., Sussman, S., Dent, C., & Stacy, A. W. (2005). Implicit cognition and dissociative experiences as predictors of adolescent substance use. *American Journal of Drug and Alcohol Abuse, 31*, 129–162.
- Banerjee, S. C., & Greene, K. (2006). Analysis versus production: Adolescent cognitive and attitudinal responses to anti-smoking interventions. *Journal of Communication, 56*, 773–794.
- Biener, L., Ji, M., Gilpin, E. A., & Albers, A. B. (2005). The impact of emotional tone, message, and broadcast parameters in youth anti-smoking advertisements. *Journal of Health Communication, 9*, 259–274.
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology, 39*, 752–766.
- Chang, C-T. (2006). Is a picture worth a thousand words? Influence of graphic illustration on framed advertisements. *Advances in Consumer Research, 33*, 104–112.
- Detenber, B. H., Simons, R. F., & Reiss, J. E. (2000). The emotional significance of color in television presentations. *Media Psychology, 2*, 331–355.
- Dillard, J. P., & Nabi, R. L. (2006). The persuasive influence of emotion in cancer prevention and detection messages. *Journal of Communication, 56*, S123–S139.
- Dillard, J. P., & Peck, E. (2001). Persuasion and the structure of affect: Dual systems and discrete emotions as complementary models. *Human Communication Research, 27*, 38–68.

- Dillard, J. P., Shen, L., & Vail, R. G. (2007). Does perceived message effectiveness cause persuasion or vice versa? 17 consistent answers. *Human Communication Research, 33*, 467–488.
- Donohew, L., Palmgreen, P., & Duncan, J. (1980). An activation model of information exposure. *Communication Monographs, 47*, 295–303.
- Edwards, A., Elwyn, G., & Mulley, A. (2002). Explaining risks: Turning numerical data into meaningful pictures. *British Medical Journal, 324*, 827–834.
- Everett, M. W., & Palmgreen, P. (1995). Influences of sensation seeking, message sensation value, and program context on effectiveness of anticocaine public service announcements. *Health Communication, 7*, 225–248.
- Glicksohn, J., & Nahari, G. (2007). Interacting personality traits? Smoking as a test case. *European Journal of Personality, 21*, 225–234.
- Green, S., Salkind, N. J., & Akey, T. M. (2000). *Using SPSS for Windows: Analyzing and interpreting data*. Upper Saddle River: Prentice Hall.
- Greene, K., Krmar, M., Walters, L. H., Rubin, D. L., & Hale, J. L. (2000). Targeting adolescent risk-taking behaviors: The contributions of egocentrism and sensation seeking. *Journal of Adolescence, 23*, 439–461.
- Harrington, N. G., Lane, D. R., Donohew, L., & Zimmerman, R. S. (2006). An extension of the activation model of information exposure: The addition of a cognitive variable to a model of attention. *Media Psychology, 8*, 139–164.
- Hersh, A. C., Cappella, J. N., Fishbein, M., Appleyard, J., & Barrett, D. W. (2004, May). *Speaking from experience: The effect of anti-marijuana teen testimonials on high sensation-seeking individuals*. Paper presented at the annual meeting of the International Communication Association, New Orleans, LA.
- Hoeken, H., & Hustinx, L. (2007). The impact of exemplars on responsibility stereotypes in fund-raising letters. *Communication Research, 34*, 596–617.
- Hoyle, R. H., Fejfar, M. C., & Miller, J. D. (2000). Personality and sexual risk-taking: A quantitative review. *Journal of Personality, 68*, 1203–1231.
- Hoyle, R. H., Stephenson, M. T., Palmgreen, P., Lorch, E. P., & Donohew, L. (2002). Reliability and validity of scores on a brief measure of sensation seeking. *Personality and Individual Differences, 32*, 401–414.
- Kang, Y., Cappella, J. N., & Fishbein, M. (2006). The attentional mechanism of message sensation value: Interaction between message sensation value and argument quality on message effectiveness. *Communication Monographs, 73*, 351–378.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication, 50*, 46–70.
- Lang, A., Bolls, P., Potter, R., & Kawahara, K. (1999). The effects of production pacing and arousing content on the information processing of television messages. *Journal of Broadcasting and Electronic Media, 43*, 451–475.
- Lombard, M., Reich, R. D., Grabe, M. E., Bracken, C. C., & Ditton, T. B. (2000). Presence and television: The role of screen size. *Human Communication Research, 26*, 75–98.
- Low, K. G., & Gendaszek, A. E. (2002). Illicit use of psychostimulants among college students: A preliminary study. *Psychology, Health, & Medicine, 7*, 283–287.
- Morgan, S. E., Palmgreen, P., Stephenson, M. T., Hoyle, R. H., & Lorch, E. P. (2003). Associations between message features and subjective evaluations of the sensation value of antidrug public service announcements. *Journal of Communication, 53*, 512–526.
- Nabi, R. L. (1999). A cognitive-functional model for the effects of discrete negative emotions on information processing, attitude change, and recall. *Communication Theory, 9*, 292–320.
- Niederdeppe, J., Davis, K. C., Farrelly, M. C., & Yarsevich, J. (2007). Stylistic features, need for sensation, and confirmed recall of national smoking prevention advertisements. *Journal of Communication, 57*, 272–292.
- O’Keefe, D. J. (2003). Message properties, mediating states, and manipulation checks: Claims, evidence, and data analysis in experimental persuasive message effects research. *Communication Theory, 13*, 251–274.
- Palmgreen, P., Donohew, D., Lorch, E. P., Hoyle, R. H., & Stephenson, M. T. (2001). Television campaigns and adolescent marijuana use: Tests of sensation seeking targeting. *American Journal of Public Health, 91*, 292–296.
- Palmgreen, P., Donohew, D., Lorch, E. P., Rogus, M., Helm, D., & Grant, N. (1991). Sensation seeking, message sensation value, and drug use as mediators of PSA effectiveness. *Health Communication, 3*, 217–227.
- Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York: Springer-Verlag.
- Rains, S. A., & Turner, M. M. (2007). Psychological reactance and persuasive health communication: A test and extension of the intertwined model. *Human Communication Research, 33*, 241–269.
- Shaver, P., Schwartz, J., Kirson, D., & O’Connor, C. (1987). Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology, 52*, 1061–1086.
- Sly, D. F., Trapido, E., & Ray, S. (2002). Evidence of the dose effects of an antitobacco counteradvertising campaign. *Preventive Medicine, 35*, 511–518.

- Stephenson, M. T. (2002). Sensation seeking as a moderator of the processing of anti-heroin public service announcements. *Communication Studies*, 53, 358–380.
- Stephenson, M. T. (2003). Examining adolescents' responses to antimarijuana PSAs. *Human Communication Research*, 29, 343–369.
- Stephenson, M. T., & Palmgreen, P. (2001). Sensation seeking, perceived message sensation value, personal involvement, and processing of anti-marijuana PSAs. *Communication Monographs*, 68, 49–71.
- Zillmann, D. (2006). Exemplification effects in the promotion of safety and health. *Journal of Communication*, 56, S221–S237.
- Zillmann, D., & Brosius, H-B. (2000). *Exemplification in communication: The influence of case reports on the perception of issues*. Mahwah: Erlbaum.
- Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensations seeking*. New York: Cambridge University Press.