



International Journal of Health Promotion and Education

Publication details, including instructions for authors and
subscription information:

<http://www.tandfonline.com/loi/rhpe20>

Framing and dosage effects: use of protection motivation theory to examine efficacy of anti-cocaine visual messages

Smita C. Banerjee^a & Kathryn Greene^b

^a Department of Psychiatry and Behavioral Sciences, Memorial
Sloan Kettering Cancer Center, 641 Lexington Avenue, 7th Floor,
New York, NY, 10022, USA

^b Rutgers University, 4 Huntington Street, New Brunswick, NJ,
08901, USA

Available online: 19 Apr 2012

To cite this article: Smita C. Banerjee & Kathryn Greene (2012): Framing and dosage effects: use
of protection motivation theory to examine efficacy of anti-cocaine visual messages, *International
Journal of Health Promotion and Education*, 50:2, 68-80

To link to this article: <http://dx.doi.org/10.1080/14635240.2012.661965>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching, and private study purposes. Any
substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing,
systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation
that the contents will be complete or accurate or up to date. The accuracy of any
instructions, formulae, and drug doses should be independently verified with primary
sources. The publisher shall not be liable for any loss, actions, claims, proceedings,
demand, or costs or damages whatsoever or howsoever caused arising directly or
indirectly in connection with or arising out of the use of this material.

Framing and dosage effects: use of protection motivation theory to examine efficacy of anti-cocaine visual messages

Smita C. Banerjee^{a*} and Kathryn Greene^b

^aDepartment of Psychiatry and Behavioral Sciences, Memorial Sloan Kettering Cancer Center, 641 Lexington Avenue, 7th Floor, New York, NY 10022, USA; ^bRutgers University, 4 Huntington Street, New Brunswick, NJ 08901, USA

This study examined the efficacy of visual anti-cocaine messages differing in framing and dosage on protection motivation theory constructs, particularly perceived severity, vulnerability, self-efficacy, response costs, and intention to stay away from cocaine. One hundred and sixty four ($N = 164$) undergraduate students at a large northern university in the UK participated in the study and were randomly assigned to one of four anti-drug visual messages depicting consequences of cocaine use and differing in framing (before-after vs. after-only) and dosage (low-dose vs. high-dose). Results revealed that after-only framing was more efficacious than before-after framing for perceived severity and vulnerability, and the low-dose message was more efficacious than the high-dose message for self-efficacy. In addition, greater perceived severity and self-efficacy were significantly associated with greater intention to stay away from cocaine. Implications for designing visual drug prevention messages are discussed.

Keywords: cocaine use; dosage; framing; protection motivation; visual messages

Introduction

Despite increased government initiatives to reduce drug use among young adults, the use of Class A drugs (most harmful of all drugs, such as Cocaine powder, Crack Cocaine, Ecstasy) remains widespread in England and Wales. Recent statistics on drug use for younger adults aged 16–24 years in England and Wales document that although illicit drug use fell from 31.8% in 1998 to 25.2% in 2005–2006, the use of Class A drugs has remained stable and cocaine use has increased from 3.2% in 1998 to 5.9% in 2005–2006 (The Information Center 2007). Also, results from the 2005–2006 British Crime Survey reveal that 16–24-year olds reported the highest levels of drug use compared with all other age groups (Roe and Man 2006). Given the continued prevalence of Class A drugs among young people in the UK, successful strategies that prevent drug use among youth warrant attention.

One strategy that has not received much attention in prevention literature, but is used frequently in the real world is the use of visuals. Whereas images can be used to illustrate the text message, it is a more frequent practice for text to be used to explain or anchor the image message (Finan 2002). The use of visual messages has also demonstrated that graphic presentation of risk information is more effective than simply providing numerical, statistical, or text-based information (Edwards *et al.* 2002, Chang 2006). These visuals may increase the perceptions of vulnerability or severity of harm, creating ‘fear’ and motivating protective behavior.

