

Visceral Influences on Risk-Taking Behavior

PETER H. DITTO^{1*}, DAVID A. PIZARRO¹, EDEN B. EPSTEIN¹,
JILL A. JACOBSON² and TARA K. MACDONALD²

¹*University of California, Irvine, USA*

²*Queen's University, Canada*

ABSTRACT

Visceral cues indicating proximity to objects of desire can lead people to be disproportionately influenced by the anticipated rewards of immediate gratification rather than the risks of consummatory behavior. Two studies examined this hypothesis. In Study 1, participants were given the choice of playing a game in which they risked time in the lab to win chocolate chip cookies. Participants who could see and smell the cookies while they made their decision were less sensitive to risk information than were participants for whom the cookies were merely described. In Study 2, male condom users either saw a video or read a description depicting a young couple deciding whether to have sex without a condom. Participants seeing the video expressed a greater likelihood of having unprotected sex in the situation than did participants reading the description. The underappreciated role of visceral factors in social cognition theory and research is discussed. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS risk perception; visceral factors; sexual decision making; motivated reasoning

INTRODUCTION

People often do things that they almost immediately regret. Would-be dieters succumb to the lure of forsworn foods, only to curse their weak wills once their hunger (or the food) is gone. Unfaithful spouses live wracked with guilt after an impulsive sexual dalliance, only to repeat the cycle again and again, each time as bewildered as the last by the inconsistency between the strength of their resolve in the company of their families and the crumbling of this resolve in the presence of a willing lover.

These types of behavior at once represent some of our most iconic human experiences and an enduring puzzle for any theory of rational behavior. In one form or another, the struggle between desire and reason, impulse and morality, is familiar to all of us, and it lies at the center of some of humankind's oldest and most

* Correspondence to: Peter H. Ditto, Department of Psychology & Social Behavior, University of California, 3340 Social Ecology II, Irvine, CA 92697-7085, USA. E-mail: phditto@uci.edu

resonant stories (think of Eve and Odysseus). For almost as long, however, the tendency for desire to emerge victorious in this struggle, and to lead individuals to behave in ways that they later recognize as having been foolish or immoral, has posed a special problem to philosophers and later economists. The Greeks referred to failures of will as *akrasia*, and Aristotle (4th Century, B.C.E./1998) in particular was struck by the difficulty of providing an adequate philosophical account of the common tendency for individuals to behave in ways that they “know” at some level to be wrong. Similarly, behavior that knowingly violates one’s own self-interest presents a significant problem for the conventional economic view of rational, goal-directed human behavior, and both classic (Smith, 1759/2002) and contemporary (Loewenstein & O’Donoghue, 2004; Shefrin & Thaler, 1988) economists have struggled to incorporate the impulsive side of human nature, so obvious from everyday experience, into the traditional economic paradigm emphasizing behavior based on reasoned, long term-oriented, cost-benefit analyses.

Psychologists too have focused considerable attention on the trials and tribulations of self-control (Baumeister, Heatherton, & Tice, 1994; Freud, 1924/1962). This body of work has produced several powerful theoretical analyses of self-regulation processes (Carver & Scheier, 1981; Muraven & Baumeister, 2000), and identified a number of factors such as stress (Cohen & Lichtenstein, 1990), cognitive preoccupation (Ward & Mann, 2000), and prior exertions of will (Baumeister, Bratslavsky, Muraven, & Tice, 1998) that make self-control failure more likely. The issue that has received less attention in this literature, however, is the particular problem that vexed Aristotle. How do strong states of desire lead people to disregard knowledge of the risks or improprieties of a behavior that seem so evident to them under “cooler” conditions?

The earliest and most influential psychological treatment of what in Aristotelian terms might be called akratic behavior is Mischel’s extensive research program on delay of gratification (e.g., Mischel, Shoda, & Rodriguez, 1989). Mischel and his colleagues have demonstrated in numerous experiments that: a) children tempted with desirable stimuli like snack foods will often opt for a small immediate payoff over a larger delayed one, and b) the tendency to delay gratification can be enhanced by diverting children’s attention away from the snack food via techniques such as removing it from their direct visual field (Mischel, Ebbesen, & Zeiss, 1972) or encouraging children to conceptualize the snack food in a non-appetitive way (Mischel & Baker, 1975). Building on this empirical work, Metcalfe and Mischel (1999) proposed a hot/cool system analysis of delay of gratification in which a cool, cognitive “know” system and a hot, emotional “go” system interact to enable or undermine individuals’ attempts at self-control. According to the analysis, sensory contact with desirable snack foods (having them dominate the individual’s visual field) or cognitions that emphasize the sensory pleasures of them (their desirable taste or the enjoyment of consuming them), engage the hot system and make delaying gratification more difficult. Conversely, factors that divert attention or thought away from the sensory pleasures of consumption allow for dominance of the cool system, which facilitates delay of gratification by enhancing an individual’s ability to consider the relative benefits of waiting to obtain the larger but later reward.

In an analysis similar in spirit to that of Metcalfe and Mischel (1999) but flowing from a decision theoretic perspective, Loewenstein (1996) modeled how what he termed *visceral factors* help to explain discrepancies between behavior and perceived self-interest. Loewenstein asserts that motivational states such as hunger, thirst, pain, and sexual desire can affect the desirability of goods and actions. As such, decisions made under “hot” conditions (e.g., when one is hungry) will be more influenced by the desire to obtain the desired “good” (e.g., food) than will decisions made under cooler circumstances such as when an individual considers his or her own behavior from the perspective of the relatively distant past or future (i.e., when predicting one’s own future behavior or remembering one’s own past behavior). Particularly relevant to the present analysis, Loewenstein (1996) also states that in addition to temporal proximity of the decision maker to the decision, sensory input indicating physical proximity to desired objects (visual, olfactory, or tactile) also promotes visceral influences on behavior. Thus, both Metcalfe and Mischel (1999) and Loewenstein (1996) converge on the notion that decisions made in the presence of sensory input from desired objects are likely to be more impulsive than are decisions made in the absence of these types of visceral cues.

