

## 16 Hedonic Adaptation

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*Hedonic adaptation refers to a reduction in the affective intensity of favorable and unfavorable circumstances. This chapter discusses the purposes, underlying mechanisms, and most common functional representations of hedonic adaptation. We then examine some of the methodological problems that hamper research in this area and review the literature on adaptation in four negative domains, (noise, imprisonment, bereavement, and disability) and four positive domains (foods, erotic images, increases in wealth, and improvements in appearance produced by cosmetic surgery). Following this review, we discuss several circumstances that promote or impede hedonic adaptation. We conclude by discussing the dark side of hedonic adaptation—the negative consequences for individuals and society.*

Those surgical operations in the field, the sickening butchery that shook even the toughest of the natives, had gradually deadened our sensibilities; we were no longer able to judge the horror of it all. . . . blood flowing and spurting, the unbearable smell from suppurating wounds—all this left us unmoved.

—Maurice Herzog, *Annapurna* (1952)

MOST OF US are familiar with striking examples of people who seem to be adapting well to circumstances that are extremely adverse. We may have seen footage of malnourished children playing happily in garbage dumps or know of severely handicapped people who maintain a cheerful disposition in spite of their disabilities. However, counterexamples come to mind as well: people who seem perpetually miserable, or those who were "never quite the same" after experiencing some devastating event. This chapter examines both the extent and limits of *hedonic adaptation*—processes that attenuate the long-term emotional or hedonic impact of favorable and unfavorable circumstances.

### HEDONIC ADAPTATION

Adaptation, in its broadest sense, refers to any action, process, or mechanism that reduces the ef-

fects (perceptual, physiological, attentional, motivational, hedonic, and so on) of a constant or repeated stimulus.<sup>1</sup> Adaptation can occur at several different levels—from overt behaviors that reduce exposure to a stimulus, to molecular changes at the cellular level that diminish the perceived or experienced intensity of an objective stimulus. For example, stepping from a dark building into sunshine induces a variety of behavioral and physiological responses to the increased light level—turning away from the sun, squinting, pupil contraction, photochemical changes in the retina, and neural changes in the areas of the brain that process the retinal signal. Counterparts to these processes occur when we step back into the building. Although there are limits to what these adaptive processes can achieve (as indicated by our need for welding helmets and night vision goggles), they do allow us to see normally over luminance intensities that vary by a factor of over one million.<sup>2</sup>

*Hedonic* adaptation is adaptation to stimuli that are affectively relevant. It relies on many of the same processes that underlie other types of adaptation and is often derivative of these processes. For example, hedonic adaptation to a foul odor is a direct consequence of sensory adaptation because an odor that is perceived as less intense will be experienced as less unpleasant. Similarly, hedonic adaptation to paraplegia may result in part from physiological adaptations, such as increases in upper body muscle mass, that enable paraplegics to manipulate their wheelchairs more effectively. However, many hedonic stimuli are cognitive rather than sensory. Thus, many of the processes involved in hedonic adaptation involve cognitive changes—in interests, values, goals, attention, or characterization of a situation. For example, the effects of diminished mobility accompanying paraplegia will be less important if one develops new interests that do not demand as much mobility, such as playing Scrabble instead of tennis.<sup>3</sup> Hedonic adaptation may also involve consciously directing one's attention away from troubling thoughts or engaging in activities likely to direct attention elsewhere,

such as playing sports or keeping busy at work. This strategy may diminish at least the "quantity" of saddening cognitions, if not their intensity, when they do intrude into consciousness. Hedonic adaptation may also be facilitated by cognitive transformations of situations—for example, by interpreting a tragedy as a "learning experience" (see, for example, Janoff-Bulman and Wortman 1977). Finally, neurochemical processes within the brain may work to oppose persistent intense negative or positive affect (Solomon and Corbit 1974) by desensitizing overstimulated hedonic circuitry. For example, continual high-level cocaine or amphetamine use may diminish the functioning of reward pathways in the brain (see, for example, Cassens et al. 1981; Wise and Munn 1995).

### *Functions of Hedonic Adaptation*

Adaptive processes serve two important functions. First, they *protect* organisms by reducing the internal impact of external stimuli. (For example, sweating causes evaporative cooling, which reduces or negates the increase in body temperature that would otherwise accompany an increase in ambient temperature.) Second, they *enhance perception* by heightening the signal value of changes from the baseline level.<sup>4</sup> The types of adaptive processes involved in visual perception illustrate this function. When we first walk indoors from the afternoon sun, we have difficulty seeing and would have difficulty judging which of two dark rooms is darker. After we have been inside for a while, however, the adaptive processes that have restored our vision have also restored our sensitivity to luminance changes at the new, lower light level—enabling us to detect, for example, a single lightbulb burning out in an auditorium lit by hundreds.

Hedonic adaptation may serve similar protective and perception-enhancing functions. Hedonic states (hunger, thirst, pain, sleepiness, sexual excitement, and so on) are necessary because they direct attention to high-priority needs and provide the motivation to engage in behaviors that satisfy those needs and to avoid behaviors that compromise them (Cabanac 1979; Damasio 1994; Pribram 1984, 2). However, persistent strong hedonic states (for example, fear or stress) can have destructive physiological concomitants, such as ulcers, circulatory disease, and viral infections (see Sapolsky, this volume). Thus, hedonic adaptation may help to protect us from these effects.

Hedonic adaptation may also increase our sensitivity to, and motivation to make, local changes in

our objective circumstances. To illustrate this second function of hedonic adaptation, consider a man who has been incarcerated. The prisoner's situation is illustrated in figures 16.1 and 16.2, which specify hedonic intensity in terms of a Prospect Theory value function (Kahneman and Tversky 1979), in which utility is determined by the difference between the prisoner's current state and the state to which he has adapted. Before he has adapted to his incarceration (see figure 16.1), he is miserable in his seven-foot cell. At this time, the difference in value between a seven-foot cell and a nine-foot cell seems insignificant, and he would have little motivation for acquiring the larger cell. However, after the prisoner has adapted (see figure 16.2), not only is he happier, but the difference in hedonic value between the small and large cells is much greater, and the prisoner would, correspondingly, be increasingly motivated to secure the larger cell.

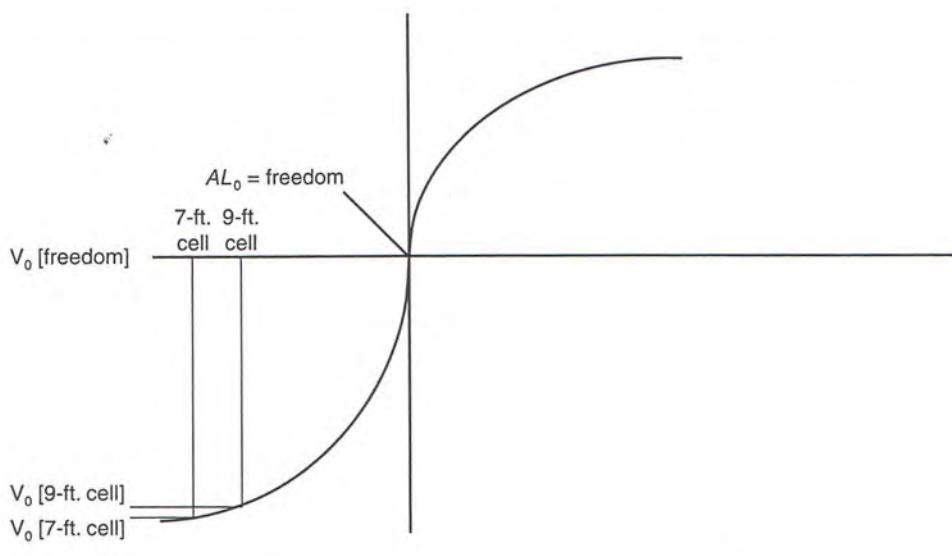
Because the persistence of an aversive state is an indication that it cannot be changed, hedonic adaptation may prevent the continued expenditure of energy in futile attempts to change the unchangeable and redirect motivation to changes that can be made. To paraphrase a famous aphorism, hedonic adaptation "provides the serenity to accept the things one cannot change, the courage to change the things one can, and the wisdom to know the difference."

