

# Out of Control: Visceral Influences on Behavior

GEORGE LOEWENSTEIN

*Carnegie Mellon University*

Understanding discrepancies between behavior and perceived self-interest has been one of the major, but largely untackled, theoretical challenges confronting decision theory from its infancy to the present. People often act against their self-interest in full knowledge that they are doing so; they experience a feeling of being “out of control.” This paper attributes this phenomenon to the operation of “visceral factors,” which include drive states such as hunger, thirst and sexual desire, moods and emotions, physical pain, and craving for a drug one is addicted to. The defining characteristics of visceral factors are, first, a direct hedonic impact (which is usually negative), and second, an effect on the relative desirability of different goods and actions. The largely aversive experience of hunger, for example, affects the desirability of eating, but also of other activities such as sex. Likewise, fear and pain are both aversive, and both increase the desirability of withdrawal behaviors. The visceral factor perspective has two central premises: First, immediately experienced visceral factors have a disproportionate effect on behavior and tend to “crowd out” virtually all goals other than that of mitigating the visceral factor. Second, people underweigh, or even ignore, visceral factors that they will experience in the future, have experienced in the past, or that are experienced by other people. The paper details these two assumptions, then shows how they can help to explain a wide range of phenomena: impulsivity and self-control, drug addiction, various anomalies concerning sexual behavior, the effect of vividness on decision making, and certain phenomena relating to motivation and action.

© 1996 Academic Press, Inc.

It is always thus, impelled by a state of mind which is destined not to last, that we make our irrevocable decisions.

Marcel Proust

Das ist eine Versuchung, sagte der Hofprediger und erlag ihr.<sup>1</sup>  
Bertolt Brecht, *Mutter Courage*

The ideas in this essay were stimulated by discussions with Drazen Prelec, and the formal analysis in section III is adapted from our joint grant proposal. I thank Baruch Fischhoff, Chris Hsee, Helmut Jungermann, Daniel Kahneman, Gideon Keren, Sam Issacharoff, Graham Loomes, Daniel Nagin, Fritz Oser, and Peter Ubel for numerous helpful discussions, suggestions, and comments. Address reprint requests to George Loewenstein, Department of Social and Decision Sciences, Carnegie Mellon University, Pittsburgh, PA 15213-3890.

<sup>1</sup> “This is a temptation, the court priest said, then succumbed.”

## I. INTRODUCTION

Avrum Goldstein, in his instant classic *Addiction*, provides the following account of relapse to drug addiction:

Relapse is, of course, always preceded by a decision to use, however vague and inchoate that decision may be. It is an impulsive decision, not a rational one; and it is provoked by craving—the intense and overwhelming desire to use the drug (1994, p. 220).

Goldstein is anxious to portray relapse as a decision involving personal volition, to bolster his position that drug users should be held personally accountable for their behavior. However, the difficulty of doing so is evident from his resorting to adjectives such as “impulsive” and “inchoate” to describe the decision and his picture of craving as “intense” and “overwhelming.” The addict knows, in one sense, that taking the drug is the wrong course of action but is unable to translate this belief into action. Craving, it seems, has the capacity to drive a wedge between perceived self-interest and behavior.

Understanding discrepancies between self-interest and behavior has been one of the major, but largely untackled, theoretical challenges confronting decision theory from its infancy to the present (though, see Beach, 1990; Fishbein & Ajzen, 1975; Janis & Mann, 1977; Kuhl & Beckmann, 1994). In 1960, Miller, Galanter, and Pribram lamented that “something is needed to bridge the gap from knowledge to action” (p. 10). Two decades later, Nisbett and Ross were continuing to despair “our field’s inability to bridge the gap between cognition and behavior, a gap that in our opinion is the most serious failing of modern cognitive psychology” (1980, p. 11). This essay is an attempt to construct the foundation for a bridge across the gap between perceived self-interest and behavior. I argue that disjunctions between perceived self-interest and behavior result from the action of *visceral factors* such as the cravings associated with drug addiction, drive states (e.g., hunger, thirst, and sexual desire), moods and emotions, and physical pain. At sufficient levels of intensity, these, and most other visceral factors, cause people to behave con-

trary to their own long-term self-interest, often with full awareness that they are doing so.

The defining characteristics of visceral factors are, first, a direct hedonic impact, and second, an influence on the relative desirability of different goods and actions. Hunger, for example, is an aversive sensation that affects the desirability of eating. Anger is also typically unpleasant and increases one's taste for various types of aggressive actions. Physical pain is, needless to say, painful and enhances the attractiveness of pain killers, food, and sex. Although from a purely formal standpoint one could regard visceral factors as inputs into tastes, such an approach would obscure several crucial qualitative differences between visceral factors and tastes:

(1) Changes in visceral factors have direct hedonic consequences, *holding actual consumption constant*. In that sense, visceral factors resemble consumption, not tastes. Whether I would be better off having one set or preferences or another is an abstract philosophical question; whether I would be better off hungry or satiated, angry or calm, in pain or pain-free, in each case holding consumption constant, is as obvious as whether I would prefer to consume more or less, holding tastes and visceral factors constant.

(2) Changes in visceral factors are predictably correlated with external circumstances (stimulation, deprivation, and such) and do not imply a permanent change in a person's behavioral dispositions. In contrast, changes in preferences are caused by slow experience and reflection, are typically not anticipated, and do imply a permanent change in behavior.

(3) Visceral factors typically change more rapidly than tastes. Tastes also change, but tend to be stable in the short run.

(4) Finally, tastes and visceral factors draw on different neurophysiological mechanisms. As Pribram (1984, p. 2) writes, "the core of the brain . . . uses chemical regulations to control body functions. The configuration of concentrations of these chemicals, although fluctuating around some set point, is sufficiently stable over periods of time to constitute steady 'states.' These states apparently are experienced as hunger, thirst, sleepiness, elation, depression, effort, comfort, and so on." Their common neurochemical basis may explain why so many behavior disorders associated with visceral factors—e.g., overeating, compulsive shopping, phobias, and drug addictions—appear to be susceptible to moderation by a single drug: Fluoxetine (Messiha, 1993). Tastes, in contrast to visceral factors, consist of information stored in memory concerning the relative desirability of different goods and activities.<sup>2</sup>

<sup>2</sup> Although visceral factors are distinct from tastes in underlying mechanisms and effects on well-being and behavior, there are im-

Rational choice requires that visceral factors be taken into account. It makes good sense to eat when hungry, to have sex when amorous, and to take pain killers when in pain. However, many classic patterns of self-destructive behavior, such as overeating, sexual misconduct, substance abuse, and crimes of passion, seem to reflect an *excessive* influence of visceral factors on behavior. As the intensity of a specific visceral factor increases, its influence on behavior tends to increase and to change in a characteristic fashion. At low levels of intensity, people seem to be capable of dealing with visceral factors in a relatively optimal fashion. For example, someone who is slightly sleepy might decide to leave work early or to forgo an evening's planned entertainment so as to catch up on sleep. There is nothing obviously self-destructive about these decisions, even though they may not maximize *ex post* utility in every instance. Increases in the intensity of visceral factors, however, often produce clearly suboptimal patterns of behavior. For example, the momentary painfulness of rising early produces "sleeping in"—a behavioral syndrome with wide-ranging negative consequences. It is at intermediate levels of intensity that one observes the classic cases of impulsive behavior and efforts at self-control—e.g., placing the alarm clock across the room (Schelling, 1984). Finally, at even greater levels of intensity, visceral factors can be so powerful as to virtually preclude decision making. No one *decides* to fall asleep at the wheel, but many people do.

The overriding of rational deliberation by the influence of visceral factors is well illustrated by the behavior of phobics who are typically perfectly aware that the object of their fear is objectively nonthreatening, but are prevented by their own fear from acting on this judgment (Epstein, 1994, p. 711). It can also be seen in behaviors commonly associated with addiction, such as that of Charlie T, a former heroin addict whose urine test showed that he had suddenly used heroin after a long hiatus. Charlie was "overwhelmed by an irresistible craving and . . . rushed out of his house to find some heroin. . . . It was as though he were driven by some external force he was powerless to resist, *even though he knew while it was happening that it was a disastrous course of action for him*" (Goldstein, 1994, p. 220, emphasis added). Behavior at variance with

---

portant interdependencies between them. Tastes are importantly shaped by visceral factors. For example, one's taste for barbecued chicken may well underlie one's visceral reaction to the smell of mingled charcoal, grease, and tomato sauce. At the same time, the visceral hunger produced by such smells, and the visceral pleasure produced by subsequent consumption, are likely to reinforce one's preexisting taste for barbecued chicken.

deliberation, however, is by no means confined to the realm of the “abnormal.” Adam Smith, for example, who is widely viewed as a proponent of enlightened self-interest, described his own internal conflict—presumably in the face of sexual desire—as follows:

At the very time of acting, at the moment in which passion mounts the highest, he hesitates and trembles at the thought of what he is about to do: he is secretly conscious to himself that he is breaking through those measures of conduct which, in all his cool hours, he had resolved never to infringe, which he had never seen infringed by others without the highest disapprobation, and the infringement of which, his own mind forebodes, must soon render him the object of the same disagreeable sentiments. (1892/1759, p. 227)

Success, in many professions, is achieved through a skillful manipulation of visceral factors. Automobile salespersons, realtors, and other professionals who use “high pressure” sales tactics, for example, are skillful manipulators of emotions. Con men are likewise expert at rapidly invoking greed, pity, and other emotions that can eclipse deliberation and produce an override of normal behavioral restraints. Cults and cult-like groups such as “EST” use food deprivation, forced incontinence, and various forms of social pressure in their efforts to recruit new members (Cinnamon & Farson, 1979; Galanter, 1989). In all of these cases there is a strong emphasis on the importance of immediate action—presumably because influence peddlers recognize that visceral factors tend to subside over time. The car or house one is considering will be “snapped up” if not purchased immediately, and the one-time-only deal on the stereo system will expire. The once-in-a-lifetime opportunity for enrichment will be lost if one doesn’t entrust one’s bank card to the con artist, and there is an unexplained urgency to the insistence that one signs up for EST in the introductory meeting rather than at home after careful deliberation.

Tactics of this type are not, however, restricted to those involved in the selling professions. Interrogators use hunger, thirst, and sleep deprivation to extract confessions. Like Esau, who sold his birthright for a mess of pottage, prisoners may sacrifice years of freedom for an extra hour of sleep or a glass of water. Lawyers use a similar tactic when taking depositions.<sup>3</sup> The early stages of a deposition, when the witness is fresh, are used to elicit background information. Information that is potentially damaging to the witness or the opposing side is requested only after the witness begins to tire, lose concentration, and is more likely to make mistakes or concessions just for the sake of ending the ques-

tioning.<sup>4</sup> Similarly, though by mutual agreement, labor negotiations are commonly structured to go “round the clock” as the strike deadline approaches. Rarely is new information produced in these last sessions, nor is there a discussion of technicalities of agreement. Perhaps, however, both sides recognize that mutual willingness to make concessions will be enhanced when sleep is the reward for speedy reconciliation.

Decision theory, as it is currently practiced, makes no distinction between visceral factors and tastes and thus does not recognize the special impact of visceral factors on behavior. It is best equipped to deal with “cool” or “dispassionate” settings in which there is typically a very close connection between perceived self-interest and behavior. The decision-making paradigm has much greater difficulty in providing an account of decisions occurring at the “hot” end of the continuum defined by the intensity of visceral factors. The drive mechanism of Freudian and behavioristic psychology provides a better account of behavior at the opposite end of the same continuum. The decline of the behaviorist paradigm in psychology can be attributed to its failure to make sense of volitional, deliberative, behavior. Does the decision-making paradigm face a similar fate if it fails to address the full range of visceral influences? My intent is to show that visceral influences on behavior can, in fact, be expressed in decision-theoretic terms. Section II below addresses the question of why and how visceral factors create discrepancies between perceived self-interest and behavior. Section III enumerates a series of propositions concerning the effect of visceral factors on behavior and perceptions, and shows how these can be expressed in the verbal and mathematical language of decision-theory. Section IV discusses applications of the proposed theoretical perspective.