This article reports two studies examining behavior in a pair of domains (eating and sex) well known for failures of will. The goal of both studies was to create a decision situation in which relevant information was held constant while manipulating the presence or absence of visceral cues. That is, participants were presented with information about a desired behavior in either a sensory-rich or a sensory-impooverished fashion. Both studies were further designed to place individuals in a situation where information about the risks of consummatory behavior conflicted with the visceral pull to engage in it. Our key prediction was that behavior in the presence of visceral cues would be more “impulsive,” i.e., less sensitive to risk information, than behavior in the absence of visceral cues. Because we were also interested in addressing more specific questions regarding how visceral cues might impel impulsive behavior, the studies each included cognitive process measures and analyses were conducted to examine their potential mediating effects on risk-taking behavior.

STUDY 1

Both research and anecdote attest to the power of olfactory cues. Smell, more so than the other sensory systems, has been found to be evocative of emotional memories (Herz, Eliassen, Beland, & Souza, 2004). The emotional power of smell is also not a point lost on real estate agents, who often encourage hopeful home sellers to fill their house with the aroma of baking cookies prior to the visits of potential buyers. Seeing may be believing, but smelling is feeling, and in many cases it is feeling that closes the deal.

In Study 1, we took advantage of the visceral power of both sight and smell to create a situation where participants were faced with the chance to risk extra time in the lab to win chocolate chip cookies that they could either see and smell or were only described. Some participants were told that their odds of winning the cookies were relatively good, others that they were relatively poor. We expected participants making a decision about described cookies to be sensitive to risk information and thus to be less likely to try to win the cookies in the high-risk than the low-risk condition. In contrast, we predicted that participants playing for the “visceral” cookies would be relatively insensitive to risk information, showing similar rates of risk-taking behavior in the low-risk and high-risk conditions.

Method

Participants

Eighty undergraduate students (48 women, 32 men) participated in the study in exchange for course credit. Twenty were randomly assigned to each of four experimental conditions.

Preliminary questions

Participants were told that they would be participating in a study on risk perception, and that at the end of the session they would have the opportunity to play a game of chance. After signing a consent form, participants completed a demographic questionnaire, and the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). Participants then completed items from the Raven’s Progressive Matrices Test (e.g., Carpenter, Just, & Shell, 1990), a cognitive task in which the respondent views a series of visual patterns, and attempts to determine the rules by which the patterns change.

Gambling task

The experimenter next told participants that they had the opportunity to play a game of chance. The experimenter explained that in order to approximate a realistic gambling scenario they were going to play for a

tangible prize. Participants were told that because gambling for money was not possible in a laboratory setting, cookies would be used as the reward.

The game involved randomly selecting one card from a set of 10. It was explained that, if they chose a winning card, they would be given the opportunity to eat as many chocolate chip cookies as they would like and their participation in the study would be complete. However, if they chose a losing card, they would receive no cookies, and would have to remain in the lab and complete an extra 30 minutes of problems from the Raven's Progressive Matrices test. Participants were also given the option to not play the game. They were told that, if they chose not to play, they would not receive cookies, and would have a few more short questionnaires to complete. At this point, participants indicated their choice (to play or not play the game), and subsequently completed a post-choice questionnaire (described below).

Experimental manipulations

The study used a 2 (risk: low vs. high) \times 2 (cookies: non-visceral vs. visceral) between-subjects design. For half of the participants (low-risk condition), when the card game was described, probabilities were presented that were favorable to winning (eight winning cards and two losing cards). For the other half (high-risk condition), probabilities were presented that were relatively unfavorable to winning (six winning cards and four losing cards). Orthogonally, half of the participants were randomly assigned to a "non-visceral cookie" condition, and the other half to a "visceral cookie" condition. In the non-visceral condition, participants were simply told that they had the chance to win cookies. In the visceral condition, however, participants arrived to a laboratory filled with the aroma of freshly made chocolate chip cookies. The cookies were baked in a small oven located inside the room, and were taken out of the oven just before participants entered. In the visceral condition, all measures were completed in the presence of the cookie smell. A batch of the warm cookies was also placed on the table in front of participants as they completed the preliminary set of questionnaires.

Dependent measures

The primary outcome of interest was whether participants chose to take the gamble in order to win the cookies (risking the aversive outcome of extra time in the lab completing effortful pattern recognition items). Immediately following this response, participants were given a follow-up questionnaire including a number of items to assess the effect of the manipulations on participants' perceptions of the desirability and likelihood of the various tasks and possible outcomes. First, participants were asked to indicate how much they liked chocolate chip cookies on a 9-point scale (1 = *don't like at all*; 9 = *like very much*), and how much they enjoyed completing the Raven's Progressive Matrices problems (1 = *didn't like at all*; 9 = *liked very much*). Second, participants were asked to indicate how pleasant or unpleasant they thought it would be to eat the cookies if they won the game, and how pleasant or unpleasant they thought it would be to complete the matrices problems if they lost the game (1 = *extremely unpleasant*; 9 = *extremely pleasant*). Finally, participants were asked to indicate how likely they believed they were to choose a winning card (1 = *extremely unlikely*; 9 = *extremely likely*), and how confident they were that they would choose a winning card (1 = *not at all confident*; 9 = *extremely confident*).