*Corresponding author. Email: banerjes@mskcc.org

One theory that holds promise in this regard is the protection motivation theory (PMT; Rogers 1985). PMT is a dynamic theory of behavioral change that attempts to explain the cognitive mediation process of behavioral change in terms of threat and coping appraisals. When applied to drug prevention research, PMT suggests that an efficacious drug prevention message must not only instill fear and vulnerability to drug use, but also provide coping responses to deal with the issue. Therefore, in this study, we use PMT to assess the efficacy of visual anti-drug messages differing in framing and dosage to investigate effectiveness for a college student population.

Protection motivation theory

PMT proposes that protection motivation is an intervening variable between the components of a health message and attitude or behavior (Rogers 1985). According to PMT, four factors influence attitudinal and behavioral responsiveness to health communication messages and the persuasiveness of a health appeal: (1) vulnerability to the undesirable health outcome (perceived vulnerability); (2) severity of the undesirable health outcome (perceived severity); (3) efficacy of the recommendations, in terms of avoiding the undesirable health outcome (response efficacy), or in terms of being able to overcome the cost (self-efficacy); and (4) the cost of adhering to the recommendations (response costs).

Prior research evidence demonstrates that PMT has been tested methodically in experimental research (e.g. Floyd *et al.* 2000, Courneya and Hellsten 2001, Milne *et al.* 2002, Pechman *et al.* 2003). Typically, experiments involving PMT focus on manipulating PMT variables in order to examine effects on cognitions, intentions, and behaviors (Milne *et al.* 2002). In this study, we use PMT to examine the efficacy of visual drug prevention messages differing in framing and dosage.

Visual message framing and PMT

Visual health messages often utilize before-and-after framing, particularly in advertisements for weight loss products (Dagnoli 1991, Federal Trade Commission 2002). Before-and-after framing typically utilizes a model, and included two images of the model. The first image (or the 'before' photograph) depicts how the model looked before he/she used the slimming product (such as a diet pill or a weight loss program) and the second image (or the 'after' photograph) shows the effect of the product on the model (see Geier *et al.* 2003). Such forms of message framing can create perceptions in our minds. Geier *et al.* (2003) found that participants exposed to the before-after and after-only image reported greater weight stigma and weight-related stereotypes.

Although Geier *et al.* (2003) did not provide a theoretical explanation for their finding; we suspected that the perceptual contrast effect (Cialdini 1993) helps to rationalize the findings. According to the perceptual contrast effect, when two things appear close to one another, people will tend to evaluate them against one another more than against a fixed standard. For instance, Sherif *et al.* (1958) found that when participants in their study first lifted a heavy weight, they underestimated the weight of lighter weights they were subsequently asked to lift. This indicates that instead of making absolute judgments, people engage in comparative or relative judgments when two things are paired together.

Using the perceptual contrast explanation, it appears that messages that show before-and-after images of drug users will tend to escalate PMT constructs, particularly, perceptions of severity of harm from drug use as compared to images showing just the

after-only effects. In addition, the before-and-after images will increase perceptions of vulnerability because they demonstrate how everybody can get affected by drug use, irrespective of age, gender, or status. We did not use before-only version for the messages, because the before-only message does not indicate any harm done from drug use, and would be irrelevant in the present context. Therefore, we hypothesize the following:

- H1a: The before-and-after (vs. after-only) framing of anti-cocaine message will enhance participants' perceptions of severity of the health risks of cocaine use.
 H1b: The before-and-after (vs. after-only) framing of anti-cocaine message will enhance participants' perceptions of vulnerability of the health risks of cocaine use.

What is unclear at this point is how framing will effect perceptions of coping appraisal, or self-efficacy. According to PMT, the motivation to adopt a healthy behavior or avoid risky behaviors arises from the individual's expectation that the action can reduce the likelihood or severity of harm (Weinstein 1993). We reason that before-after pictures increase the perception of self-efficacy or the person's belief that he or she has the ability to adopt the recommended behavior provided in the message (the tagline in the messages read, 'Cocaine will destroy you. Don't use it'). With this reasoning, we hypothesize the following:

- H1c: The before-and-after (vs. after-only) framing of anti-cocaine message will enhance participants' perceptions of self-efficacy related to staying away from cocaine use.

In addition, we were interested in examining the effects of framing on response costs, therefore, we asked:

- RQ1: How will framing affect response costs?