## II. VISCERAL FACTORS AND BEHAVIOR

As visceral factors intensify, they focus attention and motivation on activities and forms of consumption that are associated with the visceral factor—e.g., hunger draws attention and motivation to food. Non-associated forms of consumption lose their value (Easterbrook, 1959). At sufficient levels of intensity, individuals will sacrifice almost any quantity of goods not associated with the visceral factor for even a small amount of associated goods, a pattern that is most dramatically

<sup>3</sup> Personal communication, Sam Issacharoff.

<sup>4</sup> Just as a skillful lawyers strategically manipulate the opposing side’s emotions, they must also work to counteract such influences on themselves and their clients. The adage “the lawyer who represents himself has a fool for a client” reflects the dangers to a lawyer of excessive personal—i.e., emotional—involvement in a case.

evident in the behavior of drug addicts. Frawley (1988, p. 32) describes addicts as progressively "eliminating behavior that interferes with or does not lead to drug or alcohol use . . . [which] leads to a kind of 'tunnel vision' on the part of the addict." Cocaine addicts, according to Gawin (1991, p. 1581), "report that virtually all thoughts are focused on cocaine during binges; nourishment, sleep, money, loved ones, responsibility, and survival lose all significance." In economic parlance, the marginal rate of substitution between goods associated with the visceral factor and goods that are not so associated becomes infinitesimal.

Visceral factors also produce a second form of attention-narrowing: a good-specific collapsing of one's time-perspective toward the present. A hungry person, for example, is likely to make short-sighted tradeoffs between immediate and delayed food, even if tomorrow's hunger promises to be as intense as today's. This present-orientation, however, applies only to goods that are associated with the visceral factor, and only to tradeoffs between the present and some other point in time. A hungry person would probably make the same choices as a non-hungry person between immediate and delayed money (assuming that food cannot be purchased) or immediate and delayed sex. A hungry person might also make the same choices as a non-hungry person between food tomorrow versus food on the day after tomorrow.

Yet a third form of attention-narrowing involves the self versus others. Intense visceral factors tend to narrow one's focus inwardly—to undermine altruism. People who are hungry, in pain, angry, or craving drugs tend to be selfish. As interrogators understand all too well, sleep deprivation, hunger, thirst, pain, and indeed most visceral factors, can cause even the most strongly willed individuals to "betray" comrades, friends and family (e.g., Biderman, 1960).

The peremptory nature of immediate visceral factors is generally adaptive. Visceral factors play an important role in regulating behavior, and can be observed in a wide range of animals. Hunger signals the need for nutritional input, pain indicates the impingement of some type of potentially harmful environmental factor, and emotions serve a range of interrupting, prioritizing, and energizing functions (Simon, 1967; Mandler, 1964; Pluchik, 1984; Frank, 1988). The absence of even one of these signalling systems detracts dramatically from an individual's quality of life and chances of survival. Although most people occasionally wish they could eschew pain, one only has to witness the playground behavior of children who are congenitally incapable of experiencing pain (and to observe the perpetual vigilance of their parents) to abandon this fantasy (Fields, 1987, pp. 2–4).

Evolution, however, has its limitations (Gould, 1992). The same visceral factors that serve the individual's interests effectively at moderate levels produce distinctly suboptimal patterns of behavior at higher levels. Extreme fear produces panic and immobilization rather than effective escape (Janis, 1967; Janis & Leventhal, 1967). Uncontrolled anger produces ineffectual, impulsive actions or the opposite, immobilization. Intense visceral factors not only undermine effective behavior, but produce extreme misery. This should not surprise us; the 'goal' of evolution is reproduction, not happiness. If hunger ensures that an organism will eat, the fact that it is an unpleasant sensation is immaterial. As Damasio (1994, p. 264) argues, visceral factors tend to be aversive because "suffering puts us on notice. Suffering offers us the best protection for survival, since it increases the probability that individuals will heed pain signals and act to avert their source or correct their consequences."

Although visceral factors should be and are taken into account in decision making, they also influence behavior more directly. Hunger, thirst, sexual desire, pain, and indeed virtually all visceral factors, can influence behavior without conscious cognitive mediation (Bolles, 1975). To illustrate this point, Pribram (1984) provides the vivid example of a brain surgery patient who ate ravenously with no subjective feeling of hunger:

One patient who had gained more than one hundred pounds in the years since surgery was examined at lunch time. Was she hungry? She answered, "No." Would she like a piece of rare, juicy steak? "No." Would she like a piece of chocolate candy? She answered, "Umhummm," but when no candy was offered she did not pursue the matter. A few minutes later, when the examination was completed, the doors to the common room were opened and she saw the other patients already seated at a long table eating lunch. She rushed to the table, pushed the others aside, and began to stuff food into her mouth with both hands. She was immediately recalled to the examining room and the questions about food were repeated. The same negative answers were obtained again, even after they were pointedly contrasted with her recent behavior at the table. (p. 24).

Further evidence for the direct impact of visceral factors—without deliberative mediation—comes from neuropsychological research. This research shows, for example, that brain lesions in the reward centers of the brain can produce a total lack of interest in eating (Bolles, 1975). Electrical stimulation of the same areas can produce complex sequences of behavior without conscious mediation (Gardner, 1992, p. 71). Many of the sensory organs have direct nerve connections to these pleasure/motivation centers, strongly hinting at the possibility that sensory inputs can have a direct influence on behavior. Electrical stimulation of these same regions is so pleasurable that animals will self-

administer such stimulation in preference to food, water, and sex, and will do so until the point of collapse and even death (Olds & Milner, 1954). Similarly self-destructive patterns of behavior are exhibited by both animals and humans towards addictive substances, such as crack cocaine, which have a very similar effect on the reward centers of the brain as electrical stimulation (Pickens & Harris, 1968). It is difficult to imagine that this type of behavior reflects the outcome of a rational decision process, since the rather rapid consequence is to eliminate the capacity to experience pleasure altogether. Again, these findings suggest that there are certain types of influences or incentives that operate independently of, and overwhelm, individual deliberation and volition.

In contrast to this relatively strong evidence that visceral factors can influence behavior directly, there is only weak evidence supporting the standard decision-theoretic assumption that behavior follows automatically from deliberation. In fact, the standard decision-theoretic assumption seems to be supported by little more than introspection. Most people experience their own actions as resulting from decisions (Pettit, 1991), or at least as deliberate. However, it is questionable whether these introspections represent veridical reports of underlying decision processes, or *ex post* rationalizations of behavior. The limitation of verbal reports is well established (Nisbett & Wilson, 1977), as is the fact that "implicit theories" powerfully influence one's perception of the world (Bruner, 1957; Ross, 1989). People process information in a hyper-Bayesian fashion, ignoring or down-playing evidence that is at variance with their implicit theories while placing great weight on data that is supportive (Lord, Lepper & Ross, 1979). Trained to view behavior as the result of attribute-based decisions (Pettit, 1991; Christensen & Turner, 1993), most people in Western culture will almost inevitably interpret their own behavior accordingly.

Such a tendency to make retrospective sense of one's own preferences and behavior can be seen in research by Robert Zajonc and his colleagues on the "mere exposure effect" (e.g., Zajonc, 1968). People are unaware of the effect of "mere" exposure on their preferences, but, when preferences are experimentally influenced through differential exposure, they readily generate attribute-based explanations for their own preferences (Zajonc & Marcus, 1982). A subject might decide that he likes polygon number 3, for example, not because he viewed it 12 times, but due to its geometric symmetry. Likewise, someone suffering from a tic that causes his hand to fly toward his head periodically will, over time, develop a head-itch that requires scratching (Brown, 1988). Recent neuropsychological research shows that,

for many actions that are subjectively experienced as purposive by decision makers, electrical impulses associated with the action begin fractions of a second before any conscious awareness of the intention to act (Libet, Gleason, Wright, & Pearl, 1983).

The issue of cognitive versus visceral control of behavior remains unresolved, and some compromise position may well ultimately prevail. At present, however, there is little evidence beyond fallible introspection supporting the standard decision-theoretic assumption of complete volitional control of behavior.

### III. SEVEN PROPOSITIONS AND A MATHEMATICAL REPRESENTATION

Much is known, or at least can plausibly be inferred from available evidence, about the relationship between deliberation and action under the influence of visceral factors. The propositions enumerated below can be summarized simply: visceral factors operating on us in the here and now have a disproportionate impact on our behavior. Visceral factors operating in the past or future, or experienced by another individual are, if anything, underweighted. Although these propositions are simple enough to be stated in words, for the interested reader I also indicate how they could be expressed mathematically.

To represent the influence of visceral factors on behavior we need a representation of preferences that includes a new set of variables,  $\alpha_{it}$ , to represent how the fluctuating levels of the visceral factors affect intertemporal utility:

$$U = \sum_t u(x_{t1}, \dots, x_{tm}, \alpha_{t1}, \dots, \alpha_{tm}, t), \quad (1)$$

where  $U$  is the total utility of an intertemporal consumption plan,  $(x_{t1}, \dots, x_{tm})$  is the consumption vector at time  $t$ , and  $\alpha = (\alpha_{t1}, \dots, \alpha_{tm})$  is the vector of visceral factors at time  $t$ . In a given experiment, the  $\alpha$  parameters will be operationally defined, e.g., as the hours of food deprivation, the presence or absence of food stimuli, and so on. We assume that the person knows the values of  $x$ ,  $\alpha$ , and  $t$  when choosing between different consumption opportunities.

Equation (1) is the most general temporally separable model, and it allows for the value of any good or activity to be affected by all visceral factors operating at the same point in time. In many instances, however, it is possible to partition visceral factors into subsets that influence only a single consumption variable. In the simplest case, each consumption variable,  $x_i$ , is influenced by at most one visceral factor,  $\alpha_i$ , as in Eq. (2).

$$U = \sum_i u(v_i(x_{it}, \alpha_{it}, t), \dots, v_n(x_{in}, \alpha_{in}, t)). \quad (2)$$

In this equation,  $v_i(x_{it}, \alpha_{it}, t)$  might be, say, the value of consuming meal  $x_{it}$  at time  $t$  relative to the present, given that one's hunger will be at level  $\alpha_{it}$  at that time. The separability structure in Eq. (2) implies that the "conditional" preference ordering of triples  $(x_{it}, \alpha_{it}, t)$ , holding all else constant, is independent of the levels of other consumption variables and visceral factors. Stable preferences across different types of consumption are captured by the function  $u(v_1, \dots, v_n)$ . The function tells us whether a person prefers dining out to dancing, for instance. The subordinate functions,  $v_i$ , tell us how the value of particular dining opportunity hinges on what is offered ( $x_{it}$ ), the hunger level ( $\alpha_{it}$ ), and delay ( $t$ ). Each of the  $v_i$  functions is assumed to be increasing in the first variable, decreasing in the third, and possibly increasing or decreasing in the second. Further,  $x_i$  and  $a_i$  will usually be complements, e.g., hunger will enhance a solid meal, but hurt when no food is forthcoming. I also assume that  $x_i$  and  $\alpha_i$  have natural zero levels. For  $x_i$ , it is the status quo, or reference consumption level (Tversky & Kahneman, 1991). For  $\alpha_i$ , it is the level  $\alpha_i^*$  such that  $v(0, \alpha_i^*, t) = 0$ . Intuitively, the natural zero level of a visceral factor is the level at which, in the absence of the relevant form of consumption, the visceral factor neither contributes to nor detracts from utility.