### *Shifting Adaptation Levels Versus Desensitization*

Although we have used the term "adaptation" broadly to denote anything that reduces the subjective intensity of a given stimulus, it is important to distinguish between adaptive processes that diminish subjective intensity by altering the stimulus level that is experienced as neutral (*shifting adaptation levels*) and adaptive processes that diminish the subjective intensity of the stimulus generally (*desensitization*). Both processes diminish the subjective intensity of a given stimulus, but shifting adaptation levels preserve or enhance sensitivity to stimulus differences, whereas desensitization diminishes such sensitivity.

A shifting adaptation level is illustrated by the prisoner example as described earlier. The conditions initially experienced as intensely negative are later experienced as hedonically neutral ( $V_0$  [7-ft. cell] < 0, whereas  $V_t$  [7-ft. cell] = 0), and as the prisoner's hedonic state improves, he also becomes more sensitive to stimulus differences ( $|V_t$  (9-ft.

FIGURE 16.1 Prisoner's Situation Prior to Adapting to Incarceration



cell)  $- V_t(7\text{-ft. cell})] > [V_0(9\text{-ft. cell}) - V_0(7\text{-ft. cell})]$ . Desensitization, in contrast, involves a change in the shape, rather than the position, of the response function (see figure 16.3). Like a shifting adaptation level, the hedonic intensity de-

creases over time ( $V_0[7\text{-ft. cell}] < V_t[7\text{-ft. cell}]$ ), but unlike shifting adaptation levels, the prisoner's sensitivity to change also decreases ( $[V_t(7\text{-ft. cell}) - V_t(7\text{ft. cell})] < [V_0(9\text{-ft. cell}) - V_0(7\text{-ft. cell})]$ ). People who are hedonically desensitized—

FIGURE 16.2 Prisoner's Situation Following Adaptation to Incarceration

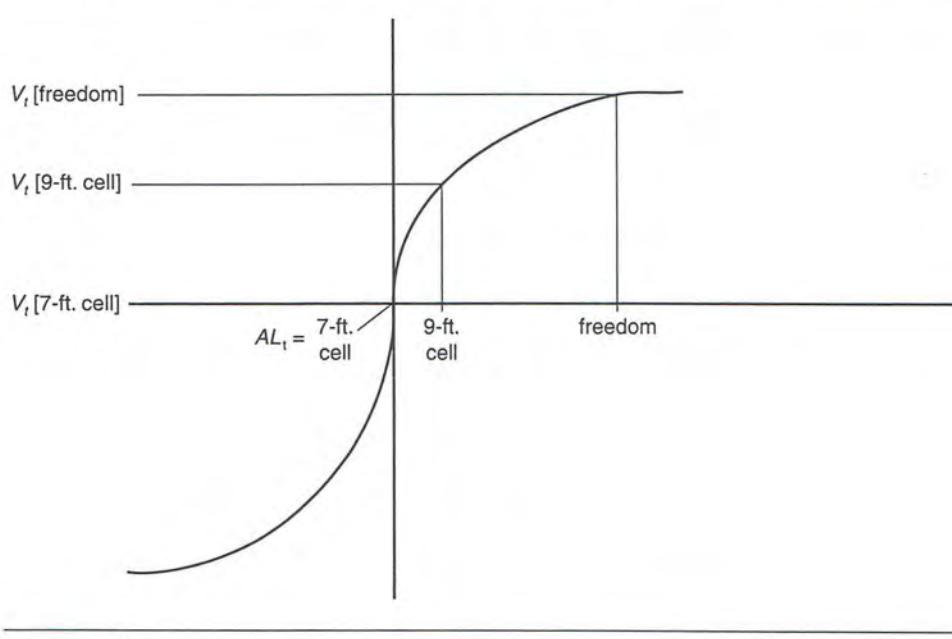
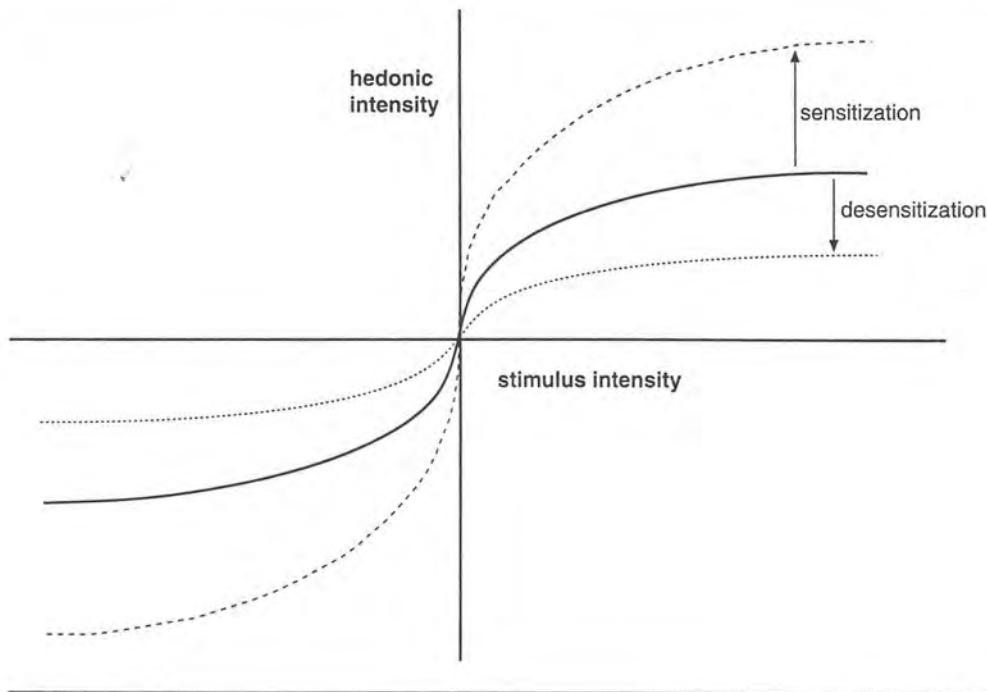


FIGURE 16.3 Sensitization and Desensitization



that is, “hardened,” “jaded,” “jaundiced”—are typically unmotivated to make any kind of change, whether local or global.<sup>5</sup>

#### Adaptation Versus Sensitization

Adaptation is not the only possible response to ongoing stimuli. Sometimes the hedonic intensity of a constant stimulus *increases* over time—a process called “sensitization” (Groves and Thompson 1973). The increasing irritation produced by exposure to a disliked roommate is a familiar example. Sensitization is rarely discussed in the literature but has been observed for some painful and other intense stimuli (Thompson et al. 1973). Sensitization to pleasurable stimuli might be illustrated by the alleged increasing pleasure from successive experiences with marijuana, or high-quality wine, food, and culture.<sup>6</sup> The “mere exposure effect” (Zajonc 1968) is another example of sensitization because it is an *increasing* hedonic response to repetition of stimuli that are initially hedonically neutral—such as pictures of male faces (Zajonc 1968) or Pakistani folk music (Heingartner and

Hall 1974).<sup>7</sup> One might also consider mood-dependent memory as a form of sensitization, because a depressed mood cues negative thoughts, which intensify the depressed mood, which, in turn, cues further negative thoughts, and so on (Bower 1981).

#### Modeling the Functional Form of Adaptation

Helson (1947, 1948, 1964) was one of the first to propose a quantitative model of adaptation. His model was an attempt to characterize formally the effect of past stimuli on the subjective experience of a current stimulus. He introduced the notion of an adaptation level (*AL*)—the level of a stimulus that elicits no response (or, in the context of *hedonic* adaptation, the level that is affectively neutral). Helson proposed that *AL* is the average of past stimulus levels ( $X$  = stimulus level, and  $t$  = time):<sup>8</sup>

$$AL_t = \frac{1}{t} \sum_{\tau=0}^t X_{\tau} \quad (16.1)$$

He further proposed that an individual's hedonic state ( $u$ ) at any time ( $t$ ) is a function of the difference between the current stimulus level,  $X_t$ , and  $AL$ :

$$u_t = f(X_t - AL_t), \quad (16.2)$$

where  $f(0) = 0$ , and  $f' \geq 0$ , as is true of the value function in figures 16.1, 16.2, and 16.3. Because  $AL$  gradually converges to the value of any constant stimulus level,  $X_t$ , the absolute difference between  $X_t$  and  $AL$  gradually diminishes over time, as does the absolute value of  $u_t$ , which is a function of this difference. Thus, Helson's model captures the essence of adaptation—that persistent bad things gradually become less aversive, and persistent good things gradually become progressively less pleasurable.