Dosage and PMT

Dosage effect refers to the number of messages attended to by audiences (see Farrelly *et al.* 2002). Persuasion research on dosage effects has included a range of manipulations including number of words in a message (see O'Keefe 2003), number of stylistic features in advertisements (e.g. Niederdeppe *et al.* 2007), exposure to a number of advertisements in a campaign (e.g. Sly *et al.* 2002), and number of testimonials on anti-drug websites (e.g. Hersh *et al.* 2004). For instance, research on dosage effects suggests that the larger the number of health messages (on the same topic) remembered by audiences, the stronger and more long lasting the effect of a campaign (see Sly *et al.* 2002). Niederdeppe *et al.* (2007) also documented that the greater the number of stylistic features in a message the greater the message recall.

In this study, we wanted to examine how a number of images in an anti-cocaine message might relate to perceived PMT constructs. Seeing a greater number of visual examples exemplifying harmful effects of cocaine use on individuals may increase participants' sense of vulnerability to the effects of cocaine use. Given that prior research has documented evidence in favor of greater number of images (to some point where repetition may cause message rejection), we hypothesized the following:

- H2a: The high dose (vs. low dose) of anti-cocaine images will enhance participants' perceptions of severity of the health risks of cocaine use.

H2b: The high dose (vs. low dose) of anti-cocaine images will enhance participants' perceptions of vulnerability to the health risks of cocaine use.

The effect of dosage on coping response is unknown. Therefore, we ask:

RQ2: How will dosage affect self-efficacy and response costs?

In addition, we were also interested in examining the interaction effects between framing and dosage on PMT constructs, and so asked:

RQ3: How will framing and dosage interact to affect PMT constructs?

Effects of PMT cognitions on intentions

Prior research has demonstrated consistent results favoring the role of major PMT constructs in predicting behavioral intention in a variety of behavioral domains, including smoking cessation (Rogers *et al.* 1978), cancer prevention (Courneya and Hellsten 2001, Helmes 2002), AIDS risk reduction (Aspinwall *et al.* 1991), exercise and diet (Plotnikoff and Higginbotham 1998, 2002), and drinking and driving (Greening and Stoppelbein 2000). Current meta-analyses also report that perceived vulnerability, self-efficacy, and perceived cost are significantly correlated with behavioral intention and behavior (Milne *et al.* 2000). Therefore, we hypothesize the following:

H3: Participants' intentions to stay away from cocaine will be a positive function of perceived (a) health risk severity and vulnerability, and (b) self-efficacy of staying away from cocaine; these intentions will be a negative function of perceived (c) costs of not using cocaine.

Method

Participants and procedure

After receiving approval from the Ethics Review Board, undergraduate students were recruited at a large northern university in the UK. Data collection took place in class and was anonymous. Research assistants announced the study in undergraduate classes after approval from the respective professors near the end of the class. Students not interested in participating were asked to leave the room, and questionnaires were distributed to students who volunteered to participate. Participants were instructed that the surveys were anonymous, so no identifying information should be included on the questionnaires.

The initial sample included 204 students; however, students older than 25 years were excluded from this analysis because drug use patterns of youth (18–25 years) are different from those of adults (The Information Center 2007). Therefore, to maintain homogeneity in the sample, 164 students were retained for analysis. Eighty-seven percent of those participants were female ($n = 143$). The mean age of participants was 20.21 years ($SD = 1.32$, range = 19–25), and about 95% participants were Caucasian.

The design of the experiment was a 2 framing (before-after vs. after-only) \times 2 dosage (low dose vs. high dose) between-participants factorial design with random assignment. The experimental procedure consisted of three segments. In the first segment, the participants filled out a baseline questionnaire about their drug use behavior and demographics. The second section included message exposure. The third segment consisted of measures that tapped participants' reactions to the messages.

Selection of images

The images used in creating the advertisements 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. The images used in this study were selected from a pool that consisted of photographs of people of similar weight, scars, and emaciation. Each pair of photograph (or photograph in after-only version) had a caption at the bottom that specified the duration of cocaine use (for example, '4 years later' for the before-after images, and 'Used cocaine for 4 years' for the after-only image). The message had a caption at the bottom, 'Cocaine Will Destroy You. Don't Use It' (images are available from the first author).