Results

Decision to play the game

The effects of the two experimental manipulations on participants' likelihood of choosing to play the game was analyzed with logistic regression. A main effect was indicated for both the risk ($Wald \chi^2(1, N = 80) = 7.89, p < 0.001$) and cookie manipulations ($Wald \chi^2(1, N = 80) = 4.90, p < 0.05$). These main

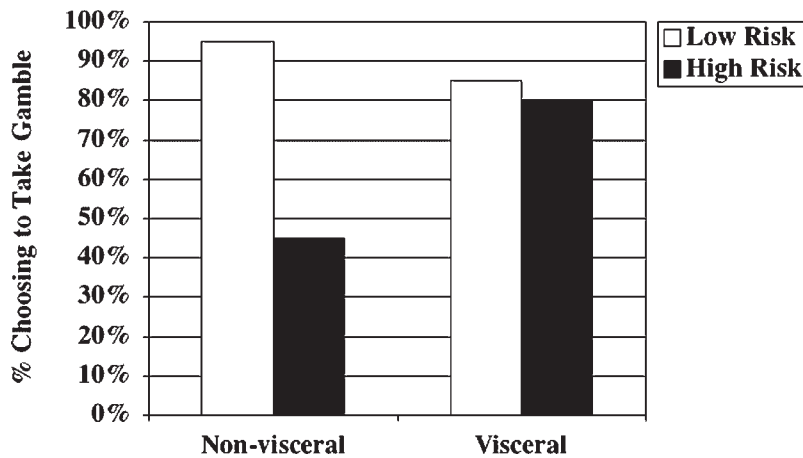


Figure 1. Percent of participants choosing to play the game by experimental condition

effects were qualified, however, by the predicted risk \times cookie condition interaction, $Wald \chi^2(1, N = 80) = 3.99, p < 0.05$. As can be seen in Figure 1, participants in the non-visceral condition, for whom the cookies were only described, were sensitive to (and behaved rationally in light of) the stated probabilities of winning the game. Whereas 95% of participants in the non-visceral condition chose to play the game in the low-risk condition, only 45% chose to play in the high-risk condition, $\chi^2(1, N = 80) = 11.91, p < 0.001$. In contrast, the behavior of participants in the visceral condition was insensitive to the risk information. As predicted, participants who made their decision while they could see and smell the cookies were just as likely to choose to play the game in the low risk (85%) as in the high-risk condition (80%), $\chi^2(1, N = 80) = 0.17, ns$.

Desirability and likelihood of winning cookies

A series of 2 (low vs. high risk) \times 2 (non-visceral vs. visceral cookies) analyses of variance (ANOVAs) revealed that the manipulations also affected the perceived desirability and likelihood of winning the cookies (see Table 1). Participants in the visceral condition indicated a greater liking for chocolate chip cookies ($M = 7.43$) than did participants in the non-visceral condition, ($M = 6.08$), $F(1, 76) = 11.72, p < 0.001$. Participants' ratings of how pleasant they thought it would be to eat the cookies if they were to win the game were also significantly higher for those in the visceral ($M = 7.58$) than non-visceral condition ($M = 6.30$), $F(1, 76) = 11.20, p < 0.001$. In contrast, the manipulations had no significant effects on participants' perceptions of the pleasantness of the Raven's Progressive Matrices test.

Table 1. Mean ratings for Study 1 Dependent measures

Variable	Non-visceral		Visceral	
	Low risk	High risk	Low risk	High risk
How much like cookies	6.00 (2.29)	6.15 (1.84)	7.20 (1.32)	7.65 (1.42)
Pleasant to eat cookies	6.25 (2.10)	6.35 (1.79)	7.15 (1.50)	8.00 (1.34)
Odds of winning	6.95 (1.09)	5.40 (0.68)	7.35 (0.59)	5.90 (0.72)
Confident will win	6.50 (1.24)	5.15 (1.76)	6.85 (1.42)	6.25 (1.33)

Note: For all risk conditions, $n = 20$. Standard deviations are given in parentheses.

Participants' perceptions of their chances of winning the game were generally sensitive to the manipulated probabilities. Those in the low-risk condition thought their chances better ($M = 7.15$) than did those in the high-risk condition ($M = 5.65$), $F(1, 76) = 71.10$, $p < 0.001$, and low-risk participants stated greater confidence that they would win the game ($M = 6.68$) than did high-risk participants ($M = 5.70$), $F(1, 76) = 9.04$, $p < 0.01$. The perceived chances of winning were also affected, however, by the visceral proximity of the cookies. Participants who made their choice while smelling the cookies believed that they were significantly more likely to choose a winning card ($M = 6.63$) than were participants deciding about described cookies ($M = 6.18$), $F(1, 76) = 6.40$, $p < 0.05$. Similarly, participants in the visceral condition were significantly more confident that they would win the gamble ($M = 6.55$) than those in the non-visceral condition, ($M = 5.83$), $F(1, 76) = 5.00$, $p < 0.05$.

A series of logistic regressions were conducted consistent with the recommendations of Baron and Kenny (1986) to examine whether participants' perceptions of the desirability of the cookies (two variables) or the likelihood of winning the game (two variables) mediated the relationship between the visceral manipulation and choice behavior. None of the four variables met the requirements for mediation.