Helson's specific formulation has, however, been criticized on a number of grounds. Sarris (1967) demonstrated (in the context of judgments of the heaviness of hefted weights) that extreme stimulus levels do not influence  $AL$  as much as Helson's theory predicts. Parducci (1968) found that judgments are influenced by factors other than the mean stimulus level and proposed "range-frequency" theory as an alternative to Helson's theory. Range-frequency theory postulates that judgments of perceptual stimuli (lengths of lines, heaviness of weights) and hedonic stimuli (odors or rewards of money) are jointly determined by two separate contextual features—the position and the rank of a stimulus within the stimuli included in some judgmental context. Suppose, for example, that a traveling salesman earns \$0, \$95, \$100, \$100, and \$90, respectively, on each of his first five days of work. The range principle alone would cause \$90 to be evaluated favorably because \$90 exceeds the midpoint of the stimulus range (\$50). The frequency principle alone would cause \$90 to be experienced negatively because it ranks below the median stimuli (\$95). The aggregate judgment will depend on the relative importance of these two principles (see Parducci 1995).

Helson's and Parducci's models of adaptation share a common shortcoming—they do not explicitly account for the role of time. For example, although both theories imply that the judged quality of a dinner will be influenced by the quality of past dinners, they make no explicit distinction between the effects of a fancy dinner experienced last week and one enjoyed last year.<sup>9</sup> Intuitively, it seems far more likely that recent events will have a larger impact on one's  $AL$  than events that are more remote in time.

A formulation that does explicitly include the temporal component and has been widely used to model adaptive processes (See for example, Hardie, Johnson, and Fader 1993; March 1988; Ryder and Heal 1973) is:

$$AL_t = \alpha X_{t-1} + (1 - \alpha)AL_{t-1}, \quad (16.3)$$

with  $1 \geq 0$ . The  $\alpha$  parameter determines the speed of adaptation. If  $\alpha = 1$ , then the adaptation level is equal to the last period's stimulus level, so that the individual's hedonic state will depend solely on the difference in stimulus level between the last period and the current period. If  $\alpha = 0$ , then the adaptation level will not be influenced by past stimulus levels at all. Equation 16.3 can be rewritten as:

$$AL_t - AL_{t-1} = \alpha(X_{t-1} - AL_{t-1}), \quad (16.4)$$

which highlights the equation's implicit assumption that the change in the adaptation level from one time period to the next is proportional to the difference between the last period's stimulus level and the last period's adaptation level. By applying equation 16.3 recursively, it is also possible to show that the adaptation level at any point in time can be represented by a weighted average of past stimulus levels, with recently experienced stimuli receiving greater weight than those experienced in the more distant past.<sup>10</sup>

To illustrate some of the implications of this formulation, assume that  $f$  is the identity function, that  $\alpha = 0.5$ , and that  $X$  represents the objective level of some positive stimulus occurring on seven consecutive days (for example, number of encyclopedias sold, hours of sunshine, minutes of attention from one's spouse).

	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
X	3	5	12	4	5	5	5
AL	3 <sup>a</sup>	3	4	8	6	5.5	5.25
u	0	+2	+8	-4	-1	-0.5	-0.25

Notes: X = stimulus level; AL = adaptation level; u = hedonic state.

<sup>a</sup>For simplicity, we assume that the stimulus level had been constant at a level of 3 in the past.

This example illustrates two principal features of most models of hedonic adaptation: (1) the affective intensity and valence of a given stimulus level depend on past stimuli (note that Tuesday is a good day, and Friday is a bad day, though the objective circumstances are the same on both days); and (2) the affective intensity of a constant stimulus diminishes over time (note that the experi-

ence of receiving five units of  $X$  gets better [less bad] from Friday to Sunday).

Several authors have proposed modifications to the "weighted average" model of adaptation level formation. Some have argued, for example, that satisfaction with income depends not just on the absolute improvement over past levels but on the *rate* of improvement over time (Frank 1992; Hsee and Abelson 1991; Hsee, Abelson, and Salovey 1991; Loewenstein and Sicherman 1991). Strahilevitz and Loewenstein (1998) have proposed that hedonic adaptation to improvements is faster than hedonic adaptation to deteriorations, an asymmetry that implies a separate, larger  $\alpha$  parameter for gains than for losses.

It is difficult, however, to formally represent all of the factors that determine the influence of a stimulus on adaptation level. Certain extreme or memorable events may have a much greater influence on adaptation level than most variants of the models discussed here would predict. For example, the memory of a single romantic encounter with Mr. or Ms. Perfect may forever diminish the satisfaction of subsequent interactions with Mr. or Ms. Ordinary—even if that single encounter happened ten years ago and even if it has been succeeded by scores of lesser experiences. Parducci (1995) reports that the memoirs of Russian émigrés who lost their wealth fleeing the 1917 revolution suggest that they felt impoverished for the remainder of their lives because they continued to judge their later material circumstances against the wealth level they had enjoyed many years before, rather than against some average of their lifetime wealth (much less against a weighted average that emphasized the recent past). Conversely, even very recent events may not influence our reference points if they do not seem relevant to some judgmental context.<sup>11</sup> For example, a Christmas bonus probably does not reduce our satisfaction with our normal monthly salary in January, and resort owners are probably not disappointed by the usual marked drop in attendance following Labor Day. These complexities pose serious challenges to theories of adaptation that attempt to model the impact of past stimuli as a simple function of their magnitude and recency.

#### *Is an Average Stimulus Hedonically Neutral?*

According to a popular joke, sex is like pizza: when it is good, it is really good, and when it is bad, it is still pretty good. This captures an important point that models of adaptation often miss:

many experiences are inherently pleasant and do not require a positive comparison to make them so (see Kahneman, this volume). An encyclopedia salesman who likes his job can have a pleasant day in spite of average sales, just as an average pizza can taste good.

A simple way of modifying adaptation models to account for this obvious truth is to add a positive or negative constant ( $u_t = c + f[X_t - AL_t]$ ) to reflect the "inherent" goodness or badness of an experience—that is, the amount of pleasure or pain one receives from an "average" experience (when  $X_t = AL_t$ ). This would reflect the fact that certain experiences continue to be pleasurable even when the current level is at, or even below,  $AL$ . Experiences like pizza and sex that have a large intrinsic pleasantness component would require a large constant term, whereas a smaller constant would apply to experiences such as an exam score, where experience is evaluated primarily by comparative standards. This would capture the intuition that it takes a very bad pizza to make the experience unpleasant, but only a slightly lower grade than you are used to getting to spoil a grade that is good by other standards.<sup>12</sup>

#### *The Influence of Future Stimuli*

Although adaptation level is typically assumed to be a function of past stimuli, it may also depend on anticipation of future stimulus levels—a process called "feedforward." Feedforward was dramatically illustrated by Siegel and his colleagues (Siegel et al. 1982; Siegel, Krank, and Hinson 1988). Rats injected with gradually increasing doses of heroin came to tolerate dosages that would have been lethal to them at the outset of the study. However, the resistance to heroin was observed only when the injection was administered at a regular time in a regular location. The identical dose of heroin administered at an unexpected time or in a new location was often fatal. Apparently, the rats' adaptive response to the heroin was not triggered solely by ingestion of the drug, but also by cues that became associated with, and therefore predictive of, imminent heroin use. Feedforward processes have also been implicated as an important process underlying human drug addiction (for reviews of this literature, see Laibson 1997; Loewenstein 1996).

Feedforward seems to apply to hedonic phenomena as well. Van Praag and his colleagues (for example, van Praag 1977; van Praag and van der Sar 1988) found that the income people view as

"sufficient" depends, in part, on their expectations for the future.<sup>13</sup> There is also evidence that the final days of a prison sentence are often regarded as the most frustrating—suggesting that prisoners are "adapting" prematurely to the anticipated joys of freedom (Bukstel and Kilmann 1980, 482). Such adaptation may be responsible for the frequently noted anomaly that escape attempts are often made near the end of a prison sentence.<sup>14</sup> Feedforward processes may also help explain the paradoxical observation that revolutions tend to occur just after conditions begin to *improve*—the "revolution of rising expectations" (Gurr 1970). Initial improvements may produce expectations of future improvement and create frustration when the anticipated improvements do not occur or are not realized quickly enough.