### Propositions

The observation that visceral factors influence the desirability of goods and activities is hardly surprising. To provide useful insights into behavior it is necessary to specify the nature of this influence with the greatest detail possible given the available evidence. The following seven propositions, which are summarized in Table 1 and discussed in detail below, encode observations concerning the influence of visceral factors on desired, predicted, recollected, and actual behavior. Although all seven have some support from existing research, I refer to them as propositions to emphasize their tentative status.

#### Proposition 1:

The discrepancy between the actual and desired value placed on a particular good or activity increases with the intensity of the immediate good-relevant visceral factor.<sup>5</sup>

If we define  $v^d$  as the desired, as opposed to the actual,

value of a particular action or consumption alternative, then proposition 1 implies that

If  $\alpha' > \alpha > \alpha_i^*$ , and  $v^d(x', \alpha', 0)$

$= v^d(x, \alpha, 0)$ , then  $v(x', \alpha', 0) > v(x, \alpha, 0)$ .

This regularity was illustrated in the introduction with the example of sleepiness, which can be dealt with in a reasonable fashion at low levels, but at high levels produces self-destructive patterns of behavior such as falling asleep at the wheel. A similar pattern of initially reasonable, but ultimately excessive, influence can be observed for virtually all visceral factors. Low levels of fear may be dealt with in an optimal fashion (e.g., by taking deliberate protective action), but higher levels of fear often produce panic or, perhaps worse, immobilization (Janis, 1967). Likewise, low levels of anger can be factored into daily decision making in a reasonable way, but high levels of anger often produce impulsive, self-destructive, behavior.

#### Proposition 2:

Future visceral factors produce little discrepancy between the value we plan to place on goods in the future and the value we view as desirable.

That is, if  $\alpha' > \alpha > \alpha_i^*$ , and  $v^d(x', \alpha', t) = v^d(x, \alpha, t)$ , then  $v(x', \alpha', t) \approx v(x, \alpha, t)$ , for  $t > 0$ .

When visceral factors are not having an immediate influence on our behavior, but will be experienced in the future, we are free to give them the weight that we deem appropriate in decision making. Thus, we position the alarm clock across the room to prevent sleeping late only because we are not currently experiencing the pain of rising early. Likewise, we avoid buying sweets when shopping after lunch because the evening's cravings, however predictable, have little reality to our current, unhungry selves. When the future becomes the present, however, and we actually experience the visceral factor, its influence on our behavior is much greater, as implied by proposition 1.

A well-known study of pregnant women's decisions concerning anesthesia illustrates the types of behavioral phenomena associated with proposition 2. Christensen-Szalanski (1984) asked expectant women to make a non-binding decision about whether to use anesthesia during childbirth; a majority stated a desire to eschew anesthesia. However, following the onset of labor, when they began to experience pain, most reversed their decision. Consistent with proposition 2, the women were relatively cavalier with respect to their own future pain. Although Christensen-Szalanski himself explained the reversals in terms of hyperbolic discounting curves, such an account should predict that

<sup>5</sup> By "actual value" I mean the value implied by the individual's behavior; by "desired value," I mean the value that the individual views as in his or her self-interest.

TABLE 1

Propositions Concerning the Actual, Desired, Predicted, and Recollected Influence of Visceral Factors on Behavior

Proposition	Description
1	The discrepancy between the actual and desired value placed on a particular good or activity increases with the intensity of the immediate good-relevant visceral factor.
2	Future visceral factors produce little discrepancy between the value we plan to place on goods in the future and the value we view as desirable.
3	Increasing the level of an immediate and delayed visceral factor simultaneously enhances the actual valuation of immediate relative to delayed consumption of the associated good.
4	Currently experienced visceral factors have a mild effect on decisions for the future, even when those factors will not be operative in the future.
5	People underestimate the impact of visceral factors on their own future behavior.
6	As time passes, people forget the degree of influence that visceral factors had on their own past behavior. As a result, past behavior that occurred under the influence of visceral factors will increasingly be forgotten, or will seem perplexing to the individual.
7	The first six propositions apply to interpersonal as well as intrapersonal comparisons, where other people play the same role vis a vis the self as the delayed self plays relative to the current self: <ul style="list-style-type: none"><li>i. We tend to become less altruistic than we would like to be when visceral factors intensify.</li><li>ii. When making decisions for another person, we tend to ignore or give little weight to visceral factors they are experiencing</li><li>iii. Increasing the intensity of a visceral factor for ourselves and another person in parallel leads to a decline in altruism.</li><li>iv. When we experience a particular visceral factor, we tend to imagine others experiencing it as well, regardless of whether they actually are.</li><li>v. &amp; vi. People underestimate the impact of visceral factors on other people's behavior.</li></ul>

at least some reversals would occur prior to the onset of labor, but none did. Moreover, the reversal of preference was observed not only for women giving birth for the first time, but also those who had previously experienced the pain of childbirth; experience does not seem to go very far in terms of enhancing one's appreciation for future pain.

A similarly underappreciation of the impact of future visceral states—again by people with considerable experience—can be seen in the relapse behavior of addicts who, after achieving a period of abstinence, believe they can indulge in low level consumption without relapsing. Underestimating the impact of the craving that even small amounts of consumption can produce (Gardner & Lowinson, 1993), such addicts typically find themselves rapidly resuming their original addictive pattern of consumption (Stewart & Wise, 1992). As Seeburger (1993) comments:

Any addict can tell us how long such negative motivation [to stay off the drug] lasts. It lasts as long as the memory of the undesirable consequences stays strong. But the more successful one is at avoiding an addictive practice on the grounds of such motivation, the less strong does that very memory become. Before long, the memory of the pain that one brought on oneself through the addiction begins to pale in comparison to the anticipation of the satisfaction that would immediately attend relapse into the addiction. Sometimes in AA it is said that the farther away one is from one's last drink, the closer one is to the next one. That is surely true for alcoholics and all other addicts whose

only reason to stop "using" is to avoid negative consequences that accompany continuing usage. (p. 152)

In a similar vein, Osiatynski refers to the tendency to underestimate the power of alcohol addiction: "After hitting bottom and achieving sobriety, many alcoholics must get drunk again, often not once but a few times, in order to come to believe and never forget about their powerlessness" (1992, p. 128). Osiatynsi argues that a major task of relapse prevention is to sustain the ex-addict's appreciation for the force of craving and the miseries of addiction; alcoholics anonymous serves this function by exposing abstinent alcoholics to a continual stream of new inductees who provide graphic reports of their own current or recent miseries.<sup>6</sup>

Impulsivity

The disproportionate response to immediately operative visceral factors expressed by proposition 1, and the tendency to give little weight to delayed visceral factors expressed by proposition 2, have important implications for intertemporal choice.<sup>7</sup> Together they point to a novel account of impulsivity—an alternative to the currently dominant account which is based on non-exponential time discounting.

<sup>6</sup> Personal communication.  
<sup>7</sup> For a preliminary rendition of this perspective, see Hoch and Loewenstein (1991).

In a seminal article, R. H. Strotz (1955) showed that a discounted utility maximizer who does not discount at a constant rate will systematically depart from his own prior consumption plans. When the deviation from constant discounting involves higher proportionate discounting of shorter time delays than of long ones, this “time inconsistency” takes the form of temporally *myopic* or impulsive behavior: spending in the present but vowing to save in the future, binge-eating in the present while planning future diets, or resolving to quit smoking, but not until tomorrow. A standard non-exponential discounting formulation that predicts impulsive behavior is  $U = u(x_0) + \gamma\delta u(x_1) + \gamma\delta^2 u(x_2)$ , where  $\delta$  is the conventional exponential discount factor and  $\gamma(<1)$  is a special discount factor applying to all periods other than the immediate present (see Elster, 1977; Akerlof, 1991). The conventional, i.e., constant discounting, approach is identical, except that  $\gamma$  is assumed to equal unity. A person who maximizes a function of this type will choose a larger reward  $x'$  at time 2 over a smaller reward  $x$  at time 1 if  $\delta u(x') > u(x)$ , but will opt for the smaller, more immediate reward if the choice is between immediate consumption or consumption at time 1 if  $\gamma\delta u(x') < u(x)$ .

The non-exponential discounting perspective has been bolstered by findings from hundreds of experiments showing that humans and a wide range of other animals, display hyperbolic discount functions of the type predicted to produce impulsive behavior (see, e.g., Chung & Herrnstein, 1967; Mazur, 1987). Many experiments with animals, and a small number with humans, have also demonstrated the types of temporally based preference reversals that are implied by hyperbolic discounting. Nevertheless, the non-exponential discounting perspective has at least two significant limitations as a general theory of impulsivity.

First, it does not shed light on why certain types of consumption are commonly associated with impulsivity while others are not. People commonly display impulsive behavior while under the influence of visceral factors such as hunger, thirst, or sexual desire or emotional states such as anger or fear. The hyperbolic discounting perspective has difficulty accounting for such situation- and reward-specific variations in impulsivity.

Second, the hyperbolic discounting perspective cannot explain why many situational features other than time delay—for example, physical proximity and sensory contact with a desired object—are commonly associated with impulsive behavior. For example, it is difficult to explain the impulsive behavior evoked by cookie shops that vent baking smells into shopping malls in terms of hyperbolic discounting.

The account of impulsivity embodied in propositions 1 and 2 is consistent with the observed differences in impulsivity across goods and situations. It views impulsivity as resulting not from the disproportionate attractiveness of immediately available rewards but from the disproportionate effect of visceral factors on the desirability of immediate consumption. It predicts, therefore, that impulsive behavior will tend to occur when visceral factors such as hunger, thirst, physical pain, sexual desire, or emotions are intense. In combination, propositions 1 and 2 imply that people will give much greater weight to immediately experienced visceral factors than to delayed visceral factors. Thus, according to proposition 2, the fact that I will be hungry (and dying to eat dessert), in pain (and longing for pain killers), or sexually deprived in the future has little meaning to me in the present. If food, pain killers, or sex have undesirable consequences I will plan to desist from these behaviors. When these visceral factors arise, however, and increase my momentary valuation of these activities, proposition 1 implies that I will deviate from my prior plans. In fact, neither proposition 1 nor 2 are necessary conditions for this account of impulsivity; what is required is a somewhat weaker condition which can be expressed as a third proposition.

#### Proposition 3:

Increasing the level of an immediate and delayed visceral factor simultaneously enhances the actual valuation of immediate relative to delayed consumption of the associated good.

That is, if  $\alpha' > \alpha$  and  $v(x, \alpha, 0) = v(x', \alpha, t)$ , then  $v(x, \alpha', 0) > v(x', \alpha', t)$ . Whereas propositions 1 and 2 deal with the effect of visceral factors on the relationship between actual and desired behavior, proposition 3 makes no reference to desired behavior and refers only to the impact of visceral factors on time preference. The absence of the subjective concept of desired behavior renders proposition 3 especially amenable to empirical investigation.

Like the hyperbolic discounting perspective, the visceral factor perspective predicts that impulsivity will often be associated with short time delays to consumption; however, it provides a different rationale for this prediction and does not predict that short time delays will *always* produce impulsive behavior. According to the hyperbolic discounting perspective, desirability increases automatically when rewards become imminently available. The visceral factor perspective, in contrast, assumes that immediate availability produces impulsivity only when physical proximity elicits an appetitive response (influences an  $\alpha$ ). Many visceral factors, such as hunger and sexual desire, are powerfully influenced by temporal proximity. Neurochemical research on animals shows that the expectation of an



imminent reward produces an aversive dopaminic state in the brain that is analogous to the impact of food expectation on hunger (Gratton & Wise, 1994). That is, the mere expectation of an imminent reward seems to trigger appetite-like mechanisms at the most basic level of the brain's reward system. The account of impulsivity proposed here, therefore, predicts that short time delays will elicit impulsivity only when they produce such an appetitive, or other type of visceral, response.