Measurement instruments

This study measured PMT constructs (perceived severity, vulnerability, self-efficacy, and response costs), and intention to stay away from cocaine. PMT measures were adapted from previously existing measures (e.g. Murgraff *et al.* 1999, Umeh 2004) and some wordings were changed to make the items cocaine-specific. All measures consisted of Likert-type items with responses ranging from 1 (Strongly disagree) to 5 (Strongly agree). Based on the results of exploratory factor analysis (EFA; Principal component with varimax rotation), items on respective scales were averaged to create composite scores.

Perceived severity

Perceived severity was measured by six items related to both specific and general health threats of cocaine use. For example, 'Once you become a cocaine addict, your life is ruined.' Reliability was high ($\alpha = 0.92$), and EFA indicated a single factor structure (eigenvalue = 4.25, 70.89% variance) with all item loadings >0.7 . A higher score indicated greater severity associated with cocaine use ($M = 3.35$, $SD = 0.89$).

Perceived vulnerability

Perceived vulnerability was measured by six items that tapped into an individual's judgments of the likelihood of a harmful event happening to them, such as 'If I use cocaine, I will be harming myself.' Reliability was high ($\alpha = 0.90$), and EFA indicated a single factor structure (eigenvalue = 3.97, 66.21% variance) with all item loadings >0.7 . A higher score indicated greater likelihood of harm to individuals themselves from cocaine use ($M = 3.95$, $SD = 0.81$).

Self-efficacy

Self-efficacy was measured by four items related to an individual's belief that he/she has the ability to stay away from cocaine. For example, one item read 'I feel confident in my ability to not use cocaine.' Reliability was high ($\alpha = 0.93$), and EFA indicated a single factor structure (eigenvalue = 3.32, 82.98% variance) with all item loadings >0.8 . A higher score indicated greater ability to stay away from cocaine ($M = 4.59$, $SD = 0.60$).

Response costs

Response costs were measured by four items that tapped into the costs associated with execution of the response. For example, one item read, 'I feel I will be left out of fun

if I decide to stay away from cocaine.’ Reliability was moderate ($\alpha = 0.79$), and EFA indicated a single factor structure (eigenvalue = 2.55, 63.71% variance) with all item loadings >0.6 . A higher score indicated greater costs associated with not using cocaine ($M = 1.35$, $SD = 0.63$).

Intention to stay away from cocaine

Intention to stay away from cocaine was measured by six Likert-type items with 5-point responses ranging from ‘Strongly agree’ to ‘Strongly disagree.’ Sample items included were ‘I intend to stay away from cocaine,’ ‘It is highly likely that I will use cocaine (R),’ and ‘I am willing to try cocaine (R).’ Reliability was high ($\alpha = 0.89$), and EFA indicated a single-factor solution (eigenvalue = 4.06, 67.59% variance, loadings above 0.6). A higher score indicated greater intention to stay away from cocaine ($M = 4.73$, $SD = 0.63$).

Results

Data analysis

A zero-order correlation matrix is presented in Table 1. In order to test our data, we used a series of 2×2 analysis of covariance (ANCOVA) with independent variables message framing (before-after vs. after-only), and dosage (low-dose vs. high-dose), covariate prior drug use and dependent variables PMT constructs and intention to stay away from cocaine. Pairwise comparisons were carried out via the Bonferroni method to adjust for possible Type I error inflation due to multiple tests.

Finally, in order to test RQ3, we used a hierarchical regression analysis with controls (age, sex, and prior cocaine use) at Step 1, message manipulation (framing and dosage) at Step 2, and PMT constructs (perceived severity, susceptibility, self-efficacy, and response costs) at Step 3. The dependent variable was intention to stay away from cocaine.

Framing and PMT constructs

The ANCOVA revealed a significant main effect of framing on perceived severity, $F(1, 158) = 6.16$, $p < 0.01$, $\eta^2 = 0.04$, such that after-only message ($M = 3.56$, $SD = 1.00$) resulted in greater perceived severity than before-after message ($M = 3.25$, $SD = 0.93$).

Table 1. Zero-order correlation matrix for all variables.