Visceral factors and mood

If the smell of cookies acted as a positive mood manipulation, then research demonstrating that positive mood can result in decreased systematic information processing (e.g., Bless, Clore, Schwarz, & Golisano, 1996) might explain the relative insensitivity of visceral condition participants to probabilistic information. Because the mood items were presented after the visceral manipulation (the smell of the cookies was present while participants were completing all initial measures), but before the risk manipulation, we analyzed the mood items only as a function of the visceral manipulation. Participants' mood was examined by summing the scores of the 10 positive mood and 10 negative mood items on the PANAS. The visceral manipulation had no effect on either positive (visceral $M = 26.50$, non-visceral $M = 24.55$, $t[78] = 1.35$, *ns*) or negative mood (visceral $M = 14.58$, non-visceral $M = 15.10$, $t[78] = 0.34$, *ns*).

Discussion

The results of Study 1 provide support for our prediction regarding the effects of visceral cues on risk-taking behavior. As expected, participants making their decision based on a "cool" description of the cookie prize were significantly less likely to risk extra time in the lab if they believed their chances of losing were 40% rather than just 20%. This rational sensitivity to risk information, however, was not evident when decisions were made in the presence of a visceral cue. Participants who could see and smell the cookies when they made their decision were just as likely to play the high-risk game as the low-risk game and were almost twice as likely to play the high-risk game than were participants in the non-visceral condition (80% vs. 45%).

This insensitivity to the risk information cannot be explained by mood as participants who could smell the cookies reported similar levels of both positive and negative affect to participants who were not exposed to the cookie smell. However, other alternative explanations deserve consideration.

First, it is possible that by placing the cookies in front of visceral condition participants as they made their decisions these individuals might have experienced some level of ego-depletion (Baumeister et al., 1998) as they had to refrain from the desire to treat themselves to a premature taste. This extra use of willpower could be expected to produce elevated risk-taking behavior in the visceral conditions. Despite the fact that our manipulation was inspired by Baumeister et al. (1998) use of aromatic cookies, this explanation seems implausible in the current context. Ego depletion effects have been found to occur only when an individual is allowed to engage in a desired action, but is asked to actively try to refrain (Vohs & Heatherton, 2000). Our visceral condition participants were given no indication that they had our permission to partake of the cookies placed near them.

Second, our decision to use olfactory cues was based on our belief that odor was an effective mode of manipulating the visceral impact of the cookies in a way that did not introduce additional information that might confound the experimental design. An ardent critic might still argue, however, that participants in the non-visceral condition may not have imagined that the cookies they were playing for were as appetizing as those presented to the visceral condition participants. This could explain both the elevated rates of risk taking in the visceral conditions, and the fact that visceral condition participants reported more positive feelings toward chocolate chip cookies than did participants in the non-visceral conditions. The distinction between this alternative explanation and the proposed one, however, is slight. In fact, it is precisely our contention that visceral proximity to objects of desire focuses attention on their attractive qualities (Loewenstein, 1996) and consequently should lead to both enhanced attractiveness of a desired object and the relative neglect of less proximal information like considerations of risk.¹ The crucial issue is whether the differences in perceived desirability stem from differences in the *information* participants are provided about the cookies, or from the visceral impact of seeing and smelling them. Unfortunately, manipulating visceral impact while equating informational content is no simple feat. As anyone who has read a steamy novel knows, verbal descriptions can produce a significant visceral effect. To the extent that a verbal description of the cookies attempts to equate informational content by emphasizing the cookies' visceral qualities (e.g., their delicious aroma and warm, chewy appearance), the distinction between a cool/informational account and a hot/visceral one is blurred (Metcalf & Mischel, 1999; Mischel & Baker, 1975). Our intent in the current study was to minimize the possibility of informational differences by using a tempting stimulus that almost all of our subjects could be expected to find familiar (chocolate chip cookies), and the fact that participants in the low risk, non-visceral condition almost unanimously opted to take the risk for the cookies suggests that even without the sensory stimulation the cookies were perceived as quite desirable.

Finally, the visceral cue manipulation not only affected the perceived desirability of chocolate chip cookies, but also the perceived likelihood of winning them. Although participants were generally sensitive to the risk manipulation (perceiving their chances of winning as better in the low- than high-risk conditions), they also rated their chances of winning the cookies as better in the visceral than in the non-visceral conditions. One explanation of this finding is that it is evidence of motivated reasoning (Kunda, 1990), such that participants who could see and smell the cookies convinced themselves to take the gamble by inflating their subjective odds of winning. It is also possible of course that it is due to a *post hoc* rationalization process that played no causal role in visceral participants' greater risk-taking behavior. The results of the mediational analyses argue against a causal role of either likelihood or desirability perceptions in participants' risk-taking behavior. Ideally, however, mediational analyses would examine measures that more closely map people's online thought processes, and minimize to the extent possible susceptibility to post-behavior justifications and/or social desirability bias.

STUDY 2

Study 2 examined the role of visceral cues on risk taking in a second appetitive domain notorious for self-control failure: sexual behavior. Actual sexual behavior is, of course, extraordinarily difficult to study, but at least three studies have examined the role of sexual arousal on sexually related judgments. Blanton and Gerrard (1997) found that male students lowered their baseline ratings of the chances of contracting sexually-transmitted diseases from a partner when presented with a picture suggesting the partner was high in physical attractiveness but not when the picture suggested that she was low in physical attractiveness.

¹This effect is also reminiscent of Rottenstreich and Hsee's (2001) finding that affect-rich stimuli lead to a relative insensitivity to probability variations (in the intermediate range). Both of our cookie conditions, however, would be seen as affect-rich in their view. Thus, their view alone cannot explain the current findings, although it is tempting to assume that the two phenomena involve similar mechanisms.