Short time delays, however, are only one factor that can produce such a visceral response. Other forms of proximity, such as physical closeness or sensory contact (the sight, smell, sound, or feeling of a desired object) can elicit visceral cravings. Indeed, as the literature on conditioned craving in animals shows, almost any cue associated with a reward—e.g., time of day, the color of a room, or certain sounds—can produce an appetitive response (Siegel, 1979). Perhaps the strongest cue of all, however, is a small taste, referred to as a “priming dose” in the neuropharmacological literature on drug addiction (Gardner & Lowinson, 1993).

Much of the seminal research of Walter Mischel and associates (summarized in Mischel 1974; Mischel, Shoda, & Yuichi, 1992) can be interpreted as demonstrating the impact of visceral factors on impulsivity. Mischel's research focused on the determinants of delay of gratification in children and was the first to raise the problem of intraindividual variability in intertemporal choice. In a series of experiments, children were placed in a room by themselves and taught that they could summon the experimenter by ringing a bell. The children would then be shown a superior and inferior prize and told that they would receive the superior prize if they could wait successfully for the experimenter to return.

One major finding was that children found it harder to wait for the delayed reward if they were made to wait in the presence of either one of the reward objects (the immediate inferior or delayed superior). The fact that the presence of either reward had this effect is significant, because conventional analysis of intertemporal choice, including the hyperbolic discounting perspective, would predict that children would be more likely to wait in the presence of the delayed reward. The visceral factor perspective offers a ready explanation for this pattern, since the sight, smell, and physical proximity of either reward would be likely to increase the child's level of hunger and desire.

Other findings from Mischel's research are also consistent with a visceral factor account of impulsivity. For example, showing children a photograph of the delayed reward, rather than the reward itself, increased wait-

ing times. Apparently the photograph provided a “picture” of the benefits of waiting without increasing the child's level of acute hunger or desire. Likewise, and explicable in similar terms, instructing children to ignore the candies or to cognitively restructure them (e.g., by thinking of chocolate bars as little brown logs) also increased waiting times.

### *Vividness*

The notion that various dimensions of proximity—temporal, physical, and sensory—can elicit visceral influences that change behavior also provides a somewhat different interpretation of the often noted effect of vividness. Vividness has a powerful impact on behavior that is difficult to reconcile with the standard decision model. Sweepstakes advertise concrete grand prizes such as luxury cars or vacations, even though any normative model would predict that the monetary equivalent of the prize should have higher value to most individuals. When Rock Hudson and Magic Johnson were diagnosed with AIDS, concern for the disease skyrocketed (Loewenstein & Mather, 1990). Well-publicized incidents of “sudden acceleration” and terrorist attacks at airports in Europe squelched Audi sales and travel abroad by Americans, despite the comparative safety of Audis and foreign travel. Behavioral decision researchers have acknowledged the impact of vividness (Tversky & Kahneman, 1973; Nisbett & Ross, 1980), but have argued that vividness affects decision making via its influence on subjective probability. Vividness is assumed to affect the ease with which past instances of the outcome can be remembered or future instances imagined, producing an exaggeration of the outcome's subjective probability via the “availability heuristic.”

Vividness, however, has a second, possibly more important, consequence. Immediate emotions arising from future events are inevitably linked to some mental image or representation of those events. There is considerable research demonstrating that the more vivid such images are, and the greater detail with which they are recalled, the greater will be the emotional response (e.g., Miller *et al.*, 1987). Hence, vividness may operate in part by intensifying immediate emotions associated with thinking about the outcome rather than (or in addition to) increasing the subjective likelihood of the outcome.

Many phenomena which have previously been attributed to availability effects on subjective probability could easily be reinterpreted in these terms. It has been shown, for example, that earthquake insurance purchases rise after earthquakes when, if anything, the objective probability is probably at a low-point but anxiety about these hazards is at a peak (Palm, Hodgson,

Blanchard, & Lyons, 1990). Similarly, purchases of flood and earthquake insurance are influenced more by whether friends have experienced the event than by the experience of one's immediate neighbors, even though neighbors' experiences would seem to provide a better guide to one's own probability of experiencing a flood or earthquake (Kunreuther *et al.*, 1978). The large increase in the number of women seeking breast exams following the highly publicized mastectomies of Hope Rockefeller and Betty Ford, the tendency for doctors whose specialties are near the lung to stop smoking, and each of the examples of vividness listed earlier could also plausibly be attributed to emotion effects rather than to changes in subjective probabilities. Most doctors have a clear understanding of the dangers of smoking, but daily confrontation with blackened lungs undoubtedly increases the frequency and intensity of negative emotions associated with smoking.

#### Proposition 4:

Currently experienced visceral factors can have a mild effect on decisions for the future, even when those factors will not be operative in the future.

Proposition 4 is probably a minor effect relative to the other six discussed here, and it cannot be expressed in conditions pertaining to Eq. (2), which assumes that the value of consumption is influenced only by visceral factors operating at the same point in time. To express proposition 4 mathematically we could allow visceral factors operating in the present to influence the value of consumption at other points in time—e.g.,  $v_i(x_{ti}, \alpha_{ti}, t, \alpha_{0i})$ . Proposition 4 would then imply that if  $\alpha'_{oi} > \alpha_{0i}$  and  $v_i(x_{ti}, \alpha_{ti}, t, \alpha_{0i}) = v_j(x_{tj}, \alpha_{tj}, t, \alpha_{0j})$ , then  $v_i(x_{ti}, \alpha_{ti}, t, \alpha'_{oi}) \geq v_j(x_{tj}, \alpha_{tj}, t, \alpha_{0j})$ .

The classic illustration of proposition 4 is the tendency to buy more groceries when shopping on an empty stomach (Nisbett & Kanouse, 1968). Similarly, when sick we are likely to overreact by cancelling appointments later in the week, only to find ourselves recovered on the following day. It also seems likely that an aggrieved person would decide to take delayed revenge if immediate revenge were not an option, even if she knew intellectually that her anger was likely to “blow over.”

The same failure of perspective taking can be observed in the interpersonal realm. For example, it is difficult for a parent, who feels hot from carrying a baby, to recognize that his baby might not be as hot. Similarly, it is difficult not to empathize with a wounded person even when they report feeling no pain. The latter phenomenon is illustrated vividly by the case of Edward Gibson, the “human pincushion.” A Vaudeville performer who experienced no pain, Gibson would walk onto the stage and ask a man from the

audience to stick 50–60 pins into him up to their heads, then would himself pull them out one by one (Morris, 1991). By Morris' description, “it is clear that Gibson's audience, no doubt reflecting a general human response, found themselves incapable of imagining a truly pain-free existence. They instinctively supplied the pain he did not feel” (p. 13).

#### Proposition 5:

People underestimate the impact of visceral factors on their own future behavior.

Let  $\hat{v}$  represent the individual's prediction at time  $t < 0$  of the value she will place on consumption at time 0 (when a visceral factor will be operative). Proposition 5 implies that if  $\alpha' > \alpha > \alpha^*$ , and  $\hat{v}(x', \alpha', 0) = \hat{v}(x, \alpha, 0)$ , then  $v(x', \alpha', 0) > v(x, \alpha, 0)$ .

Proposition 5 is similar to proposition 2 except that it refers to predictions of future behavior rather than to decisions applying to the future. It implies that we underestimate the influence of future visceral factors on our behavior, whereas proposition 2 implies that we give future visceral factors little weight when making decisions for the future. Although closely related, the two phenomena have somewhat opposite implications for behavior; the failure to *appreciate* future visceral factors (as implied by proposition 2) increases our likelihood of binding our own future behavior—thus contributing to far-sighted decision making. For example, showing little sensitivity to tomorrow morning's self, we experience no qualms in placing the alarm clock across the room. The failure to *predict* our own future behavior (as implied by condition 5), however, decreases the likelihood that we will take such actions, even when they are necessary. Failing to predict the next morning's pain of awakening, we may underestimate the necessity of placing the alarm clock on the other side of the room.

The difficulty of predicting the influence of future visceral factors on our behavior results partly from the fact that visceral factors are themselves difficult to predict. The strength of visceral factors depends on a wide range of influences. Drive states such as sexual desire and hunger depend on how recently the drive was satisfied and on the presence of arousing stimuli such as potential sexual objects or the proximity of food. Moods and emotions depend on the interaction of situational factors and construal processes and on internal psychological factors. Physical pain and pleasure often depend on sensory stimulation, although construal processes also play an important role (Chapman, 1994). Because these underlying factors are themselves often erratic, predicting changes in visceral factors is commensurately difficult.

Even when visceral factors change in a regular fash-

ion, however, people will not be able to predict such change if they lack a theory of how they change over time. Thus, Loewenstein and Adler (1995) demonstrated that people are unable to predict that ownership will evoke attachment to objects and aversion to giving them up, presumably because they, like social scientists until recently, are unaware of the endowment effect. They elicited selling prices from subjects actually endowed with an object and others who were told they had a 50% chance of getting the object. Selling prices were substantially higher for the former group, and the valuations of subjects who were not sure of getting the object were indistinguishable from the buying prices of subjects who did not have the object.

Moreover, even in the many cases when we can predict the intensity of a particular visceral factor relatively accurately, we may still have difficulty in predicting its impact on our own future behavior. It is one thing to be intellectually aware that one will be hungry or cold at a certain point in the future and another to truly appreciate the impact of that hunger or cold on one's own future behavior. If a teenager tries crack once for the experience, how difficult will he or she find it to desist from trying it again? How strong will a smoker's desire to smoke be if she goes to a bar where others are smoking, or the ex-alcoholic's desire for a drink if he attends the annual Christmas party at his place of work? Proposition 5 implies that people who are not experiencing these visceral factors will underestimate their impact on their own future behavior.

The difficulty of anticipating the effect of future visceral factors on one's own behavior is also illustrated by a study in which subjects were informed of the Milgram shock experiment findings and were asked to guess what they personally would have done if they had been subjects in the experiment. Most subjects in the piggy-back study did not think that they themselves would have succumbed to the pressure to shock. Despite their awareness that a substantial majority of subjects delivered what they believed were powerful shocks, subjects underestimated the likely effect on their own behavior of being exposed to the authoritative and relentless pressure of the experimenter.

#### Proposition 6:

As time passes, people forget the degree of influence that visceral factors had on their own past behavior. As a result, past behavior that occurred under the influence of visceral factors will seem increasingly perplexing to the individual.

If we define  $v'$  as the individual's recollection at time  $t > 0$  of his own past utility, then, if  $\alpha' > \alpha > \alpha_i^*$ , and  $v(x', \alpha', 0) = v(x, \alpha, 0)$ , then  $v'(x', \alpha', 0) < v'(x, \alpha, 0)$ .

Human memory is well suited to remembering visual images, words, and semantic meaning, but seems ill-

sued to storing information about visceral sensations. Recall of visual images actually activates many of the brain systems that are involved in visual perception (Kosslyn *et al.*, 1993). Thus, it appears that to imagine a visual scene is, in a very real sense, to "see" the scene again, albeit in distorted, incomplete, and less vivid form. The same probably applies to memory for music and words; one can render a tune in one's head, or articulate a word, without producing any externally audible sound.