	1	2	3	4	5	6	7	8	9
1. Sex ^a	1.00								
2. Dosage ^b	0.08	1.00							
3. Framing ^c	0.01	0.01	1.00						
4. Cocaine use ^d	-0.02	0.03	-0.11	1.00					
5. Severity	0.31**	0.06	0.19*	-0.22*	1.00				
6. Vulnerability	0.25**	-0.06	0.15	-0.40**	0.74**	1.00			
7. Self-efficacy	-0.06	-0.11	0.01	-0.53**	0.31**	0.45**	1.00		
8. Response costs	-0.06	-0.05	-0.06	0.30**	-0.14	-0.33**	-0.67**	1.00	
9. Intention	0.02	0.05	-0.07	0.71**	-0.33**	-0.45**	-0.54**	0.35**	1.00

Note: * $p < 0.01$, ** $p < 0.001$.

^a Gender: 0 = male, 1 = female; ^b Dosage: 0 = 2, 1 = 8; ^c Framing: 0 = before-after, 1 = after-only; ^d Cocaine use: 0 = never used, 1 = used.

For perceived vulnerability, $F(1, 158) = 3.84, p < 0.05, \eta^2 = 0.03$, after-only message ($M = 4.10, SD = 0.80$) resulted in greater perceived vulnerability than before-after message ($M = 3.83, SD = 0.79$). The effects of framing on self-efficacy and response costs were not significant (see Table 2).

Therefore, these results indicate that H1a–c were not supported, and framing did not have the intended effect on PMT constructs. In fact, the findings were in opposite direction, particularly for perceived severity and vulnerability. After-only messages were perceived as increasing severity and vulnerability of participants as compared to before-after messages. For RQ1, the results showed that framing did not have any effect on response costs.

Dosage and PMT constructs

The ANCOVA revealed a significant main effect of dosage only on self-efficacy, $F(1, 158) = 3.37, p < 0.05, \eta^2 = 0.02$, such that low-dose message ($M = 4.79, SD = 0.47$) resulted in greater self-efficacy than high-dose message ($M = 4.66, SD = 0.64$). There was no effect of dosage on perceived severity, perceived vulnerability, and response costs (see Table 2).

Therefore, these results indicate that H2a and H2b were not supported, and dosage did not affect severity or vulnerability. However, results for RQ2 indicate that the low-dose message was more effective than the high-dose message for self-efficacy, but there was no effect of dosage on response costs.

Interaction between framing and dosage and PMT constructs

The results revealed that the interaction between framing and dosage was not significant for severity, vulnerability, self-efficacy, or response costs (see Table 2). Therefore, for RQ3, results demonstrated no interaction effects for any of the PMT constructs.

PMT constructs and intention

The results of regression analyses indicated that the final model was significant for intention to stay away from cocaine, $F(9, 153) = 21.75, p < 0.001$ and accounted for 54% variance in the model. In terms of significant indicators, age ($\beta = 0.14, p < 0.05$), prior cocaine use ($\beta = -0.57, p < 0.001$), greater perceived severity ($\beta = 0.16, p < 0.05$), and greater self-efficacy ($\beta = 0.18, p < 0.05$) predicted greater intention to stay away from cocaine (see Table 3).

Therefore, the findings lend partial support to H3. In particular, severity and self-efficacy were significantly associated with intention to stay away from cocaine, but vulnerability and response costs had no association with intentions.

Overview of findings

The present study aimed at examining the efficacy of visual anti-cocaine messages differing in framing and dosage on PMT constructs, particularly, perceived severity, vulnerability, self-efficacy, response costs, and intention to stay away from cocaine. Results revealed that after-only framing was more efficacious than before-after framing for perceived severity and vulnerability, and low-dose message was more efficacious than high-dose message for self-efficacy. In addition, greater perceived severity and

Table 2. ANCOVA results for framing and dosage on PMT components.

	Before-after, M (SD)	After-only, M (SD)	df, df_{hyp} , df_{err}	F	η^2	2 images, M (SD)	8 images, M (SD)	df, df_{hyp} , df_{err}	F	η^2
Perceived severity	3.25 (0.93)	3.56 (1.00)	1,158	6.16**	0.04	3.30 (0.81)	3.40 (0.97)	1,158	0.09	0.00
Perceived vulnerability	3.83 (0.79)	4.10 (0.80)	1,158	3.84*	0.03	4.00 (0.74)	3.90 (0.88)	1,158	2.14	0.01
Self-efficacy	4.69 (0.61)	4.73 (0.59)	1,158	0.32	0.00	4.79 (0.47)	4.66 (0.64)	1,158	3.37*	0.02
Response costs	1.39 (0.66)	1.31 (0.60)	1,158	0.49	0.00	1.38 (0.61)	1.32 (0.65)	1,158	0.18	0.00

Note: * $p < 0.05$, ** $p < 0.01$.