#### *Multiple Reference Points*

The literature on sensory and perceptual adaptation has commonly assumed that the adaptation level in a particular domain can be characterized by a single summary number. As Helson (1947) comments, "For every excitation-response configuration, there is assumed a stimulus which represents the pooled effect of all the stimuli to which the organism may be said to be attuned or adapted" (2). The assumption of a single adaptation level may be reasonable for many types of adaptation. For example, the adaptation level of spiciness marking the boundary between too spicy and too bland may be accurately modeled by a single number representing the average spiciness of the foods one is used to consuming. In other contexts, however, the effect of past stimuli cannot be summarized so simply. Consider the case of an individual who earned \$20,000 annually for her first six years on the job, got a promotion that raised her salary to \$50,000, then was transferred two years later to a different department where she earned \$40,000. What is her adaptation level income? It is possible that she compares her current salary to a single adaptation level lying somewhere between \$20,000 and \$50,000. It seems more likely, however, that she has two different adaptation levels—one at \$20,000 and the other at \$50,000—that are invoked in different situations and both of which contribute to her satisfaction or dissatisfaction with her current salary.<sup>15</sup> Although the issue of multiple reference points has been raised (see, for example, Boles and Messick 1995; Kahneman 1992; Schweitzer 1995; Strahilevitz and Loewens-

tein 1998), their formation and relative weighting has not been investigated empirically.

#### MEASUREMENT ISSUES

A comprehensive treatment of the literature on hedonic adaptation is impossible without considering the many methodological problems that plague this line of research.

#### *Scale Norming*

The literature on perceptual adaptation has hosted a long-standing debate about whether adaptation is "real" or simply a matter of relabeling. Stevens (1958), for example, argues that some of the evidence Helson cites to support his adaptation level theory merely illustrates the judgmental relativity of labels and not "adaptation" in its conventional sense (see also Krantz and Campbell 1961). For example, when a given weight is called "very heavy" in the context of lighter weights and "very light" in the context of heavier weights, it seems more plausible that a different label is being given to the same (or a similar) perception than that the perception itself is changing.<sup>16</sup>

Similar issues plague research on hedonic adaptation because answers to questions about well-being inherently confound respondents' "true" happiness with their semantic conventions, reference groups, and other factors that influence their interpretation of the response scale on which well-being is reported. When asked for judgments of well-being (for example, "How happy are you on a scale from 0 to 100?"), respondents must usually decide for themselves what the endpoints of the response scale represent. Thus, one person may interpret 100 as the highest level of happiness they have thus far experienced, another may interpret it as the highest level of happiness they can imagine experiencing on earth, and a third might interpret it as a hypothetical state of ideal, heavenly bliss. Similarly, one person might interpret 0 as the absence of salient good feelings, while another may reserve that label to represent the most intolerable hell imaginable.

An obvious problem arises if factors that affect respondents' "true" happiness also affect their use of scales. Suppose, for example, that a sample of quadriplegics and control subjects both rate their happiness as 80 on a 100-point scale. This number may accurately represent the true happiness levels of the two groups. However, it may also overstate

the happiness of the quadriplegics if they implicitly rate their own happiness relative to that of other quadriplegics (who may be much less happy than the control group)<sup>17</sup> or elevate their current rating to reflect the contrast to their extreme despair immediately following the onset of their disability, or if they have adopted lower standards for the intensity of positive affect that warrants the rating 80. All of these forms of norming could lead researchers to overestimate the degree of adaptation to paralysis.

Some researchers (for example, Diener et al. 1985) have suggested that *frequency* measures of affect (the proportion of time an individual feels "good" or "bad") may be less susceptible to scale norming than *intensity* measures (how happy the individual is at a given time, or how happy he or she is overall). Evidence from some judgmental domains suggests that contextual effects do not influence the judged *valence* (positive versus negative) of a stimulus even if they do influence the absolute value of the judgment. In other words, contextual factors may make things more or less good or more or less bad, but they do not make bad experiences good or good experiences bad. (Changing the context of reference may turn a -7 into a -2 but will not turn a -2 into a +2.) Kicking someone's dog is not rated positively even if it is evaluated in the context of very severe crimes (Parducci 1968), and losing fifty dollars in a card game is not considered good even if you usually lose more (Marsh and Parducci 1978).

However, frequency measures have their own problems. First, valence does not capture everything one might want to know about affect. A person who experiences extreme highs and shallow lows clearly enjoys a higher quality of life than one who experiences the opposite, even if the two individuals spend identical proportions of time on the positive and negative sides of the hedonic ledger. Second, it is not obvious that even the valence of well-being judgments is immune to scale-norming effects. If you ask someone whether she is having a good day, she must still decide where to make the division between good and bad, and this choice may be affected by the distribution of recent experiences that set the context for that judgment. Thus, a "no" response from a newlywed might indicate a more positive level of affect than a "yes" response from a person receiving chemotherapy.

There have been occasional attempts to avoid the problems created by scale norming by supplementing verbal responses with physiological or behavioral measures that should be immune to such

effects. For example, Krupat (1974) found that prior exposure to threat not only lowered subjects' ratings of the "threateningness" of a given situation but also reduced their galvanic skin conductance (a physiological measure of experienced threat)—suggesting that the difference in ratings was not purely a semantic phenomenon. Dar, Ariely, and Frenk (1995) used both verbal and behavioral measures of pain in veterans who had suffered injuries of varying severities in the past: *pain threshold*—the length of time the subject could hold his index finger in hot (48 degrees Celsius) water before he classified the sensation as painful—and *pain tolerance*—the length of time before he pulled his finger out of the water. The authors found that veterans with more severe past injuries not only held their finger in longer before classifying the sensation as painful (10.1 seconds versus 4.7 seconds) but also held their finger in longer before terminating the experiment (58 seconds versus 27 seconds).<sup>18</sup> This is compelling, but not conclusive, evidence that the veterans with more severe prior injuries actually felt less pain. It is possible that the more severely injured veterans not only had different semantic standards for the intensity of sensation that warrants the label "pain" but also had different standards about how much pain they should be willing to endure.

Not all studies, however, have observed parallel results between physiological and self-report measures. For example, Paulus, McCain, and Cox (1973) reported a positive relation between prisoner density and palmar sweat (a physiological measure of stress), but not between density and subjective appraisals of crowding. Ostfeld and his colleagues (1987) found that prisoner density was correlated with blood pressure, but not with measures of anxiety, hostility, or depression. Zisook, Shuchter, and Lyons (1987) observed a dramatic decrease in tearfulness in the first year following the death of a spouse, but no significant decline in reported depression. Divergence between measures that are intended to measure the same construct may indicate the presence of measurement error or bias, or it could point to the existence of multiple independent dimensions of hedonic status.

#### Context and Demand Effects

Some judgments requested from subjects in adaptation studies are vulnerable to social-desirability effects. Adaptation may be overreported if subjects feel pressured to exaggerate how much they benefited from some intervention like a support group

(Conway and Ross 1984). Conversely, adaptation may be underreported if subjects fear appearing callous if they truthfully report substantial or complete emotional recovery from some negative event, such as the death of a spouse. Indeed, many psychiatrists have considered the lack of affective reaction to some negative event as a disorder. For example, Wortman and Silver (1989) cite an Institute of Medicine report by Osterweis, Solomon, and Green (1984) that stated: "The absence of grief phenomena following bereavement represents some form of personality pathology. . . . Professional help may be warranted for persons who show no evidence of having begun grieving" (18). They also cited an article by Siller (1969) that maintained: "[When] a newly disabled person does not seem to be particularly depressed, this should be a matter of concern. [The person] should be depressed because something relatively significant has happened, and not to respond as such is denial" (292).

Furthermore, apart from demand effects, simply asking respondents about a particular event may temporarily raise its prominence.<sup>19</sup> This problem is noted by Lehman, Wortman, and Williams (1987) in a paper about the long-term effects of losing a spouse or child in a motor vehicle crash: "The most serious threat to the validity of these findings concerns the possibility that respondents' distress scores were artificially inflated because . . . by contacting respondents and requesting an interview, we raised a series of troubling issues that are not normally on their minds" (228).

Asking about a troubling event may not only raise its prominence but actually induce negative affect, a possibility that raises ethical as well as methodological issues.