Except under exceptional circumstances,<sup>8</sup> memory for pain, and probably other visceral factors, appears to be qualitatively different from other forms of memory. As Morley (1993) observes in an insightful paper, we can easily *recognize* pain, but few can *recall* any of these sensations at will, at least in the sense of reexperiencing them at any meaningful level. Morley distinguishes between three possible variants of memory for pain: (1) sensory reexperiencing of the pain; (2) remembering the sensory, intensity, and affective qualities of the pain without re-experiencing it; and (3) remembering the circumstances in which the pain was experienced. Most studies of memory for pain have focussed on the second variant and have obtained mixed results. For example, several studies have examined the accuracy of women's memory of the pain of childbirth—most employing a so-called visual analog scale (basically a mark made on a thermometer scale) (e.g., Rofé & Algom, 1985; Norvell, Gaston-Johansson, & Fridh, 1987). These have been about evenly split in their conclusions, with about half finding accurate recall of pain (or even slight retrospective exaggeration) and the other half finding significant, and in some cases quite substantial, under-remembering of pain.

Morley himself (1993) conducted a study in which subjects completed a two-part survey on pain memories. In the first part they were asked to recall a pain event and in the second they were asked questions designed to measure the extent of the three variants of

<sup>8</sup> Traumatic injury may be such a case. Katz and Melzack (1990) argue, based on research on amputees experiencing the "phantom limb" phenomenon, that amputees store pain memories in a "neuro-matrix" such that they can be retrieved and veridically reexperienced: "The results of the present study suggest that the somatosensory memories described here are not merely images or cognitive recollections (although obviously a cognitive component is involved); they are direct experiences of pain (and other sensations) that resemble an earlier pain in location and quality" (p. 333). They summarize different past studies of phantom limb pain in which 46, 79, 50, 17.5, 37.5, and 12.5% of patients who had lost limbs reported that the pain mimicked the original pain. There are problems with this research, most notably the retrospective methodology which introduces the possibility of recall bias. However, at a minimum, the phantom limb research suggests that some people in some situations may, in fact, be capable of remembering pain.

pain memory dimensions. When asked questions about the second variant type of pain memory, 59% were able to recall at least some aspect of the pain sensation, while the remaining 41% reported that they had no recall of the pain sensation at all and were thus unable to rate the vividness of their pain experience. For example, one subject reported "I remember the pain getting worse and worse, but I can't remember what the pain felt like at all." Not a single subject reported actually reexperiencing the pain—i.e., Morley's first variant of pain memory. Consistent with these results, Strongman and Kemp (1991) found that spontaneous accounts of pain tended to fit Morley's first variant of pain memory—remembering the circumstances in which the pain was experienced. Their subjects were given a list of 12 emotions and were asked for each to remember a time they had experienced the emotion. They found that, "overwhelmingly, the descriptions were of 'objective' details of the events rather than of the feelings of the respondents" (p. 195).

Scarry (1985, p. 15) notes a similar phenomenon when it comes to descriptions of pain; these rarely describe the pain itself, but typically focus either on the external agent of pain (e.g., "it feels as though a hammer is coming down on my spine") or on the objective bodily damage associated with the pain ("it feels as if my arm is broken at each joint and the jagged ends are sticking through the skin"). Fienberg, Loftus, and Tanur (1985, p. 592) reached virtually the same conclusion in their review of the literature on memory for pain which concluded with the question: "Is it pain that people recall or is it really the events such as injuries and severe illnesses?"

Whether people can remember the sensory, intensity, and affective qualities of a pain (Morley's second variant), therefore, or only the events that produced the pain, the evidence is strong that most people cannot remember pain in the sense of reexperiencing it in imagination (Morley's first variant). We can recognize pain all too effortlessly when it is experienced, but only in a limited number of cases actually call it to mind spontaneously—i.e., recall them—in the same way that we can recall words or visual images.<sup>9</sup>

There may be certain types of visceral sensations, however, which, if not remembered in Morley's third sense, at least evoke arousal upon recall. For pain, this is true of those for which the pain-causing event can be imagined vividly. Highly imaginable events such as dentist visits, cuts and wounds, and bone breakage produce immediate anxiety and dread, to the point where the recollection of the event may actually be worse than

the reality (e.g., Linton, 1991; Rachman & Arntz, 1991). For such events there is evidence that what people remember is what they expected to experience beforehand, rather than what they actually experienced (Kent, 1985).

A similar pattern holds for emotions. Some emotions are associated with straightforward cognitions. For example, anger may arise from a perceived insult, shame or embarrassment from a faux pas. To the extent that the insult or faux pas can be conjured up in the mind, one can reproduce the emotion at any time, not just at the time when the instigating incident occurs (see, Strack, Schwarz & Gschneidinger, 1985, p. 1464).<sup>10</sup> Thus, as for pain, the ability to imagine the impact of future emotions depends on the concreteness and imaginability of the instigating stimuli. Moods or feeling states that have no obvious object, such as sadness or depression, by this reasoning, will be especially prone to anticipatory underestimation, as will pains and discomforts that are not associated with vivid images.

The latter observation may help to explain an observation made by Irena Scherbakowa (personal communication), on the basis of hundreds of interviews conducted with victims of Stalin's terror. She noted that people who had "betrayed" friends or family, or confessed to crimes they didn't commit when they were tortured by such methods as being forced to stand in one position for hours, or prevented from sleeping, may have been particularly haunted by the memory years later because it was difficult to understand, in retrospect, why they had succumbed to such seemingly "mild" methods. A similar observation was made by Biderman (1960) in his analysis of the retrospective reports of 220 repatriated U.S. Air Force prisoners captured during the Korean war. According to Biderman, "the failure of the prisoner to recognize the sources of the compulsion he experiences in interrogation intensifies their effects, particularly the disabling effects of guilt reactions" (p. 145).

Limitations in the memory for visceral sensations may also help to explain the disappointing results that have been obtained by interventions designed to alter behavior by invoking fear. In some such efforts, such as trying to "scare-straight" at-risk youths by exposing them to life in a maximum security penitentiary, the effect seems to have been opposite to what was intended (Finckenauer, 1982; Lewis, 1983). The standard explanation for such an effect is that the fear communication produced a defensive compensatory response. Perhaps, however, the paradoxical effect resulted from

<sup>9</sup> Deleted in proof.

<sup>10</sup> Jon Elster brought this point to my attention.

the weakness of the evoked response to the memory. If thinking about incarceration fails to evoke affect, even after touring the facility, perhaps the youths in question conclude that "I've experienced the worst, and it must not be that bad since thinking about it leaves me cold." This conjecture is consistent with research on people's response to minimally, moderately, and strongly fear-arousing lectures about dental hygiene (Janis & Feshbach, 1953). Immediately following the communication there appeared to be a monotonic relationship between fear intensity and vigilance; however, 1 week later the effect of the lectures on behavior was inversely related to fear.

In sum, with certain important exceptions, it appears that people can remember visceral sensations at a cognitive level, but cannot reproduce them, even at diminished levels of intensity. It seems that the human brain is not well equipped for storing information about pain, emotions, or other types of visceral influences, in the same way that visual, verbal, and semantic information is stored. We can recognize visceral sensations often too effortlessly when they occur, but only in a limited number of cases actually call them to mind spontaneously—i.e., recall them—in the same way that we can recall words or visual images. Unable to recall visceral sensations as we can recall other types of information, their power over our behavior is difficult to make sense of retrospectively or to anticipate prospectively.

#### Proposition 7:

Each of the first six propositions apply to interpersonal as well as intrapersonal comparisons, where other people play the same role visavis the self as the delayed self plays relative to the current self.

Analogous to proposition 1, actual altruism tends to decline relative to desired altruism as visceral factors intensify. A friend related to me the frenzied struggles between passengers that occurred on a transatlantic flight when the plane suddenly dived and only about half the oxygen masks dropped. Although fear caused people to become self-centered, it seems likely that even as they grasped for their neighbor's child's mask, they knew that they were violating their own moral codes. The self-focusing effects of visceral factors is not surprising given the prioritizing and motivating role that visceral factors play in human and nonhuman behavior. Analogous to proposition 2, when making decisions for others, we are likely to ignore or radically underweight the impact of visceral factors on them. Few of the classic tragedies (e.g., *Eve* and the apple; *Macbeth*) would have happened if the protagonists had turned over decision-making power to a disinterested party. Combining both of these analogous propositions, the interpersonal equivalent

to proposition 3 states that the weight one places on oneself relative to other persons who are experiencing equivalent levels of a visceral factor increases as the common level of the visceral factor intensifies. Hunger, thirst, pain, and fear are all powerful antidotes to altruism (Loewenstein, forthcoming a).

Proposition 4 applied to the interpersonal domain implies that people who are themselves experiencing a visceral factor will be more empathic toward, and more accurate predictors of, others who are experiencing the same visceral factor. One summer, for example, a friend mentioned his back problems to me. I responded sympathetically, but his pain had little reality until, when working in the garden one day, I suddenly felt something "give" in my back. My virtually instant reaction was to think of him and to feel deeply for the first time what he must have been experiencing all along. Despite such occasional examples of "priming," however, in which one's own weak experience of a visceral factor allow us to empathize with another person's stronger one, in general, there seems to be an empathic gulf when it comes to appreciating another person's pain, hunger, fear, etc. As Elaine Scarry writes with respect to pain,

When one speaks about "one's own physical pain" and about "another person's physical pain," one might almost appear to be speaking about two wholly distinct orders of events. For the person whose pain it is, it is "effortlessly" grasped (that is, even with the most heroic effort it cannot *not* be grasped); while for the person outside the sufferer's body, what is "effortless" is *not* grasping it (it is easy to remain wholly unaware of its existence; even with effort, one may remain in doubt about its existence or may retain the astonishing freedom of denying its existence; and, finally, if with the best effort of sustained attention one successfully apprehends it, the aversiveness of the "it" one apprehends will only be a shadowy fraction of the actual 'it'). (1985, p. 4).

Scarry argues that pain, uniquely, possesses such an empathic gulf, and attributes it to the poverty of language when it comes to expressing pain. While agreeing with her that such a gulf exists, I think it applies to a much wider range of feelings than pain, doubt it arises from limitations of linguistic expression, and also believe that virtually the same gulf exists when it comes to remembering or anticipating one's own pain and other visceral factors. Regardless of the source of such an empathic gulf, its existence implies that, analogous to proposition 5, people will have difficulty predicting the behavior of other people who are experiencing intense visceral factors. Just as people underestimated the likelihood that they themselves would have conformed to the modal pattern of behavior in the Milgram experiment, for example, they also underestimated the likelihood that other, superficially described, persons would do so (Nisbett & Ross, 1980). Finally,

analogous to proposition 6, the behavior of other people acting under the influence of visceral factors will seem as incomprehensible as one's own past visceral-factor-influenced behavior.

Most of the propositions just enumerated, including the 7th, are illustrated in William Styron's autobiographical treatise on depression. Depression fits the definition of a visceral factor since it has a direct impact on well-being and also influences the relative desirability of different activities. Proposition 1 (the excessive influence of immediately operative visceral factors) is illustrated by the fact that while he was depressed Styron experienced an almost overwhelming desire to commit suicide, but recognized that this was not in his self-interest. This latter awareness induced him to seek psychiatric help. Proposition 2 (the underweighting of future visceral factors), proposition 5 (underestimation of the impact of future visceral factors), and proposition 6 (the minimization in memory of the impact of past visceral factors) are also all vividly described in the book. When Styron was not feeling depressed, he reports, depression had little reality to him; indeed, writing the book was his attempt to come to terms with this lack of intrapersonal empathy. Proposition 4 (the projection of currently experienced visceral factors onto the future) is well illustrated by the feeling he reports, while depressed, that the depression will never end—all the while recognizing intellectually that this is probably false. Finally proposition 7 (the analog between intra- and interpersonal empathy vis à vis the effect of visceral factors) is amply illustrated both from his own perspective and that of others. Prior to his own long bout with depression, Styron received a visit from two friends who were suffering from severe depression, but reports that he found their behavior baffling, since their depression had no reality to him in his own nondepressed state. Later, when he became depressed himself, he experienced the same empathic void with respect to the people around him.