Loewenstein, Nagin, and Paternoster (1997) asked male students to predict their behavior in a hypothetical date rape scenario. Men sexually aroused by rating the attractiveness of nude *Playboy* centerfolds prior to the prediction task estimated their probability of engaging in sexually aggressive behavior as higher than did men who had been exposed to non-arousing pictures. Finally, Ariely and Loewenstein (2006) found that men sexually aroused by self-stimulation indicated greater willingness to engage in a number of risky and/or morally-questionable sexual behaviors than did non-aroused men.

Study 2 builds on this research by using a different method of manipulating visceral impact (presenting the decision situation in either a sensory-rich or sensory-impoverished fashion). In addition, Study 2 included a well-established thought listing measure and a host of risk perception items to gain a clearer picture of the cognitive processes underlying impulsive sexual behavior.

Method

Participants

Participants were 23 sexually active males, selected on the basis of their responses to a prescreening questionnaire. Specifically, the participants were 18–25 years old, heterosexual, sexually active, condom users (i.e., scored 5 or above on a 9-point rating where 9 = *always use condoms*), and not in an exclusive dating relationship (cf. MacDonald, Fong, Zanna, & Martineau, 2000; MacDonald, Zanna, & Fong, 1996).

Procedure

Upon arrival, participants were escorted into individual rooms, and all study materials were presented on a computer. The participants were randomly assigned to either the visceral ($n = 12$) or non-visceral condition ($n = 11$). In the visceral condition, participants watched a short video designed by MacDonald and her colleagues for their research on condom use (MacDonald et al., 1996, 2000). In the video, two attractive students, Pierre and Rebecca, talk after class and arrange to meet at a bar later that night. After an evening of dancing, they go to Rebecca's apartment where they kiss on her couch. Eventually, Rebecca takes off her shirt and indicates that she is interested in having sex (alleviating the threat of a potential date rape situation). Pierre then discloses that he did not bring any condoms. Rebecca tells him that she also does not have any condoms but is on the pill (alleviating the threat of pregnancy). The two discuss the idea of obtaining condoms from a local store but conclude that it is not feasible. They discuss their sexual history (e.g., Pierre states that he is "clean," and Rebecca states that she does not "sleep around"). The video ends with Pierre asking Rebecca, "What do you want to do?" and Rebecca replying, "I don't know. What do you want to do?"

In the non-visceral condition, participants read about the scenario instead of watching the video. Specifically, they read:

Imagine that you are single and that you run into an attractive acquaintance, Rebecca, at a bar. You continue to spend time together throughout the night and end up at her apartment at the end of the evening. After talking and kissing on the couch, it is clear that you are both very interested in having sex with each other. However, neither of you has a condom. You discuss the possibility of going to a store, but there is not one nearby. She tells you that she is on the pill and has not slept with anyone since her last boyfriend.

All participants then completed a series of questions about the scenario and their reactions to it, after which they were debriefed and excused.

Dependent measures

Manipulation checks. Three questions were included to assess the effect of the visceral manipulation. Participants rated the extent to which they thought the situation was sexually arousing (1 = *strongly disagree*, 9 = *strongly agree*), how engaging they found the situation (1 = *not at all engaging*, 9 = *extremely*

engaging), and how difficult it was to put themselves in the place of the male protagonist (1 = *extremely difficult*, 9 = *extremely easy*).

Intentions. The primary dependent measure concerned participants' intentions to engage in sexual intercourse with Rebecca without a condom. This item ("If I were in this situation, I would engage in sexual intercourse with Rebecca.") was rated on a 9-point scale with 1 = *very unlikely* and 9 = *very likely*.

Thought listing. Immediately following the intentions measure, participants were asked to list up to eight thoughts that influenced their decision about whether or not to engage in sexual intercourse with Rebecca. On average, participants listed 5.21 thoughts ($SD = 2.01$). Using the coding scheme developed by MacDonald et al. (2000), two coders independently rated each thought on two dimensions. The valence dimension had two possible codes: impelling or inhibiting. Impelling statements described reasons to engage in sexual intercourse with Rebecca, and inhibiting statements pertained to reasons not to engage in sexual intercourse with Rebecca. In terms of their valence, the coders agreed on 118 of the 120 thoughts (Cohen's $\kappa = 0.97$). For the content dimension, all of the categories outlined in MacDonald et al. (2000) were coded, but we chose to examine only the two most frequent types of statements: risk and attractiveness. Risk statements referred to risks involved in having sexual intercourse with Rebecca, while attractiveness statements referred to Rebecca's physical appearance or the participants' sexual attraction to her. In terms of their content, the coders agreed on 106 of the 120 thoughts (Cohen's $\kappa = 0.82$). Using the two valence and two content codings categorizes participants' thoughts into four types: *impelling risk* ("She said she had been tested recently"), *impelling attractiveness* ("She's beautiful and very sexy"), *inhibiting risk* ("No condom"), and *inhibiting attractiveness* ("Tough decision. Hopefully logic would win over sex drive").

Rating scales. Immediately following the thought listing procedure, participants responded to a series of items intended to assess their perceptions of the risk associated with having sex with Rebecca (10 items) and their perception of Rebecca as a person (16 items). The first set included both items tapping participants' agreement with several "risk rationalizations" (e.g., *Because Rebecca's on the pill and won't get pregnant, there's little need for me to worry if we have intercourse*) and ratings of how sexual intercourse with Rebecca would make them feel (e.g., *foolish-not foolish*). The second set included items tapping general evaluations of Rebecca (e.g., *bad-good*), perceptions of her riskiness as a sexual partner (e.g., *sleeps around-monogamous*), and perceptions of her sexual attractiveness (e.g., *lousy in bed-good in bed*). All ratings were made on 9-point scales. A full list of items can be obtained from the first author upon request.