#### *Threats to Internal Validity*

Interpretation of study results from most empirical research on hedonic adaptation is nonexperimental, and, thus, subject to the problem of confounds. *Retrospective* studies (in which people are asked to report their current subject state and to recall past states) are problematic because recollections are notoriously inaccurate and may reflect the individual's implicit theories about change processes rather than a veridical recollection of prior hedonic states (Ross 1989).<sup>20</sup> *Cross-sectional* studies (which compare the affect of people who have been exposed to a particular stimulus with that of those who have not) suffer from the difficulty of matching the exposed and nonexposed

subgroups. For example, Janal and his colleagues (1994) found that habitual joggers displayed a higher pain threshold for cold than nonjogging control subjects. They noted, however, that this relative insensitivity could suggest either that jogging produces adaptation to pain or that people who are more tolerant of discomfort are likely to select jogging as their form of exercise.<sup>21</sup> *Longitudinal* studies (which compare the affect of people at different points in time) are confounded by the problem of *history* (other events that occur during the observed time period), *maturational* (effects that result from the aging of the observed population), and *regression* to the mean if study participants are selected based on an extreme value of some hedonic measure (such as being counseled for depression).

#### *Measurement Ambiguities Created by a Nonconstant Stimulus*

Adaptation is well defined only when a response diminishes or remains the same despite constant or increasing stimulus level; sensitization is well defined only when a response increases or stays the same despite a constant or decreasing stimulus level. It is difficult to determine whether adaptation or sensitization has occurred in situations in which both the stimulus and response levels move in the same direction. For example, suppose the amperage of an electric shock delivered to an experimental subject is increased over a series of trials, and the behavioral or subjective response measure also increases—the subject yells louder, jumps higher, or exhibits a greater elevation in blood pressure. It isn't clear whether this observation supports adaptation (the response increase was less than it would have been without adaptation), sensitization (the response increased more than would be expected from the stimulus increase), or neither (the response increase was commensurate with the stimulus increase). For another example, suppose that the concentration of some atmospheric pollutant doubles, and the subjective rating of air quality decreases from a 4 to a 3 (on a 5-point scale), or the average time spent outdoors decreased by twenty minutes. Would the changes in these dependent variables indicate adaptation or sensitization to the increased air pollution? (Of course, whether we choose to label the change in the dependent variable "adaptation" or "sensitization" may be less important than an evaluation of whether the effects are "big" or "small" relative to

our expectations, or relative to the effects wrought by other changes.)

### *Is It Possible to "Adapt to Depression"?*

A second source of conceptual ambiguity regarding hedonic adaptation is illustrated by a colleague's comment that people "can't adapt to depression," a speculation that struck us as strange, after some reflection. Because depression is itself a subjective state, it is difficult to interpret what adapting to depression could mean—that a person doesn't feel bad when he feels bad? The concept of adapting to pain also seems problematic, though less so. While it still seems unusual to say, "Although I'm still experiencing intense pain, I've completely adapted to it," the statement may make sense if one separates the experience of pain into *sensory* and *affective* components, as many pain researchers have done (Ahles, Blanchard, and Leventhal 1983; Fernandez and Turk 1992; Leventhal et al. 1979; Leventhal et al. 1989; Price, Harkins, and Baker 1987). For example, in a study by Price, Harkins, and Baker (1987), subjects experiencing pain separately rated its sensory and affective components using two visual analog scales whose endpoints were either "the *most intense sensation* imaginable" (the sensory component) or "the *most unpleasant feeling* imaginable" (the affective component). By considering the components of pain separately, one could interpret "adapting to pain" as a reduction in intensity of the affective component, despite a constant or increasing sensory component.<sup>22</sup>

## RESEARCH ON ADAPTATION IN SPECIFIC DOMAINS

We now turn to a review of the literature on hedonic adaptation to specific experiences and conditions, both undesirable (such as noise) and desirable (such as an increase in income). Our review is limited by the shortage of high-quality empirical studies.<sup>23</sup> We discuss only the small subset of domains where it seemed possible to draw at least tentative conclusions about the extent of hedonic adaptation.

### *Undesirable Experiences*

**Noise** Few studies have observed adaptation to noise, and some have even found sensitization (for a discussion, see Weinstein 1982). Weinstein (1978)

interviewed first-year college students about their reactions to dormitory noise in the first few weeks of the school year and again at the end of the year. Reported annoyance *increased* significantly. In a study on highway noise, Weinstein (1982) interviewed a panel of residents four months and sixteen months after the highway was opened. Reported irritation remained constant, and residents became *increasingly* pessimistic about their ability to adjust to the noise (the proportion who said they would *not* be able to adjust increased from 30 to 52 percent). Perhaps more tellingly, in two control groups interviewed only once, fewer than one-third of residents interviewed at  $t =$  four months spontaneously mentioned highway noise as something they disliked about the neighborhood, compared to over half of those interviewed at  $t =$  sixteen months. Jonsson and Sørensen (1973) had earlier found comparable results, in a similar study. Cohen and his colleagues (1980, 1981) found little evidence of adaptation to aircraft noise among Los Angeles schoolchildren. Children in noisy schools did more poorly on a cognitive task and had shorter attention spans and higher systolic and diastolic blood pressure than those from matched control schools. Neither longitudinal nor cross-sectional analyses suggested that the differences in these outcomes diminished over time, with the exception of systolic blood pressure, where the differences between noisy and quiet schools did decrease slightly.

**Incarceration** Although incarceration is *designed* to be unpleasant, most of the research on adjustment to prison life points to considerable adaptation following a difficult initial adjustment period.<sup>24</sup> In a study of British prisoners, Flanagan (1980) observed generally successful long-term adjustment (although prisoners reported that specific stressors, such as the loss of relationships with people outside the prison, became increasingly difficult to deal with as time passed). In a sample of inmates whose sentences varied from one month to ten years, Wormith (1984) observed significant improvement over time in deviance, attitude, and personality measures. Mackenzie and Goodstein (1985) recorded similar results. Zamble and Proporino (1990) and Zamble (1992) reported declining dysphoria, a reduction in stress-related problems such as sleep disturbances, and decreasing boredom over the course of prison sentences.

Even inmates placed in solitary confinement for long periods adapt to their circumstances. Deaton and his colleagues (1977) report that American

soldiers placed in solitary confinement during the Vietnam War (for up to six years) were highly successful in devising effective coping mechanisms. Suedfeld and his colleagues (1982) observed similarly successful adaptation to solitary confinement in civilian prisons. Indeed, some found it difficult to adjust to *release* from solitary confinement.

Although there appears to be considerable hedonic adaptation to imprisonment throughout most of the prison term, evidence suggests that prisoners find their incarceration less tolerable as they approach the end of their sentence—presumably because they begin to compare the circumstances of incarceration with the freedom they are beginning to anticipate (see section on *feedforward*). Bukstel and Kilmann (1980) reviewed thirty-one studies of adaptation to prison and concluded that the hedonic response to incarceration shows a curvilinear pattern over time, with long-term improvement in functioning followed by a short-term deterioration near the end of the sentence.

**Disability/Disease** Several studies have observed substantial adaptation to disability. The most famous is Brickman, Coates, and Janoff-Bulman's (1978) "Lottery Winners and Accident Victims: Is Happiness Relative?" Accident victims (those who had become paraplegic or quadriplegic as a result of an accident within the last year) rated their happiness as 2.96 on a 5-point scale (above the midpoint)—a result that is widely interpreted as evidence for remarkable adaptation to extreme misfortune.<sup>25</sup> Other researchers have come to similar conclusions. Schulz and Decker (1985) interviewed one hundred middle-aged and elderly paraplegics and quadriplegics and found that reported well-being levels were only slightly lower than population means of nondisabled people of similar age.<sup>26</sup> Wortman and Silver (1987) found that quadriplegics reported no greater frequency of negative affect than control respondents. In a review of several empirical studies, Tyc (1992) found "no difference in quality of life or psychiatric symptomatology" in young patients who had lost limbs to cancer compared with those who had not.<sup>27</sup> In a review of studies examining adaptation to burn injuries, Patterson and his colleagues (1993) reported similarly high levels of psychosocial adaptation by one year after the accident.

There is less evidence of adaptation to chronic or progressive diseases such as chronic rheumatoid arthritis (Smith and Wallston 1992), multiple sclerosis (Antonak and Livneh 1995), and other degenerative disorders (Livneh and Antonak 1994).