## APPLICATIONS

A major challenge confronting the decision paradigm is the generally poor "fit" achieved in empirical analyses of behavior that are guided by decision theory. In attempts to use decision models to explain or predict such wide-ranging behaviors as job choice, migration, contraception, criminal activity, and self-protective measures against health, home and work-place risks, the fraction of explained variance has generally been low. Although disappointing results are often attributed to measurement error, the poor fit problem persists even when researchers collect their own data, and

despite the opportunities for data fitting inherent in the typical retrospective design. Even when applied to gambling—an activity which serves as the central metaphor for the decision making perspective—decision models have been largely unable to account for the "stylized" facts of aggregate behavior, let alone to predict the behavior of individuals. Is it possible that part of the poor fit problem results from the decision making paradigm's failure to take account of visceral factors? In this section I discuss a variety of patterns and domains of behavior in which I believe that visceral factors are likely to play an especially prominent role.

### *Drug Addiction*

In the introduction of *Addiction*, Avrum Goldstein expresses the central paradox of addiction as follows:

If you know that a certain addictive drug may give you temporary pleasure but will, in the long run, kill you, damage your health seriously, cause harm to others, and bring you into conflict with the law, the rational response would be to avoid that drug. Why then, do we have a drug addiction problem at all? In our information-rich society, no addict can claim ignorance of the consequences.

Several different solutions to this riddle have been proposed. Becker and Murphy (1988), for example, argue that the addict begins taking the addictive substance with a realistic anticipation of the consequences. Such an account is unsatisfactory not only because it fails to fit the facts (e.g., it implies incorrectly that addicts will buy in bulk to save time and money in satisfying their anticipated long term habit), but also because it is difficult to understand how the rapid downward hedonic spiral associated with many kinds of addictions can be viewed as the outcome of a rational choice. Cocaine addiction, for example, seems to produce a relatively rapid diminution in the overall capacity for pleasure (Gardner & Lowinson, 1993). Herrnstein and Prelec (1992), in contrast, argue that people become addicted because they fail to notice the small incremental negative effects of the addictive substance. However their account fails to explain why people don't get the information from sources other than their own personal experience since, as Goldstein notes, the consequences of addiction are well publicized.

The theoretical perspective proposed here provides a somewhat different answer to this question (see, Loewenstein, forthcoming b, for a more detailed discussion). Research on drug addiction suggests that it is not so much the pleasure of taking the drug that produces dependency, but the pain of not taking the drug after one has become habituated to it (Gardner & Lowinson, 1993). This pain is usually subclassified into two components: the pain of withdrawing from the drug and

the cravings for the drug that arise from “conditioned association”—i.e., that result from exposure to persons, places, and other types of stimuli that have become associated with drug taking. Proposition 5 (underestimation of the impact of future visceral factors) implies that people who have not experienced the pains of withdrawal and craving may over- or underestimate the aversiveness of withdrawal and craving, but will almost surely underestimate the likely impact of these visceral factors on their behavior. That is, people will exaggerate their own ability to stop taking a particular drug once they have started. Believing that they can stop taking the drug at will, they are free to indulge their curiosity, which, according to Goldstein (1994, p. 215) is the driving force in most early drug use.

Proposition 2 can also help to explain the prevalence of self-binding behavior among addicts. The alcoholic who takes antabuse (assuring him or herself of horrible withdrawal symptoms), the smoker who ventures off into the wilderness without cigarettes (after a final smoke at the departure point), and the dieter who signs up for a miserable, hungry, vacation at a “fat farm” are all imposing extreme future misery on themselves. To those who view these behaviors as the manifestation of myopic time preferences, such seemingly far-sighted behavior may seem anomalous. Proposition 2, however, suggests that such readiness to impose future pain on oneself has less to do with time preference, and more to do with the unreality of future pain to the currently pain-free self. It seems unlikely that alcoholics, smokers, or overeaters would take any of these actions at a moment when they were experiencing active craving for the substance to which they are addicted.

### *Sexual Behavior*

As is true for addiction, volition seems to play an ambiguous and often changing role in sexual behavior. Although we hold people accountable for their behavior as a matter of policy, sexually motivated behavior often seems to fall into the “gray region” between pure volition and pure compulsion. The following three examples illustrate the applicability of the proposed theoretical perspective to sexual behavior.

*Teenage contraception.* In a recent study of teenage contraceptive behavior, Loewenstein and Furstenberg (1991) found that birth control usage was largely unrelated to the main variables that the decision making perspective would predict they should be correlated with—e.g., belief in birth control’s effectiveness or the desire to avoid pregnancy. The most important correlates of birth control usage were embarrassment about using it and perceptions that it interferes with pleasure

from sex. Clearly, the emotions associated with unwanted pregnancy are much more powerful or at least long-lasting than those associated with sexual spontaneity and enhanced pleasure; however, and consistent with proposition 1, the immediacy and certainty of embarrassment and discomfort seem to overwhelm the delayed and uncertain consequences of using it or failing to use it.<sup>11</sup> Proposition 7 can, perhaps, help to explain some of the misguided policies in this area—such as the abstinence movement—which leaves teenagers unprepared for their own feelings and behavior because its proponents underestimate the influence of visceral factors on the behavior of others.

*Self-protection against sexually transmitted disease.* Based on his own extensive and innovative research on the AIDS-related sexual behavior of gay men, Gold (1993, p. 1994) argues that much unprotected sex occurs in the heat of the moment but that people can’t remember or predict what the heat felt like and so are unprepared to deal with it. He believes that the poor memory for the “heat of the moment” has hampered researchers who “have studied only those cognitions that are present in respondents’ minds at the time they are answering the researcher’s questions (that is, ‘in the cold light of day’), rather than those that are present during actual sexual encounters” (Gold, 1993, p. 4). Based on his view that gay men forget the influence of the heat of the moment (consistent with proposition 6), Gold (1994) ran a study in which he compared the effectiveness of a conventional informational intervention intended to increase the use of condoms during anal intercourse (exposure to didactic posters) to a new

<sup>11</sup> Immediate affect has been found to be a critical determinant of behavior in numerous analyses of decision making. For example, Grasmick, Bursik, and Kinsey (1990) conducted two surveys on littering in Oklahoma City, one just before and one shortly after the initiation of a successful anti-littering program. The survey asked people whether they littered, obtained demographics, and asked questions about shame (e.g., “Generally, in most situations I would feel guilty if I were to litter the highways, streets, or a public recreation area”) and also about the embarrassment the respondents would feel if they littered. The R<sup>2</sup> jumped from .076 to .269 when shame and embarrassment variables were added to the equation predicting compliance, and the increase in these variables across the surveys mediated the change in mean compliance, strongly suggesting that the effectiveness of the program was due to its success in attaching an immediate negative emotion to littering. Manstead (1995) found that age and sex (typically the two most powerful explanatory variables) dropped out of regression equations predicting risk taking among drivers after controlling for affective variables. Klatzky and Loewenstein (1995) found that traditional decision making variables (probabilities and outcome severities) explained surprisingly little of the variance in women’s breast-self examination behavior relative to subjective reports of anxiety associated with breast cancer and self-examination.

“self-justification” intervention. Subjects in the self-justification group were sent a questionnaire which instructed them to recall as vividly as possible a sexual encounter in which they had engaged in unprotected anal intercourse and were asked to indicate which of a given list of possible self-justifications for having unsafe sex had been in their mind at the moment they had decided not to use a condom. They were then asked to select the self-justifications that had been in their mind most strongly at the time, to indicate how reasonable each of these seemed to them now, looking back on it; and to briefly justify these responses. The men were thus required to recall the thinking they had employed in the heat of the encounter and to reflect on it in the cold light of day. The percentage of men in the three groups who subsequently engaged in two or more acts of unprotected anal intercourse differed dramatically between the three groups—42 and 41% for the control and poster groups, but only 17% for the self-justification group.

*Sex lives of married couples.* Recent surveys of sexual behavior suggest that the sex lives of married couples tend to be even worse (in terms of frequency) than what most people already suspected. For example, a recent study conducted by the National Opinion Research Center (Michael, Gagnon, Laumann & Kolata, 1994) found that the average frequency of intercourse of married couples declined markedly as a function of years of marriage. Certainly some of this drop-off reflects the combined effects of soured relations, diminished attraction, etc. What is surprising, as reported in the same study, is that many couples enjoy sex quite a lot when it actually occurs. The visceral factor perspective can perhaps shed some additional light on the anomaly posed by the failure to take advantage of an obvious opportunity for gratification.

In the early stages of a relationship, the mere thought of sex, or the physical proximity of the other partner is sufficient to produce significant arousal. It is easy to understand this arousal in evolutionary terms, and indeed research has shown that rats, cattle, and other mammals can be sexually rejuvenated following satiation by the presentation of a new partner—the so-called “Coolidge Effect” (Bowles, 1974). Thus, early in a relationship one initiates sex in a visceral state not unlike that associated with the sex act itself. Repeated presentation of the same sexual partner, however, diminishes initial arousal. Proposition 5 implies that people who are not aroused will have difficulty imagining how they will feel or behave once they become aroused. It can thus explain why couples fail to initiate sex despite ample past experience showing that it will be pleasurable if they do. As in so many

cases when people experiencing one level of a visceral factor need to make decisions for themselves when they will be at a different level, rules of thumb, such as “have sex nightly, regardless of immediate desire,” may provide a better guide to behavior than momentary feelings.

### *Motivation and Effort*

Another area in which the decision making perspective falls short is its treatment of motivation and effort. In the decision paradigm there is no qualitative distinction between choosing, say one car over another, or “deciding” to pick up one’s pace in the last mile of a marathon; both are simply decisions. Years after the decline of behaviorism, behaviorists still offer the most coherent theoretical perspective on motivation and the most sophisticated and comprehensive program of research (see, e.g., Bolles, 1975).

Physical effort, and often mental effort as well, often produce an aversive sensation referred to as fatigue or, at higher levels, exhaustion. Like other visceral factors, fatigue and exhaustion are directly aversive, and alter the desirability of different activities; most prominently, they decrease the desirability of further increments of effort. Proposition 1 implies that as exhaustion increases, there will be an ever-increasing gap between actual and desired behavior. Anyone who has engaged in competitive sports, or who has taught for several hours in a row can confirm this prediction; regardless of the importance of performing well, and even with full knowledge that one will recover from the exhaustion virtually immediately after suspending the activity, sustained performance is often impossible to achieve. Proposition 5 implies that people will overestimate their own ability to overcome the effect of fatigue—they will exaggerate the degree to which they can overcome limitations in physical conditioning, concentration, etc. through sheer willpower, and proposition 6 implies that, as time passes, people increasingly come to blame themselves for deficiencies in their own prior effort level because they will forget their own past exhaustion. Proposition 7 predicts that people who are observing the effort output of others will have a difficult time understanding or predicting reductions in effort output. Watching speed-skaters during the Olympics, for example, I found it difficult to understand why they failed to maintain their pace in the face of such overwhelming incentives.