Results

Manipulation checks

Independent *t*-tests showed that, as expected, participants seeing the video depiction of the scenario rated the situation as significantly more sexually arousing ($M = 6.50$) than did participants reading the written description ($M = 4.18$), $t(21) = 2.59$, $p < 0.05$. Participants rated the video and written description as equally engaging and easy to relate to.

Intention to have sex

As predicted, participants in the visceral condition reported greater intentions to have sex with Rebecca ($M = 6.42$) than did participants in the non-visceral condition ($M = 4.09$), $t(21) = 2.09$, $p < 0.05$.

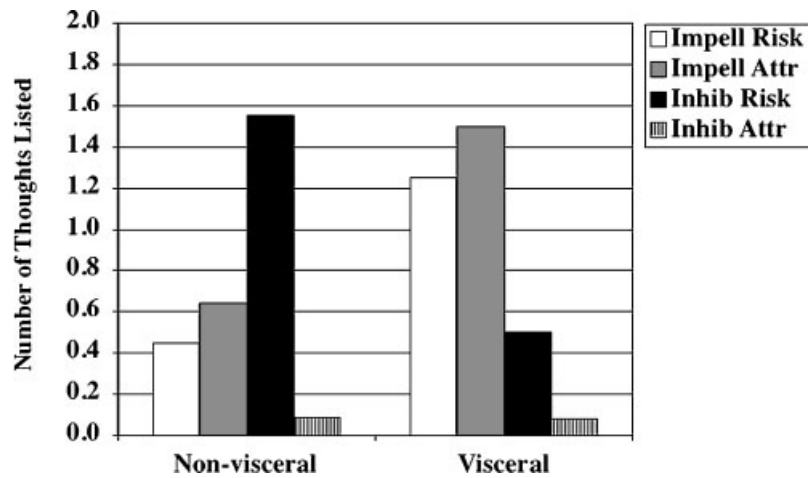


Figure 2. Mean number of impelling risk, impelling attractiveness, inhibiting risk, and inhibiting attractiveness thoughts by experimental condition

Thought listing

The total number of thoughts reported did not differ by experimental condition ($p < 0.6$), and so a 2 (visceral condition) \times 4 (thought type) mixed design ANOVA was conducted using the raw number of each type of thought as the dependent variables. This analysis revealed only a condition \times thought type interaction, $F(3, 63) = 4.53$, $p < 0.01$. As can be seen in Figure 2, whereas the thoughts of participants stating their intentions based on a written description of the scenario were focused largely on the potential risks of having sex with Rebecca, the thoughts of participants watching the video were dominated by impelling thoughts minimizing the risks of sex and emphasizing Rebecca's attractiveness and/or their attraction to her. Specifically, participants in the visceral condition reported significantly fewer inhibiting risk thoughts than did non-visceral participants ($M_s = 0.50$ vs. 1.55 , $t[63] = 2.57$, $p < 0.05$), but significantly more impelling attractiveness thoughts ($M_s = 1.50$ vs. 0.64 , $t[63] = 2.12$, $p < 0.05$), and marginally significantly more impelling risk thoughts ($M_s = 1.25$ vs. 0.45 , $t[63] = 1.95$, $p < 0.06$). Inhibiting attractiveness thoughts were infrequent and did not differ by condition.

Each of the four types of thoughts described above was examined as a potential mediator between the visceral manipulation and reported intentions to have sex with Rebecca. Only the number of impelling attractiveness thoughts met all of the criteria to establish mediation. Consistent with results reported above, experimental condition was a significant predictor of both intentions ($b = 0.41$, $t(21) = 2.09$, $p < 0.05$) and the number of impelling attractiveness thoughts ($b = 0.41$, $t(21) = 2.04$, $p = 0.05$). In the final step including both experimental condition and impelling attractiveness thoughts as predictors, the number of impelling attractiveness thoughts remained a significant predictor of intentions ($b = 0.70$, $t(20) = 4.40$, $p < 0.01$), while experimental condition did not ($b = -0.13$, $t(20) = -0.82$, $p = 0.42$; Sobel test = -1.85 , $p = 0.06$).

Perceptions of risk and sexual attractiveness

Iterative principal axis factor analyses were conducted on the 10 items measuring perceptions of the risk of having sex with Rebecca and the best representation of the ratings was a one-factor solution accounting for 63% of the variance. The 10 items were averaged to create an index representing the participants' risk rationalizations (Cronbach's alpha = 0.93). Participants in the visceral and non-visceral conditions did not differ significantly in their perceptions of the riskiness of having sex with Rebecca (visceral $M = 4.04$, non-visceral $M = 3.08$, $t(21) = 1.40$, *ns.*)

Iterative principal axis factor analyses were conducted to determine the number of factors that best represented the 16 items measuring participants' perceptions of Rebecca and the best representation of these ratings was a two-factor solution. The first factor accounted for 54% of the variance and consisted of 13 items tapping both general evaluations of Rebecca's trustworthiness (e.g., *dishonest-honest*) and her sexual riskiness (e.g., *frequently has one-night stands-never has one-night stands*). These 13 items were averaged to create an evaluation-riskiness index (Cronbach's $\alpha = 0.94$). The second factor accounted for 11% of the variance and consisted of three items pertaining to Rebecca's sexual attractiveness (e.g., *ugly-physically attractive, not sexually appealing-sexually appealing, lousy in bed-good in bed*). These three items were averaged to create a sexual attractiveness index (Cronbach's $\alpha = 0.78$). The evaluation-riskiness index showed no significant differences between the visceral ($M = 7.53$) and non-visceral condition ($M = 6.82$), $t(21) = 1.65$, *ns*. However, visceral condition participants reported significantly stronger perceptions of Rebecca's sexual attractiveness ($M = 6.72$) than did non-visceral condition participants ($M = 5.07$), $t(21) = 4.09$, $p < 0.001$.