Table 3. Results of hierarchical regression analyses predicting intention to stay away from cocaine ($n = 164$).

Steps	1			2			3		
	B	SE	β	B	SE	β	B	SE	β
Step 1									
Age	0.08	0.03	0.18**	0.08	0.03	0.18**	0.07	0.03	0.14*
Gender ^a	-0.04	0.10	-0.02	-0.04	0.10	-0.02	-0.12	0.11	-0.06
Prior cocaine use ^b	-1.65	0.13	-0.71***	-1.64	0.13	-0.71***	-1.32	0.16	-0.57***
Step 2									
Framing ^c				0.01	0.07	0.01	-0.02	0.07	-0.02
Dosage ^d				-0.02	0.07	-0.02	-0.01	0.07	-0.01
Step 3									
Perceived severity							0.11	0.06	0.16*
Perceived vulnerability							0.01	0.07	0.01
Self-efficacy							0.20	0.10	0.18*
Response costs							-0.02	0.07	-0.02
R^2 change					0.00			0.06***	
Adjusted R^2					0.49***			0.54***	

Note: Numbers in columns represent standardized coefficients for each variable. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

^aGender: 0 = male, 1 = female; ^bCocaine use: 0 = never used, 1 = used; ^cFraming: 0 = before-after, 1 = after-only; ^dDosage: 0 = 2, 1 = 8.

self-efficacy were significantly associated with greater intention to stay away from cocaine. These results are further discussed.

Discussion

The results for framing and dosage were contrary to our expectations that before-after or high-dose messages would create greater perception of threat and provide greater coping responses as than after-only or low-dose messages. We found stronger effects for after-only and low-dose messages, respectively. Past research has shown mixed results for effects of threatening messages. Whereas some researches have demonstrated that high threat messages are effective in bringing about behavioral change (e.g. Mongeau 1998, Floyd *et al.* 2000, Dillard *et al.* 2007), other researches have also demonstrated that threatening messages do not always work as intended (e.g. Keller and Block 1997, La Tour and Rotfeld 1997). Rather than acting to eliminate the threat, individuals may engage in biased processing of the message and chose to regulate the effects of threat and discount the severity of the threat, thereby making the desired behaviors less likely (Rogers 1983). It may be possible that the before-after images and high-dose images were perceived as very threatening or obnoxious, and may have prevented participants from paying close attention to them. On the other hand, the after-only pictures may have attracted the attention of participants and they may have felt greater involvement because they have had to guess how the drug user may have looked before he/she got hooked on to cocaine. Similarly, the low-dose messages showed only two examples, and may not have appeared as too threatening or overwhelming to the participants. Future research should also measure other cognitive predictors such as attention and involvement, which may help unravel the persuasiveness of visual messages better.

Finally, we found that greater perceived severity and self-efficacy were significantly associated with greater intention to stay away from cocaine. This finding is not surprising, because, similar patterns have been observed in prior research (Floyd *et al.* 2000, Milne *et al.* 2000). However, we did not find support for perceived vulnerability and response costs. Young adults tend to hold optimistic bias, which refers to people's beliefs that they are less vulnerable than are others to health risks (Weinstein 1993). This optimistic bias often prevents young adults from perceiving themselves as vulnerable to health risks, as has been demonstrated in prior studies (e.g. Chapin 2001, Chapin *et al.* 2005). In this study, although the after-only message was successful in eliciting the perception of vulnerability, but the perception was probably not strong enough to effect intentions.

With regard to findings for response costs, prior meta-analysis has documented that response costs affect intentions (Floyd *et al.* 2000), but our results did not support this. Because the visual images utilized for creating anti-cocaine messages focused only on visible effects of cocaine use, they did not target response costs. Possibly for this reason, the image manipulations did not have any effect on response costs, and therefore, results did not demonstrate an association between costs and intentions.