Many of the tactics that people use to motivate themselves in the face of fatigue and exhaustion can be described by the observation that you can only fight visceral factors with other visceral factors. Thus, a common tactic for mustering willpower is to attempt to



imagine, as vividly as possible, the potential positive consequences of greater effort output, or the potential negative consequences of insufficient output. When I lived in Boston many years ago, a friend and I would regularly drive to West Virginia to go canoeing, and would typically drive back days later in the middle of the night. During these long drives I would remain awake at the wheel by imagining myself ringing the doorbell of my friend's parents house to announce that he had died in a car crash. The effectiveness of mental imagery in eliciting an emotional response explains not only why it is commonly used as an emotion-induction method in research, but also may also help to explain its prominent role in decision making (c.f., Pennington & Hastie, 1988; Oliver, Robertson, & Mitchell, 1993). Not only does imagery provide a tool for deciding between alternative courses of action but, once a resolution has been made, it may also help to stimulate the emotional response needed to implement the decision. Multiattribute analytical evaluation seems unlikely to provide such a motivational impetus.

### *Self-Control*

One of the most difficult patterns of behavior to subsume under a conventional rational choice framework, and one that has received increasing attention in the literature, is the phenomenon of intrapersonal conflict and self-control. People sometimes report feeling as if though there were two selves inside them—one more present- and one more future-oriented—battling for control of their behavior. To express the introspective sensation of intra-individual conflict, a number of people have proposed different types of “multiple self” models that apply to intrapersonal conflict preexisting models that have been developed to describe strategic interactions between different people.

Schelling's multiple self model (1984), for example, constitutes a relatively straightforward application of his pioneering research on commitment tactics in interpersonal bargaining to intrapersonal conflict. In his model a series of far-sighted selves who would prefer to wake up early, eat in moderation, and desist from alcohol, use a variety of precommitment techniques to control the behavior of their more short-sighted counterparts. Elster (1985), somewhat differently, sees intrapersonal conflict as a “collective action problem” involving the succession of one's selves. Such a perspective sheds special light on the phenomenon of unraveling. Just as one person's cutting in line can cause a queue to disintegrate into a state of anarchy, the first cigarette of someone who has quit, or the first drink of an ex-alcoholic, often usher in a resumption of the original self-destructive pattern of behavior. Fi-

nally, Thaler and Shefrin's (1981) “planner/doer” model adopts a principal-agent framework in which a far-sighted planner (the principle) attempts to reconcile the competing demands of a series of present-oriented doers (the agents).

The strength of multiple self models is that they transfer insights from a highly developed field of research on interpersonal interactions to the less studied topic of intraindividual conflict. However, the usefulness of the multiple self approach is limited by imperfections in the analogy between interpersonal and intrapersonal conflict. There is an inherent asymmetry between temporal selves that does not exist between different people. People often take actions that hurt themselves materially to either reward or punish others who have helped or hurt them. In the intrapersonal domain, however, people cannot take actions for the purpose of rewarding or punishing their past selves. Another form of asymmetry arises from the fact that attempts at self control are almost always made by the far sighted self against the short-sighted one, and almost never in the opposite direction. Consistent only with the planner-doer model, there is little camaraderie between successive short-sighted selves, but much more of a sense of continuity between far-sighted selves. For example, when people “decide” to sleep in, they rarely disable the alarm clock to promote the cause of tomorrow morning's sluggish self; however, when not actually experiencing the misery of premature arousal, we might well make a policy decision to place the alarm clock away from the bed every night.

Perhaps the most significant problem with multiple self models is that they are metaphorical and not descriptions of what we think actually takes place in intrapersonal conflict. Advocates of the multiple self approach do not believe that there are little selves in people with independent motives, cognitive systems, and so on. Thus, it is difficult to draw connections between multiple self models and research on brain neurochemistry or physiology beyond the rather simplistic observation that the brain is not a unitary organism.

The visceral factor perspective, and its key assumption that intense visceral factors cause behavior to depart from perceived self-interest, provides a better fit to the stylized facts than do multiple self models. The introspective feeling of multiple selves, for example, arises from the observation that one is clearly behaving contrary to one's own self interest. Since we are used to interpreting behavior as the outcome of a decision, it is natural to assume that there must be some self—other than the self that identifies one's self-interest—that is responsible for the deviant behavior. The fact that impulsive selves never promote one-another's be-

havior is not surprising if these selves are not, in fact, coherent entities with consciousness and personal motives, but instead represent the motivational impact of visceral factors. The far-sighted self, in contrast, represented by the individual's assessment of self-interest, is much more constant over time. The far-sighted self can, in a sense, represent the individual's tastes, factoring out as much as possible the effect of visceral factors.

### CONCLUDING REMARKS

The decision-making paradigm, as it has developed, is the product of a marriage between cognitive psychology and economics. From economics, decision theory inherited, or was socialized into, the language of preferences and beliefs and the religion of utility maximization that provides a unitary perspective for understanding all behavior. From cognitive psychology, decision theory inherited its descriptive focus, concern with process, and many specific theoretical insights. Decision theory is thus the brilliant child of equally brilliant parents. With all its cleverness, however, decision theory is somewhat crippled emotionally, and thus detached from the emotional and visceral richness of life.

Contrary to the central assumption of decision theory, not all behavior is volitional, and very likely most of it is not. This is not a novel critique, but most recent critiques along these lines have attacked from the opposite angle. A number of researchers have argued that most behavior is relatively "automatic" (Shiffrin, Dumais & Schneider, 1981), "mindless" (Langer, 1989), habitual (Ronis, Yates & Kirscht, 1989; Louis & Sutton, 1991), or rule-guided (Anderson, 1987; Prelec, 1991). While not disputing the importance of habitual behavior, my focus is on the opposite extreme—one that, while perhaps less prevalent than habitual behavior, presents a more daunting challenge to the decision making perspective. My argument is that much behavior is non-volitional or only partly volitional—even in situations characterized by substantial deliberation.

The failure to incorporate the volition-undermining influence of emotions and other visceral factors can be seen not only in the disappointing explanatory power of decision models, but also in two additional significant problems faced by the decision-making perspective. The first is the counterintuitive notion of "irrationality" that has arisen in a field which has irrationality as a central focus. As Daniel Kahneman notes (1993), contemporary decision theorists typically define irrationality as a failure to adhere to certain axioms of choice such as transitivity or independence—a definition that diverges sharply from personal accounts of irrational-

ity. In everyday language, the term irrationality is typically applied to impulsive and self-destructive behavior and to actions that violate generally accepted norms about the relative importance of different goals.

The theoretical perspective proposed here views irrationality not as an objective and well-defined phenomenon, but as a subjective perception that occurs in the mid-range of the continuum defined by the influence of visceral factors. At low levels of visceral factors, people generally experience themselves as behaving in a rational fashion. At extremely high levels, such as the level of sleepiness that causes one to fall asleep at the wheel, decision making is seen as *arational*—that is, people don't perceive themselves as making decisions at all. It is in the middle region of visceral influences, when people observe themselves behaving contrary to their own perceived self-interest, that they tend to define their own behavior as irrational. Expressions such as "I don't know what got into me," or "I must have been crazy when I . . ." refer to discrepancies between behavior and perceived self-interest that are produced by the influence of visceral factor. As proposition 7 would imply, moreover, the same expressions are used to refer to the irrational behavior of others that is difficult to comprehend as self-interested. In sum, the visceral factor perspective helps to explain when and why people view their own, and others', behavior as irrational.

The second problem resulting from the failure to take account of the impact of visceral factors, is a widespread skepticism toward the decision making perspective, on the part of both the general public and of academics in the humanities. A commonly heard complain is that decision theory fails to capture what makes people "tick," or what it means to be a person (c.f., Epstein, 1994). People who introspectively experience high conflict in their personal lives are unlikely to embrace a theory of behavior that denies such conflict or that, at best, treats it as a matter of balancing competing reasons for behaving in different ways (Tversky & Shafir, 1992). The dismaying consequence of decision theory's lack of general appeal is a widespread tendency for those in the humanities and in the general public to fall back on outmoded theoretical accounts of behavior such as those proposed by Freud and his followers. The task of decision researchers, as I see it, is to try to breathe more life into decision models without losing the rigor and structure that are the main existing strengths of the perspective. Incorporating the influence of visceral factors, I hope, is a step in that direction.

### REFERENCES

- Akerlof, G. A. (1991). Procrastination and obedience. *American Economic Review*, 81, 1–19.

- Anderson, J. R. (1987). Skill acquisition: compilation of weak-method problem solutions. *Psychological Review*, 94, 192–210.
- Beach, L. R. (1990). *Image theory: Decision making in personal and organizational contexts*. Chichester: Wiley.
- Becker, G., & Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy*, 96, 675–700.
- Biderman, A. D. (1960). Social-psychological needs and 'involuntary' behavior as illustrated by compliance in interrogation. *Sociometry*, 23, 120–147.
- Bolles, R. C. (1975). *The theory of motivation* (2nd ed.). New York: Harper & Row.
- Brown, J. W. (1988). *The life of the mind*. Hillsdale, NJ: Erlbaum.
- Bruner, J. (1957). Going beyond the information given. In J. Bruner et al. (Eds.), *Contemporary approaches to cognition*. Cambridge, MA: Harvard Univ. Press.
- Chapman, C. R. (1994). Assessment of pain. In W. Nimo & G. Smith (Eds.), *Anaesthesia*. England: Blackwell.
- Christensen, S. M., & Turner, D. R. (1993). *Folk psychology and the philosophy of mind*. Hillsdale, NJ: Erlbaum.
- Christensen-Szalanski, J. J. J. (1984). Discount functions and the measurement of patients' values: Women's decisions during child-birth. *Medical Decision Making*, 4, 47–58.
- Chung, S-H., & Herrnstein, R. J. (1967). Choice and delay of reinforcement. *Journal of the Experimental Analysis of Behavior*, 10, 67–74.
- Cinnamon, K., & Farson, D. (1979). *Cults and cons*. Chicago: Nelson-Hall.
- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Putnam.
- Easterbrook, J. A. (1959). The effect of emotion on cue utilization and the organization of behavior. *Psychological Review*, 66, 183–201.
- Elster, J. (1985). Weakness of will and the free-rider problem. *Economics and Philosophy*, 1, 231–265.
- Elster, J. (1977). *Ulysses and the sirens*. Cambridge, England: Cambridge Univ. Press.
- Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 49, 709–24.
- Fields, H. L. (1987). *Pain*. New York: McGraw–Hill.
- Fienberg, S. E., Loftus, E. F., & Tanur, J. M. (1985). Recalling pain and other symptoms. *Health and Society*, 63, 582–97.
- Finckenauer, J. O. (1982). *Scared straight! and the panacea phenomenon*. Englewood Cliffs, NJ: Prentice–Hall.
- Fishbein, M., & Azjen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Frank, R. H. (1988). *Passions within reason: The strategic role of the emotions*. New York: Norton.
- Frawley, P. J. (1988). Neurobehavioral model of addiction: Addiction as a primary disease. In S. Peele (Ed.), *Visions of addiction*. Lexington, MA: Lexington Books.
- Galanter, M. (1989). *Cults: faith, healing, and coercion*. New York: Oxford Univ. Press.
- Gardner, E. L. (1992). Brain reward mechanisms. In J. H. Lowinson, P. Ruiz, R. B. Millman & J. G. Langrod (Eds.), *Substance abuse: A comprehensive textbook* (2nd ed., pp. 70–99). Baltimore: Williams & Wilkins.
- Gardner, E. L., & Lowinson, J. H. (1993). Drug craving and positive/negative hedonic brain substrates activated by addicting drugs. *Seminars in the Neurosciences*, 5, 359–368.
- Gawin, F. H. (1991). Cocaine addiction: Psychology and neurophysiology. *Science*, 251, 1580–1586.
- Gold, R. (1993). On the need to mind the gap: On-line versus off-line cognitions underlying sexual risk-taking. In D. Terry, C. Gallons, & M. McCamish (Eds.), *The theory of reasoned action: Its application to AIDS preventive behavior*. New York: Pergamon Press.
- Gold, R. (1994). *Why we need to rethink AIDS education for gay men*. Plenary address to the Second International Conference on AIDS' impact: Biopsychosocial aspects of HIV infection 7–10 July, Brighton, UK.
- Goldstein, A. (1994). *Addiction: From biology to drug policy*. New York: Freeman.
- Gould, S. J. (1992). *The panda's thumb: More reflections on natural history*. New York: Norton.
- Grasmick, H. G., Bursik, R. J., & Kinsey, K. A. (1991). Shame and embarrassment as deterrents to noncompliance with the law—The case of an antilittering campaign. *Environment and Behaviour*, 23, 233–251.
- Gratton, A., & Wise, R. A. (1994). Drug- and behavior-associated changes in dopamine-related electrochemical signals during intravenous cocaine self-administration in rats. *The Journal of Neuroscience*, 14, 4130–46.
- Herrnstein, R., & Prelec, D. (1992). Addiction. In G. Loewenstein & J. Elster (Eds.), *Choice over time*. New York: Russell Sage.
- Hoch, S. J., & Loewenstein, G. F. (1991). "Time-inconsistent preferences and consumer self-control." *Journal of Consumer Research*, 17, 492–507.
- Janis, I. L. (1967). Effects of fear arousal on attitude change. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 3, pp. 167–224).
- Janis, I. L., & Feshbach, S. (1953). Effects of fear-arousing communications. *Journal of Abnormal and Social Psychology*, 48, 78–92.
- Janis, I. L., & Leventhal, H. (1967). Human reactions to stress. In E. Borgatta & W. Lambert (Eds.), *Handbook of personality theory and research*. Chicago: Rand McNally.
- Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.
- Kahneman, D. (1993). *Presidential address to the society for judgment and decision making*. St. Louis, MO.
- Katz, J., & Melzack, R. (1990). Pain 'memories' in phantom limbs: review and clinical observations. *Pain*, 43, 319–336.
- Kent, G. (1985). Memory of dental pain. *Pain*, 21, 187–94.
- Klatzky, R., & Loewenstein, G. (1995). *Proximate influences and decision analyses as predictors of breast self-examination*. Working paper, Carnegie Mellon University, Department of Psychology.
- Kosslyn, S. M., Alpert, N. M., Thompson, W. L., Maljkovic, V., Weise, S. B., Chabris, C. F., Hamilton, S. E., Rauch, S. L., & Buonanno, F. S. (1993). Visual mental imagery activates topographically organized visual cortex: PET investigations. *Journal of Cognitive Neuroscience*, 5, 263–87.
- Kuhl, J., & Beckmann, J. (Eds.). (1994). *Volition and personality*. Seattle/Toronto/Bern/Göttingen: Hogrefe & Huber Publishers.
- Kunreuther, H., Ginsberg, R., Miller, L., Slovic, P., Borkan, B., & Katz, N. (1978). *Disaster insurance protection: Public policy lessons*. New York: Wiley.
- Langer, E. (1989). *Mindfulness*. Reading, MA: Addison-Wesley.