Discussion

The results of Study 2 again provide support for the role of visceral factors in risk-taking behavior, in this case risky sexual behavior. Our selection criteria were designed to identify male students who were most likely to experience response conflict in our unsafe sex scenario, i.e., individuals who reported being currently sexually active, but committed to using condoms during their sexual behavior. When these individuals were presented with a written description of a situation about engaging in consensual but unsafe sex with an attractive female, they predicted future behavior consistent with their reports of their past sexual behavior: the average participant responded that his likelihood of having sex in such a situation was on the "unlikely" side of the scale. When participants saw a video depiction of the same situation, however, they reported being significantly more likely than non-visceral participants to have unsafe sex in such a situation, with the average response being well on the "likely" side of behavioral intention scale. It might be argued that the perspective of participants in the two experimental conditions differed in that men watching the video imagined Pierre in the sexual situation while men reading the scenario imagined themselves in the sexual situation. In both cases, however, participants were asked whether *they* would have sex with Rebecca if *they* were in this situation. It should also be noted that the video and intention question used in this study have been used in several previous studies as a measure of participants' intention to engage in sexual behavior (MacDonald et al., 1996, 2000).

Study 2 also provided additional evidence about the mechanism by which visceral states influence judgment and decision-making. Thought listing measures are standard practice in many areas of psychological research (e.g., Petty & Cacioppo, 1986; Shapiro, 1994), and are widely accepted as a valid method of gauging the content of mental processes underlying judgments and behavior. Relying on an approach used in prior research on sexual decision making (MacDonald et al., 2000), we found significant differences in the thoughts reported by our visceral and non-visceral condition participants. Specifically, relative to participants who merely read about Pierre and Rebecca's date, those watching the video depiction reported significantly fewer thoughts about the risks of having unprotected sex, but significantly more thoughts about Rebecca's attractiveness and their feelings of attraction toward her. That is, the viscerally engaging version of the decision seemed to lead the object of desire (i.e., Rebecca) to loom relatively large in participants' thoughts, apparently at the expense of thoughts concerned with distal considerations such as the risks of engaging in unsafe sex. The results of the thought listing measures are confirmed by the analyses on the rating scales showing that participants in the visceral and non-visceral conditions did not differ on two separate measures tapping participants' perceptions of the risks of having sex with Rebecca, but did differ in their perception of her sexual attractiveness. Finally, our analyses show that the only thought listing variable that met conditions for establishing a mediational relation between

the visceral cue manipulation and intentions to have sex was the number of impelling attractiveness thoughts. Thus, the more the video led our male students to focus on Rebecca's sexual attractiveness, the more likely they were to predict that, if given the opportunity, they would take the risk of having sex with her without a condom.

GENERAL DISCUSSION

To the average person on the street, the hypothesis that the temptations of food or sex can alter the way people think and act would seem so obvious as to defy the need for empirical confirmation. For most of its history, however, research on judgment and decision-making processes has proceeded as if these bodily motivations did not exist.

The reasons for this are both theoretical and empirical in origin. After a brief outbreak of interest in the role of motivational factors in perception as part of the "New Look" movement of the 1940s and 50s (e.g., Bruner & Goodman, 1947; Erickson, 1958), a cognitive paradigm emerged in which the prevailing computer metaphor left little room for affect or motivation in its information processing view of behavior. This theoretical problem was compounded by difficulties producing empirical evidence of motivational influence that was not subject to cognitive counterexplanation (Erdelyi, 1974). Even as the cognitive paradigm became more receptive to affective influences in general (e.g., Zajonc, 1980), visceral motivations like hunger or sexual desire were still largely ignored as they did not fit readily within traditional definitions of affect or emotion and did not lend themselves to easy manipulation in the psychological laboratory.

One goal of the current research then was simply to provide an empirical demonstration of visceral influences on risk-related behavior. The experiments examined two different appetitive domains and used two different manipulations of visceral cues to show that participants were more likely to engage in desired but risky behavior when the decision context was viscerally rich than viscerally impoverished. These results are consistent with previous research from the delay of gratification tradition (e.g., Mischel and Baker, 1975; Mischel et al., 1972) and together these studies suggest that manipulations enhancing the sensory aspects of appetitive stimuli promote impulsive behavior. Still, the challenges of manipulating visceral influence unconfounded by other factors (e.g., information content) are considerable, and the studies reported here should be considered only an initial foray into this empirical thicket. Creative methods will be needed to operationalize bodily motivations like hunger, thirst, and sexual desire within standard judgment and decision-making procedures, or to study them in their more powerful real life incarnations using new and promising hypothesis testing methods based on experience sampling approaches. A hotter psychology must also be informed by a solid understanding of the physiological underpinnings of visceral motivations and grapple with distinguishing the judgmental effects of bodily forces like hunger, thirst, and sex from those of less bodily but still "hot" factors (e.g., curiosity) that may have similar effects (Loewenstein, 1994, 1996; Rottenstreich & Hsee, 2001).