Implications for visual message design

This study suggests that the after-only message-framing strategy may be used to motivate young adults to refrain from cocaine use/experimentation. However, the amount of fear elicited that will be most effective in motivating attitude, intention, and behavior change will need to be pretested. There needs to be caution exercised when exposing young adults to a threatening message, or there might be a significant risk of message failure or

counterattitudinal message processing. Finally, exploration of individual differences (such as sensation seeking) may be beneficial in targeting prevention messages effectively, and this could be explored in future research.

Limitations and future research

This 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 substance use (particularly, cocaine use) is more typically found among males in young adults (The Information Center 2007). It is reasonable to believe that the effect of visual anti-cocaine messages would have been more pronounced with a predominately male sample.

Second, this study utilized framing and dosage to examine responses to PMT components, and therefore 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. In addition, the messages used in this study only demonstrated physical effects of cocaine use. Using striking images of the physical, emotional, or social effects of drug use may convey different meaning to participants and differ in persuasiveness, something that needs to be explored in future research.

Third, we utilized the perceptual contrast effect in print visual messages. Use of perceptual contrast in a video mode (with a time-lag) between the before-and-after image may affect cognitions and intentions differently. Finally, the present study only tested for cognitions as specified by the PMT. Exploring other cognitions that have been associated with intentions in traditional persuasion research such as the theory of reasoned action (Ajzen and Fishbein 1980), theory of planned behavior (Ajzen 1985), and inoculation theory (McGuire 1964) will help in understanding the utility of visual anti-drug messages. Ultimately, a better understanding of how visual messages work for drug prevention will aid in disseminating anti-drug message to youth, even those with limited literacy levels. Therefore, in order to best utilize the resources available through visual means, more research needs to inform the persuasiveness of visual messages for youth.

References

- Ajzen, I., 1985. From intentions to actions: a theory of planned behavior. *In*: J. Kuhl and J. Beckmann, eds. *Action control: from cognition to behavior*. New York: Springer-Verlag, 11–39.
- Ajzen, I., and Fishbein, M., 1980. *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Aspinwall, L., et al., 1991. Psychosocial predictors of gay men's AIDS risk-reduction behavior. *Health Psychology*, 10, 432–444.
- Chang, C.-T., 2006. Is a picture worth a thousand words? Influence of graphic illustration on framed advertisements. *In*: C. Pechmann and L.L. Price, eds. *Advances in consumer research*, Vol. 33. Duluth, MN: Association for Consumer Research, 104–112.
- Chapin, J., 2001. It won't happen to me: the role of optimistic bias in African American teens' risky sexual practices. *Howard Journal of Communications*, 12, 49–59.
- Chapin, J., de las Alas, S., and Coleman, G., 2005. Optimistic bias among potential perpetrators and victims of youth violence. *Adolescence*, 40, 749–760.
- Cialdini, R., 1993. *Influence: science and practice*. 3rd ed. New York: Harper Collins.
- Courneya, K.S., and Hellsten, L.-A.M., 2001. Cancer prevention as a source of exercise motivation: an experimental test using protection motivation theory. *Psychology, Health and Medicine*, 6, 59–64.