- Lewis, R. V. (1983). Scared straight—California style. *Criminal Justice and Behavior*, 10, 209–226.
- Libet, B., Gleason, C., Wright, E., & Pearl, D. (1983). Time of conscious intention to act in relation to onset of cerebral activity (readiness-potential). *Brain*, 106, 623–42.
- Linton, S. J. (1991). Memory for chronic pain intensity: Correlates of accuracy. *Perceptual and Motor Skills*, 72, 1091–95.
- Loewenstein, G. (forthcoming, a). Behavioral decision theory and business ethics: Skewed tradeoffs between self and other. In D. M. Messick (Ed.), *Business ethics*.
- Loewenstein, G. (forthcoming, b). Addiction, choice, and rationality. In J. Elster & O. J. Skog (Eds.), *Getting hooked: Rationality and addiction*. Cambridge, England: Cambridge Univ. Press.
- Loewenstein, G., & Adler, D. (1995). A bias in the prediction of tastes. *Economic Journal*, 105, 929–937.
- Loewenstein, G., & Furstenberg, F. (1991). Is teenage sexual behavior rational? *Journal of Applied Psychology*, 21, 957–86.
- Loewenstein, G., & Mather, J. (1990). Dynamic processes in risk perception. *Journal of Risk and Uncertainty*, 3, 155–75.
- Lord, Lepper, & Ross (1979). Biased assimilation and attitude polarization: the effect of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 37, 2098–2110.
- Louis, M. R., & Sutton, R. I. (1991). Switching cognitive gears: from habits of mind to active thinking. *Human Relations*, 44, 55–76.
- Mandler, G. (1964). The interruption of behavior. In D. Levine (Ed.), *Nebraska symposium on motivation*. Lincoln, Nebraska: University of Nebraska Press.
- Manstead, A. S. R. (1995). *The role of affect in behavioural decisions: Integrating emotion into the theory of planned behaviour*. Paper presented at seminar on Affect and Decision Making. Technical University of Eindhoven, March 31, 1995.
- Mazur, J. E. (1987). An adjustment procedure for studying delayed reinforcement, In M. L. Commons, J. E. Mazur, J. A. Nevins, & H. Rachlin (Eds.), *Quantitative analysis of behavior: The effect of delay and of intervening events on reinforcement value* (Chapter 2). Hillsdale, NJ: Erlbaum.
- Messiha, F. S. (1993). Fluoxetine: A spectrum of clinical applications and postulates of underlying mechanisms, *Neuroscience and Bio-behavioral Reviews*, 17(4), 385–396.
- Michael, R. T., Gagnon, J. H., Laumann, E. O., & Kolata, G. (1994). *Sex in America: A definitive survey*. Boston: Little, Brown.
- Miller, G. A., Galanter, E. H., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Henry Holt & Co.
- Miller, G. A., Levin, D. N., Kozak, M. J., Cook, E. W. III, McLean, A., Jr., & Lang, P. J. (1987). Individual differences in imagery and the psychophysiology of emotion. *Cognition and Emotion*, 1, 367–90.
- Mischel, W. (1974). Processes in delay of gratification. In D. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 7, pp. 249–292).
- Mischel, W., Shoda, Y., & Rodriguez, M. L. (1992). Delay of gratification in children. In G. Loewenstein & J. Elster (Eds.), *Choice Over time*. New York: Russell Sage.
- Morley, S. (1993). Vivid memory for 'everyday' pains. *Pain*, 55, 55–62.
- Morris, D. B. (1991). *The culture of pain*. Berkeley: University of California Press.
- Nisbett, R. E., & Kanouse, D. E. (1968). *Obesity, hunger, and super-market shopping behavior*. Proceedings, American Psychological Association Annual Convention.
- Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, NJ: Prentice-Hall.
- Nisbett, R. E., & Wilson, D. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84, 231–59.
- Norvell, K. T., Gaston-Johansson, F., & Fridh, G. (1987). "Remembrance of labor pain: How valid are retrospective pain measurements?" *Pain*, 31, 77–86.
- Olds, J., & Milner, P. (1954). Positive reinforcement produced by electrical stimulation of septal area and other regions of rat brain. *Journal of Comparative and Physiological Psychology*, 47, 419–27.
- Oliver, R. L., Robertson, T. S., & Mitchell, D. J. (1993). Imaging and analyzing in response to new product advertising. *Journal of Advertising*, 22, 35–50.
- Osiatynski, W. (1992). *Choroba kontroli (The disease of control)*. Warszawa: Instytut Psychiatrii i Neurologii.
- Palm, R., Hodgson, M., Blanchard, D., & Lyons, D. (1990). *Earthquake insurance in California*. Boulder, CO: Westview Press.
- Pennington, N., & Hastie, R. (1988). Explanation-based decision making: effects of memory structure on judgment. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 14, 521–33.
- Pettit, P. (1991). Decision theory and folk psychology. In M. Bacharach & S. Hurley (Eds.), *Foundations of decision theory*. Oxford: Blackwell.
- Pickens, R., & Harris, W. C. (1968). "Self-administration of d-amphetamine by rats." *Psychopharmacologia*, 12, 158–163.
- Pluchik, R. (1984). A emotions: A general psychoevolutionary theory. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (Chapter 8, pp. 197–219). Hillsdale, NJ: Erlbaum.
- Prelec, D. (1991). Values and principles: Some limitations on traditional economic analysis. In A. Etzioni & P. Lawrence (Eds.), *Socio-economics: toward a new synthesis*. New York: M. E. Sharpe.
- Pribram, K. H. (1984). Emotion: A neurobehavioral analysis, In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (Chapter 1, pp. 13–38). Hillsdale, NJ: Erlbaum.
- Rachman, S., & Arntz, A. (1991). The overprediction and underprediction of pain. *Clinical Psychology Review*, 11, 339–55.
- Rofé, Y., & Algom, D. (1985). Accuracy of remembering postdelivery pain. *Perceptual and Motor Skills*, 60, 99–105.
- Ronis, D. L., Yates, J. F., & Kirscht, J. P. (1989). Attitudes, decisions, and habits as determinants of repeated behavior. In A. R. Pratkanis, S. J. Breckerler, & A. G. Greenwald (Eds.), *Attitude, structure and function*. Hillsdale, NJ: Erlbaum.
- Ross, M. (1989). Relation of implicit theories to the construction of personal histories. *Psychological Review*, 96, 341–57.
- Scarry, E. (1985). *The body in pain*. Oxford, England: Oxford Univ. Press.
- Schelling, T. (1984). Self-command in practice, in policy, and in a theory of rational choice. *American Economic Review*, 74, 1–11.
- Seeburger, F. F. (1993). *Addiction and responsibility. An inquiry into the addictive mind*. New York: Crossroads Press.
- Shiffrin, R. M., Dumais, S. T., & Schneider, W. (1981). Characteristics of automatism. In J. Long & A. Baddeley (Eds.), *Attention and performance* (Vol. IX, pp. 223–238). Hillsdale, NJ: Erlbaum.
- Siegel, S. (1979). The role of conditioning in drug tolerance and addiction.

- tion. In J. D. Keehn (Ed.), *Psychopathology in animals: Research and treatment implications*. New York: Academic Press.
- Simon, H. A. (1967). Motivational and emotional controls of cognition. *Psychological Review*, 74, 29–39.
- Smith, A. (1892/1759). *Theory of moral sentiments*. London: George Bell & Sons.
- Stewart, J., & Wise, R. A. (1992). Reinstatement of heroin self-administration habits: morphine prompts and naltrexone discourages renewed responding after extinction. *Psychopharmacology*, 108, 779–784.
- Strack, F., Schwarz, N., & Gschneidinger, E. (1985). Happiness and reminiscing: The role of time perspective, affect, and mode of thinking. *Journal of Personality and Social Psychology*, 49, 1460–1469.
- Strotz, R. H. (1956). Myopia and inconsistency in dynamic utility maximization. *Review of Economic Studies*, 23, 165–80.
- Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy*, 89, 392–406.
- Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5, 207–32.
- Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics*, 106, 1039–61.
- Tversky, A., & Shafir. (1992). Choice under conflict: The dynamics of deferred decision. *Psychological Science*, 13, 793–5.
- Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology Monograph*, 9, 1–28.
- Zajonc, R. B., & Markus, H. (1982). Affective and cognitive factors in preferences. *Journal of Consumer Research*, 9, 123–31.

Received: October 4, 1995