However, the progressive deterioration associated with these diseases makes it difficult to measure the degree of adaptation (see the section on *non-constant stimulus*). The progression of multiple sclerosis, for example, typically leads to increasing numbness, paralysis, spasticity, fatigue, vertigo, problems in bladder control, sexual dysfunction, difficulty in communication, cognitive deterioration, and visual impairments (Antonak and Livneh 1995). Thus, in contrast to paralysis victims, whose condition is likely to remain constant over time, sufferers of such debilitating diseases must cope not only with the disabilities resulting from the cumulative deterioration they have thus far suffered but with new impairments as their disease progresses. Even maintaining a constant hedonic state in the face of these deteriorating conditions would be impressive evidence of hedonic adaptation. Thus, the hedonic deterioration that is commonly observed does not provide evidence that adaptive processes are not occurring—only that they are not occurring fast enough to keep pace with the progression of the disease.

**Loss (Bereavement)** Studies of bereavement have generally found that those who lose a child or spouse experience intense and prolonged grief (Dyregrov 1990; Lehman et al. 1987; Sanders 1980; Weiss 1987), and that such dramatic effects are much rarer in those losing friends, colleagues, parents, or siblings who live in different households (Weiss 1988; Stroebe, Stroebe, and Hansson 1993). Kaprio, Koskenvuo, and Rita (1987) noted that in the week following the death of a spouse, suicide rates are elevated almost tenfold for women, and almost seventyfold for men. Wortman and her colleagues (1992) found that it took almost one decade before widows and widowers approached a control group's scores on life satisfaction, and nearly two decades before differences in depression were no longer significant.

While intense and prolonged grief is common, it is not universal. Wortman and Silver (1989, 1990) review evidence suggesting that a substantial minority of individuals do not experience extreme grief at all. For example, Wortman and Silver (1987) found that about 30 percent of parents who had lost a child to sudden infant death syndrome (SIDS) showed no significant depression at any time following the infant's death. In the same article, these authors contest the widely held belief that the absence of grief shortly after a death is a sign of repression or denial. They found, instead, that the absence of grief shortly after the loss is a

positive indicator of long-term well-being, and that "delayed grief" is, in fact, fairly uncommon.

Similarly, there is little evidence supporting the widespread belief that recovery from (adaptation to) bereavement proceeds in "stages." Considerable variability is observed with respect to the types of emotions that are experienced, their sequence, and their intensity at various times (Silver and Wortman 1980; Wortman et al. 1993). While there are clearly large individual differences in styles of coping with bereavement, some of the variability observed among people may be due to the situational aspects of the loss. For example, grief seems to be particularly long-lasting if the loss is unexpected (Lehman et al. 1987; Wortman and Silver 1987). We return to this issue when we discuss forewarning as a moderator of adaptation.

### Desirable Experiences

Just as adaptive processes reduce the impact of negative changes, they may also diminish the pleasure of positive events or improving circumstances. In this section, we review evidence of adaptation (or lack of adaptation) to two favorable changes, increases in wealth and improved appearance following cosmetic surgery, and to the repetition of hedonically positive stimuli—erotic images and foods.

**Increases in Income** Few studies have examined the relation between wealth levels and happiness within individuals across time. However, hedonic adaptation is suggested by the following findings. First, Brickman, Coates, and Janoff-Bulman (1978) studied twenty-two state lottery winners who had won between \$50,000 and \$1,000,000 within the previous year. These lottery winners reported only slightly higher levels of life satisfaction than a control group (4.0 versus 3.8 on a 5-point scale).<sup>28</sup> Second, at least within the United States, there is only a small positive correlation between wealth and reported happiness. Diener and his colleagues (1993) estimated the correlation at 0.12. Third, several studies have observed no change in well-being in a country as its real income increases over time (Campbell 1981; Duncan 1975; Easterlin 1974, 1995). For example, between 1958 and 1987, real per capita income in Japan rose fivefold, while subjective judgments of happiness did not increase (Easterlin 1995). Fourth, though moderately strong correlations between wealth and well-being have been found between countries (Veenhoven 1991; Diener et al. 1993; Diener, Diener,

and Diener 1995), wealth per se does not appear to be driving the correlation. For example, Diener, Diener, and Diener (1995) conducted a massive cross-sectional study of reported well-being in one hundred thousand people from fifty-five different countries whose per capita income ranged from \$120 (Tanzania) to \$32,790 (Switzerland). Although measures of per capita wealth and average reported well-being were highly correlated (0.58), controlling for human rights eliminated the correlation. Fifth, Clark (1996) presents evidence from British data that job satisfaction is strongly related to *changes* in a worker's pay, but not to *levels* of pay.

Scitovsky (1976) has even suggested that wealth may undermine happiness. He argues that pleasure results from incomplete and intermittent satisfaction of desires, and that the continuous comforts made possible by substantial wealth may remove the conditions necessary for this experience. While consistent with the popular conception of the "poor little rich girl," this speculation is inconsistent with the positive, albeit small, correlation between wealth and happiness that is observed in cross-sectional empirical studies.

**Cosmetic Surgery** The small number of longitudinal studies of people who have received cosmetic surgery have generally not observed adaptation to increased attractiveness. The vast majority of patients report satisfaction with the results of cosmetic operations (Wengle 1986),<sup>29</sup> which does not appear to decrease over time. In a study of nine hundred cosmetic and plastic surgery patients, Reich (1982) found that satisfaction increased from 70 percent at three months after the operation to 85 percent four years later. Young, Nemecek, and Nemecek (1994) found that reported satisfaction remained constant. Beale and his colleagues (1985) did, however, observe a slight decrease.<sup>30</sup>

In addition to satisfaction with the surgery itself, several studies have indicated an overall improvement in psychological health or life satisfaction as a whole. Ohlsen, Ponten, and Hamburt (1978) noted that twenty-five of seventy-one women in their study were receiving psychiatric treatment prior to a breast augmentation procedure, whereas only three continued to do so after the operation. Klassen and his colleagues (1996) also found substantial reductions in psychiatric symptomatology among people receiving plastic surgery. Cole and his colleagues (1994) reported that 73 percent of their patients re-

ported a higher quality of life after cosmetic surgery, compared to only 6 percent who reported a lower quality of life. The largest gains were for cosmetic breast surgery (both reductions and enlargements), with slightly smaller gains for abdominoplasty (tummy tucks) and only slight gains for rhinoplasty (nose jobs). All of these studies should be treated with caution, however, because of the likelihood of strong demand effects in reporting satisfaction with cosmetic surgery.<sup>31</sup>

**Sexually Arousing Stimuli** The evidence regarding adaptation to sexually arousing stimuli is mixed. O'Donohue and Geer (1985) and Koukounas and Over (1993) found that male sexual arousal (as measured by penile tumescence and subjective report) diminished with repeated presentation of erotic slides. Meuwissen and Over (1990) found similar results for female sexual arousal to fantasy and sexual films. However, Smith and Over (1987) found no decline in physiological or subjective arousal for male subjects who were instructed to imagine the same sexual fantasy in eighteen repeated trials, and Laan and Everaerd (1995) found no evidence of reduction in genital arousal for females repeatedly presented with erotic slides—in fact, arousal increased somewhat over the ten trials despite returning to baseline levels during inter-stimulus intervals.<sup>32</sup>

**Foods** Most adults enjoy every day at least one substance they once found aversive, such as coffee, beer, tobacco, chili peppers, and other strong spices (Rozin and Schiller 1980). Thus, for some foods, repeated exposure not only reduces initial subjective unpleasantness (adaptation) but later continues to increase subjective pleasantness (sensitization). Torrence (1958) found that previous consumption of pemmican (dried meat) by military aircrewmen led to increased liking when it was later eaten during a survival exercise, even among the minority who initially found the taste pleasant. Stevenson and Yeomans (1995) found that the hedonic quality of the burning sensation of capsaicin (the hot compound in chili peppers) was enhanced by repeated exposure. Crandall (1984) gave the employees of a remote Alaskan fish cannery access to cake doughnuts not normally available in their diet on thirteen occasions during a twenty-nine-day period. He found a significant rise in consumption of doughnuts over time, which suggests increased liking. Repeated exposure has also been found to increase liking for unfamiliar tropical fruit

juices (Pliner 1982), novel fruits and cheeses (Birch and Marlin 1982), low-salt foods (Beauchamp, Bertino, and Engelman 1983), and plain yogurt (Kahneman and Snell 1990).