- Dagnoli, J., 1991. Heavying Up on diet ads. *Advertising Age*, 26, 3–4.
- Dillard, J.P., Shen, L., and Vail, R.G., 2007. Does perceived message effectiveness cause persuasion or vice versa? 17 consistent answers. *Human Communication Research*, 33, 467–488.
- Edwards, A., Elwyn, G., and Mulley, A., 2002. Explaining risks: turning numerical data into meaningful pictures. *British Medical Journal*, 324, 827–834.
- Farrelly, M.C., et al., 2002. Getting to the truth: evaluating national tobacco countermarketing campaigns. *American Journal of Public Health*, 92, 901–907.
- Federal Trade Commission, 2002. *Weight loss advertising: an analysis of current trends* [online]. Available from: <http://www.ftc.gov/bcp/reports/weightloss.pdf> [Accessed 30 June 2010].
- Finan, N., 2002. Visual literacy in images used for medical education and health promotion. *Journal of Audiovisual Media in Medicine*, 25, 16–23.
- Floyd, D.L., Prentice-Dunn, S., and Rogers, R.W., 2000. A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30, 407–429.
- Geier, A.B., Schwartz, M.B., and Brownell, K.D., 2003. “Before and after” diet advertisements escalate weight stigma. *Eating and Weight Disorders*, 8, 282–288.
- Greening, L., and Stoppelbein, L., 2000. Young driver’s health attitudes and intentions to drink and drive. *Journal of Adolescent Health*, 27, 94–101.
- Helmes, A.W., 2002. Application of the protection motivation theory to genetic testing for breast cancer risk. *Prevention Medicine*, 35, 453–462.
- Hersh, A.C., et al., 2004. 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.
- Keller, A.P., and Block, L.G., 1997. Vividness effects: a resource matching perspective. *Journal of Consumer Research*, 24, 295–304.
- La Tour, M., and Rotfeld, H., 1997. There are threats and (maybe) fear-caused arousal: theory and confusions of appeals to fear and fear arousal itself. *Journal of Advertising*, 26, 45–61.
- McGuire, W.J., 1964. Inducing resistance to persuasion: some contemporary approaches. In: L. Berkowitz, ed. *Advances in experimental social psychology*. New York: Academic Press, 191–229.
- Milne, S., Orbell, S., and Sheeran, P., 2002. Combining motivational and volitional interventions to promote exercise participation: protection motivation theory and implementation intentions. *British Journal of Health Psychology*, 7, 163–184.
- Mongeau, P.A., 1998. Another look at fear-arousing persuasive appeals. In: M. Allen and R.W. Preiss, eds. *Persuasion: advances through meta-analysis*. Cresskill, NJ: Hampton Press.
- Murgraff, V., White, D., and Phillips, K., 1999. An application of protection motivation theory to riskier single-occasion drinking. *Psychology and Health*, 14, 339–350.
- Niederdeppe, J., et al., 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.
- Pechman, C., et al., 2003. What to convey in antismoking advertisements for adolescents: the use of protection motivation theory to identify effective message themes. *Journal of Marketing*, 67, 1–18.
- Plotnikoff, R., and Higginbotham, N., 1998. Protection motivation theory and the prediction of exercise and low-fat diet behaviors among Australian cardiac patients. *Psychology and Health*, 13, 411–429.
- Plotnikoff, R., and Higginbotham, N., 2002. Protection motivation theory and exercise behavior change for the prevention of coronary heart disease in a high-risk, Australian representative community sample of adults. *Psychology, Health and Medicine*, 7, 87–98.
- Roe, S., and Man, L., 2006. *Drug misuse declared: findings from the 2005/06 British Crime Survey* [online]. Available from: <http://www.homeoffice.gov.uk/rds/pdfs06/hosb1506.pdf> [Accessed 10 November 2007].
- Rogers, R.W., 1983. Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In: B.L. Cacioppo and L.L. Petty, eds. *Social psychophysiology: a source book*. London: Guildford Press, 153–176.
- Rogers, R.W., 1985. Attitude change and information integration in fear appeals. *Psychological Reports*, 56, 183–188.

- Rogers, R.W., Deckner, W., and Mewborn, C.R., 1978. An expectancy-value theory approach to the longterm modification of smoking behavior. *Journal of Clinical Psychology*, 34, 562–566.
- Sherif, M., Taub, D., and Hovland, C.I., 1958. Assimilation and contrast effects of anchoring stimuli on judgements. *Journal of Experimental Psychology*, 55, 150–155.
- Sly, D.F., Trapido, E., and Ray, S., 2002. Evidence of the dose effects of an antitobacco counteradvertising campaign. *Preventive Medicine*, 35, 511–518.
- The Information Centre, 2007. *Statistics on drug misuse: England 2007* [online]. Available from: <http://www.ic.nhs.uk/webfiles/publications/drugmisuse07/Drugs%20misuse-England%202007.pdf> [Accessed 28 June 2010].
- Umeh, K., 2004. Cognitive appraisals, maladaptive coping, and past behavior in protection motivation. *Psychology and Health*, 19, 719–735.
- Weinstein, N., 1993. Testing four competing theories of health-protective behavior. *Health Psychology*, 12, 324–333.