Another goal of the current studies was to elucidate the cognitive mechanisms at work when individuals are exposed to visceral cues. One possibility is that individuals engage in motivated reasoning, seeking to rationalize or justify their desire for the visceral stimuli (Kunda, 1990). Loewenstein (1996), on the other hand, posits that visceral factors evoke a narrowing and focusing of attention: focus on the object of desire rather than other aspects of the immediate physical environment, on the present rather than the past or future, and on the self rather than others. That is, rather than leading people to harness rationalizing cognitions to justify a "decision" to engage in action of questionable wisdom, Loewenstein's view suggests that visceral cues enhance stimulus control over behavior (Metcalf & Mischel, 1999), impelling a consummatory response with little conscious mediation or sense of having "decided" to act.

We believe that this latter explanation best fits our findings. Study 1 provided evidence that changes in risk assessments failed to explain (via mediation) the insensitivity to the risk exhibited in behavioral responses. In

Study 2, analyses of both the thought listings and rating scale responses demonstrated a marked increase in impelling thoughts about the sexual attractiveness of Rebecca, but no increase in the sorts of risk-reducing cognitions that might be seen as attempts by participants to rationalize their desire to engage in unprotected sex. Thoughts about Rebecca's sexual attractiveness were also the only variable that was found to mediate the relation between the presence of visceral cues and sexual intentions.

This interpretation of visceral states as promoting thoughtless responding is remarkably similar to Steele and Josephs' (1990) account of alcohol myopia. Steele and Josephs argue that alcohol affects behavior by creating a kind of cognitive shortsightedness in which the "depth, breadth, and time line" of cognitive processing is constrained (Steele & Josephs, 1990, p. 922). The current studies seem to point to a similar effect of visceral states, a sort of "motivational myopia," that is induced by exposure to sensory cues indicating close proximity to desirable stimuli. Such visceral short-sightedness is also consistent with a large body of research showing mood and motivation to alter the intensity of cognitive processing according to an adaptive logic (Bless et al., 1996; Ditto, Scepansky, Munro, Apanovich, & Lockhart, 1998; Frijda, 1988; Peters & Slovic, 2000). According to the affect-as-information hypothesis (Schwarz & Clore, 1983), for example, negative affect indicates that something in the current environment is problematic and thus motivates detail-oriented cognitive analysis to identify and deal with the possible threat. Positive affect, on the other hand, indicates that the current environment is free from risk and/or presents the potential to obtain reward, and thus promotes reliance and simpler, more general cognitive structures. Similarly, if sensory cues indicate close proximity to an object of desire, the most adaptive response is not to focus cognitive resources on broad, abstract considerations of past and future, but rather to shift attention to the here and now and reflexively initiate behavior to obtain the currently accessible commodity.

CONCLUSION

It used to be the case that if you saw desirable food, the most prudent action was to eat it. And while forgoing the chance to engage in sexual intercourse may not have killed you, it certainly did not do wonders for your genetic legacy. Throughout most of our evolutionary history, a healthy dose of impulsivity was likely worth the risk. However, as the complexity of social environments increased, the ability to abstain from immediate pleasures came to be associated with much richer future rewards. Indeed, the ability to represent rewards in a temporal sequence greater than that of a few minutes is almost certainly one of the most important accomplishments of our species.

The research reported in this paper provides a snapshot of this continuing struggle between passion and reason. Historically, the passionate, impulsive aspects of human behavior have presented a puzzle to philosophers, economists, and psychologists alike, and perhaps for that reason have not received scholarly attention commensurate with the weight they seem to carry in our intuitive experience. In recent years, however, there has been a renewed interest in issues of self-control and a rekindled recognition of the power of visceral influences on judgment and behavior. Armed with new theoretical insights and methodological strategies, we may finally be on the verge of resolving the akratic paradox that so bothered Aristotle, and developing a view of human behavior that explains why in the heat of the moment we so often do things that we later regret.

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Authors' biographies:

Peter H. Ditto is a professor in the Department of Psychology and Social Behavior at the University of California, Irvine. He received his BA from UCLA and his PhD from Princeton University, both in psychology. His research focuses on judgment and decision making in motivationally charged situations.

David A. Pizarro received his PhD in Social Psychology from Yale University in 2002, and is currently a post-doctoral fellow at the University of California, Irvine. His interests include moral judgment and decision making and the effects of emotion on judgment. Dr Pizarro will begin an assistant professorship at Cornell University in 2006.

Eden B. Epstein received her BA in psychology from the University of Oregon in 1995, and is currently a graduate student in health and social psychology at the University of California, Irvine. Her research interests include cognitive, emotional, and behavioral aspects of self-regulation, and stress physiology.

Jill A. Jacobson completed her undergraduate degree in psychology at Northwestern University and her master's and PhD in social psychology at Ohio State University. After a post-doctoral fellowship at the University of California, Irvine, she took her current position as an assistant professor of Psychology at Queen's University.

Tara K. MacDonald is an associate professor of Psychology at Queen's University. She studies situations in which people fail to attend to all of the relevant information in their environment, and the reasons underlying this neglect. Her primary research program investigates how alcohol intoxication affects decisions to engage in risky behaviors.

Authors' addresses:

Peter H. Ditto and **Eden B. Epstein**, Department of Psychology & Social Behavior, University of California, 3340 Social Ecology II, Irvine, CA 92697-7085, USA.

David A. Pizarro, Department of Psychology, Uris Hall, Cornell University, Ithaca, NY 14853-7601, USA.

Jill A. Jacobson and **Tara K. MacDonald**, Department of Psychology, Queen's University, Kingston, Ontario, K7L 3N6, Canada.