The hedonic effects of repeated consumption may, of course, depend on the interval between consumption events—one may like kiwi fruit more and more every year, but not enjoy the fifth kiwi fruit consumed at dinner as much as the first. There has been little research on the duration of “sensory-specific satiety” (Rolls et al. 1981) for different types of foods. Thus, conclusions about the temporal dynamics of affect may depend on the length of the interval between successive consumptions. For example, Kahneman and Snell (1990) found that people who consumed a small serving of their chosen flavor of ice cream over eight consecutive days liked it less over time. Perhaps an opposite effect would be found if the servings were consumed over eight consecutive weeks.<sup>33</sup>

#### *Explaining Domain-Specific Differences in Hedonic Adaptation*

What distinguishes the things people can and cannot adapt to hedonically? Why can people adapt to prison but not to noise? Why are the pleasures of increased income fleeting, while the pleasures of foods and erotic stimuli are sustained despite repeated exposure? Part of the answer may lie in evolutionary pressures. We should not expect much adaptation to stimuli that are necessary for continued survival and reproduction (for example, food and sex), nor to stimuli that strongly compromise survival (for example, harmful chemicals, very hot or cold temperatures).<sup>34</sup>

Beyond this broad generalization, we may look for specific features of situations and stimuli that can help to explain differences in the degree of hedonic adaptation across different domains. For example, the failure to adapt to highway noise may reflect its high temporal variability. Perhaps people could adapt to a constant loud drone, but not to occasional random bursts of noise from motorcycles with sawed-off mufflers. In the following section, we discuss some of the moderators of adaptation.

#### MODERATORS OF ADAPTATION

##### *Social Support*

Social contact with other people who have had similar experiences is generally found to facilitate

hedonic adaptation. In their study of bereavement over the death of a spouse or child, Wortman and Lehman (1985) found that contact with a similar other was frequently mentioned as the most helpful factor in assuaging grief, and it was never mentioned as unhelpful. Mullan (1992) found similar results. Regarding adaptation to limb loss, Parkes (1972) argues: "It is only when [handicapped persons] meets someone more seriously mutilated than [themselves] who appears to be coping well and cheerfully with his disability that it becomes possible for [them] to look to the future in an optimistic and realistic manner."<sup>35</sup>

People who have not had similar experiences, however, often give inadequate or inappropriate support. For example, Walker, MacBride, and Vachon (1977) concluded that even intimate friends of widows did not support their need to mourn for more than a few days after the death, and Shuchter and Zisook (1993) cite the intolerance of family members to the bereaved one's continuing grief as a major impediment to successful coping with bereavement. Maddison and Walker (1967) reported that bereaved widows were often encouraged by friends to begin thinking about remarriage within a few weeks of the husband's death. Similarly, Hughes, Good, and Candell (1993) found that the psychological adjustment of recent divorcees was impeded when friends continually offered advice. Afflictions and disabilities with no obvious manifestations (such as chronic fatigue syndrome) pose special problems as well, because sufferers are likely to face performance expectations that exceed their abilities (see Tyc 1992).

#### Advance Notice

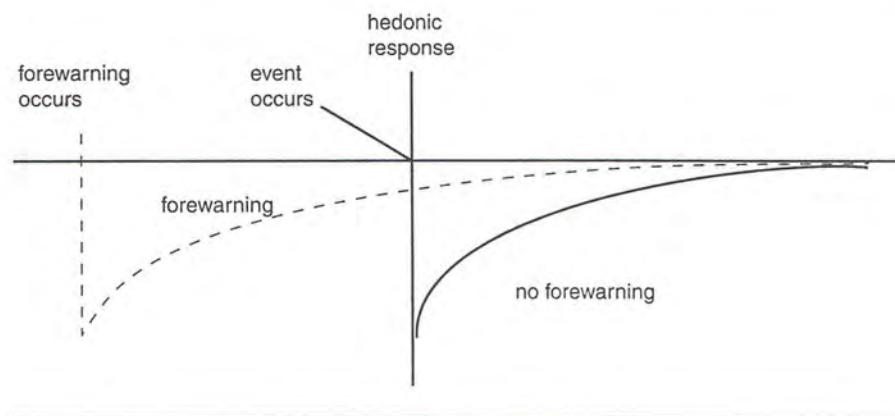
Studies on forewarning of and anticipatory grief over a loved one's death generally indicate that it improves affect and functioning after bereavement (though for a more equivocal interpretation of the evidence, see Stroebe and Stroebe 1987; and Hill, Thompson, and Gallagher 1988). In a review of the literature on the effects of forewarning on coping with the death of a husband, O'Bryant (1991) concluded: "No investigation of conjugal bereavement . . . has found that adjustment to widowhood was poorer when the spouse had been forewarned" (229). In a study of the bereavement of people who had cared for spouses or parents with progressive dementia, Mullan (1992) states: "The progressive decline of the impaired family member . . . affords ample opportunity to prepare psychologically for the death"; moreover, "many of these

caregivers reported that they had already experienced the loss of the person for whom they were caring, and the greater the sense of loss during caregiving, the lower the depression during bereavement" (681). Parkes and Weiss (1983) found that those who had "short forewarning" (less than two weeks' notice) that their spouse was going to die seemed less able to put the death behind them than those who had had a longer warning period, and a large body of evidence reviewed by Lehman, Wortman, and Williams (1987) is also consistent with the conclusion that preadaptation occurs, or that the anticipation of loss accelerates the adaptation process.<sup>36</sup>

However, the benefits of advance notice of a negative outcome must be balanced against the aversiveness of waiting for that outcome to take place. Even if advance notice does improve post-outcome well-being, its *overall* effect on well-being is ambiguous since receipt of the bad news may diminish the well-being of the person between the time the notice is received and the time the event actually occurs. Thus, the improved post-outcome adaptation doesn't necessarily compensate for the earlier onset of misery associated with advance warning. In some cases, however, the net effect seems clear. For example, in the study by Parkes and Weiss (1983), the tremendous reduction in long-term suffering associated with advance notice of widowhood would seem to more than compensate for the reduction in affect from receiving the bad news somewhat sooner.

When forewarning does improve post-loss well-being, how does it do it? Does it produce a type of *preadaptation*, or accelerate the process of post-loss adaptation? In principle, these processes could be discriminated by a longitudinal study of people who suffered a loss either with or without prewarning.<sup>37</sup> If forewarning advances the time course of adaptation (that is, if there is preadaptation), as illustrated by figure 16.4, the immediate post-loss state would be more favorable among those who had forewarning. If forewarning accelerates the process of adaptation, however, as depicted in figure 16.5, then hedonic ratings would be similar immediately after the event but would improve more quickly.

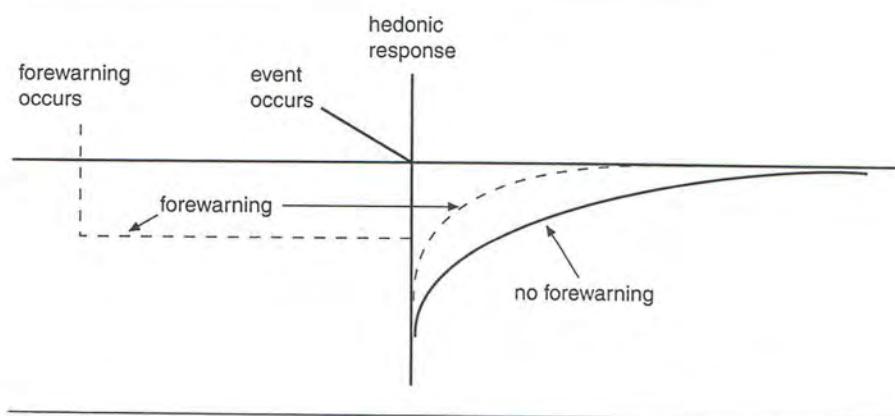
Curiously, advance warning seems to predict worse outcomes in other domains. Lazarus (1968) reviews evidence suggesting that subjects who were given a longer advance warning that they would watch a gruesome film clip (about genital subincision or wood-shop accidents) displayed more stress during the film (as measured by skin conductance) than subjects who received no such

FIGURE 16.4 Hedonic Impact of Forewarning If It *Advances the Start of Adaptation*

advance warning. He concludes: "Very clearly, when the anticipatory times involved are relatively brief, a longer period of anticipation results in a more marked stress reaction" (236). Breznitz (1967) made a similar observation, which he called the "incubation of threat." Subjects were told they would receive a severe electric shock after either three, six, or twelve minutes. Those facing a longer time interval had faster heart rates immediately preceding the shock.

Sapolsky (this volume) reports evidence from animal research suggesting that the effect of advance warning may depend on the interval prior to the aversive event. If two groups of rats are exposed to a random pattern of electric shock, but

one is shown a warning light that flashes ten seconds before the shock, the rats receiving the warning exhibit lower stress and lower incidence of stress-related disease than the rats who receive no such warning. However, flashing the warning signal a half-hour before the shock produces the opposite pattern—the warned rat displays greater amounts of stress and stress-related disease than the non-warned rats. These results make intuitive sense if one assumes that forewarning decreases the aversiveness of the event itself but increases the stressfulness of the waiting period. Thus, the hedonically optimal forewarning period may be one that is long enough to allow for the mobilization of defenses, but no longer.

FIGURE 16.5 Hedonic Impact of Forewarning If It *Accelerates the Rate of Adaptation*

### Uncertainty

Although folk wisdom often stresses the importance of maintaining hope in the face of some likely negative outcome, many researchers have suggested that successful adaptation to an adverse outcome is actually *impeded* by the possibility of relief. Herrmann and Wortman (1985), for example, draw a sharp distinction between stressors that "confront victims with a life situation that is fundamentally altered" (168), such as the loss of their spouse or permanent paralysis, and more ambiguous situations, such as that of a couple who continue to fail to conceive a child for some unknown reason and who must continually decide between abandoning their hope to conceive a child and intensifying their efforts at conception—perhaps by seeking out new medical specialists or procedures. The authors suggest that the latter type of situation poses special difficulties for adaptation.

Successful hedonic adaptation may require a person to "take a hit"—to recognize, admit, and confront some loss. Even a small possibility that such actions will later prove to be premature or unnecessary may prevent people from undertaking them. Consistent with this argument, it is commonly reported that concrete proof of a missing person's death (such as physical remains) has a large, long-term, positive impact on the coping of family members, and that, likewise, adaptation is poor for relatives of people who die without leaving concrete evidence of their demise—such as soldiers missing in action, the people who "disappeared" from their homes during the dictatorships in Argentina and Chile, or the victims of "ethnic cleansing" in Bosnia.<sup>38</sup>

The notion that someone who is 100 percent sure that something bad has happened is better off than someone who is 95 percent sure may seem counterintuitive. However, a small remaining hope may impede the onset of adaptive processes that could eventually return one to normal hedonic levels. Indeed, there is substantial evidence suggesting such a pattern. Moulton and his colleagues (1991) examined the impact of HIV testing in a sample of homosexual men and found that those testing positive showed less hopelessness and distress than did a cohort of non-notified controls (who agreed to be tested but did not wish to be notified). A similar pattern has been observed in studies examining the impact of notification of Huntington's disease test results (Brandt et al.

1989; Wiggins et al. 1992). Those receiving adverse test results eventually had better hedonic outcomes than those who were not tested or those who received an uninformative test result. Sapolsky (this volume) reports that "During the blitz of London, there was more of an increase in ulcer rates in the suburbs, which were bombed only intermittently, than in the city center, which was bombed like clockwork each night." Schelling (1984) reports that addicts suffer less withdrawal pain when there is absolutely no possibility of obtaining the drug.

Adaptation to imprisonment provides further anecdotal evidence for the conjecture that uncertainty impedes hedonic adaptation. Sapsford (1978) claims that uncertainty about the length of their sentence is a source of misery for prisoners with a life sentence but also a chance of parole. Scitovsky (1976) cites Farber (1944) to the effect that "prisoners who had hopes of parole suffered much more than those who knew they would never be released" (57). Roberts and Jackson (1991) cite the case of a man released from prison after serving thirty-seven years under an indeterminate sentence on the grounds that his continued imprisonment under these circumstances constituted cruel and unusual punishment. The stress of uncertainty may be particularly acute for inmates on death row who cling to the small possibility of reprieve. Thus, successful adaptation to death row may, paradoxically, involve giving up hope (Gallemore and Panton 1972, 170).<sup>39</sup>

### Reminders, Distractions, and Intrusive Thoughts

Shuchter and Zisook (1993) comment that the bereaved find themselves trapped in a world of continuous threats because of the triggers that cue painful thoughts and memories. For example, among parents who have recently lost an infant, the mere sight of other babies often stimulates intense grieving (Cornwell, Nurcombe, and Stevens 1977). The powerful influences of reminders raises two issues for hedonic adaptation. First, does successful adaptation involve avoiding painful cues, or confronting them, or some of each (for example, by deliberately confronting grief-inducing cues in a supportive setting but otherwise avoiding them)? Second, if cues cannot easily be avoided (as in the case of marital sex triggering memories of prior incest or rape), how can the emotional consequences be minimized?

### *Attributions*

Attribution theory predicts that (1) people will attempt to assign responsibility for adverse events, and (2) those who hold themselves responsible will feel worse than those who do not (see, for example, Weiner 1982). The evidence we reviewed on both of these points, however, was mixed. Taylor (1983) found that 95 percent of a sample of women diagnosed with breast cancer did try to make some attribution for its occurrence, such as stress, taking birth control pills, living near a chemical dump, hereditary factors, or diet. However, Downey, Silver, and Wortman (1990) found that nearly half of the mothers in their study who lost their babies to SIDS were unconcerned about assigning responsibility. Similarly, studies have found that less than half of all victims of accidents that led to severe burns (Kiecolt-Glaser and Williams 1987) or physical disabilities (Silver 1982) said they ever asked themselves, "Why me?"

Regarding the second point, Wortman (1976), Janoff-Bulman (1979), and Tennen and Affleck (1990) have all argued that external attributions do not always facilitate coping. Janoff-Bulman and Wortman (1977) found that victims of severe accidents who blamed themselves for the accident were coping more successfully eight to twelve months afterward than those who did not, and that victims who blamed other *people* (as opposed to some nonspecific external cause) displayed especially low coping scores. The authors postulate that self-blame may help to maintain a sense of personal control. However, Sapolksy (this volume) comments on the negative effects of rigidly maintaining an internal locus of control: "It is beneficial for individuals to interpret themselves as being in control only if they live in relatively benign environments. . . . Such an attitude may be considered pathological when it occurs in poor people with limited opportunities. . . . In such a setting, an internal locus of control, where one habitually decides that those insurmountable odds could have been surmounted if only they had worked harder, is highly maladaptive."<sup>40</sup>

### *Perception of "Silver Linings"*

The desire to explain an event is closely related to the desire to find "meaning" in an experience or to identify some positive consequence of it (a "sil-

ver lining"). In a study of seventy-eight women with breast cancer, Taylor (1983) found that over half reported that the cancer experience had caused them to reappraise their lives in a favorable way. Similarly, ten of the twenty-nine accident victims in Janoff-Bulman and Wortman's (1977) study believed that God had intentionally (and benevolently!) selected them for victimization. However, in a study of people paralyzed in auto accidents, Lehman, Wortman, and Williams (1987) report that three-fourths of their subjects were unable to find any meaning in their loss.

From his experience in Auschwitz, Frankl (1963) concluded that the ability to find meaning and purpose in their suffering was essential for the survival of concentration camp prisoners. Less anecdotally, Taylor (1983) found that women who found positive meaning in their breast cancer exhibited "significantly better psychological adjustment" (1163). Affleck and his colleagues (1987) found that men who perceived benefits from a heart attack were less likely to have a subsequent attack and exhibited lower morbidity eight years later. Of course, the causal direction between meaning-making and adaptation may run in either or both directions. It is also possible that adaptation and meaning-making are spuriously correlated through their common relation to a third factor, such as innate happiness, which causes people to both adjust successfully to their new condition and find meaning in it.

### *Counterfactuals*

Counterfactuals—mental representations of things that were not actually experienced—can sometimes influence the evaluation of (or adaptation to) a situation in the same way that actual experiences do. Thus, salient positive counterfactuals ("Things could have turned out so much better") should increase one's reference point and reduce well-being, and salient negative counterfactuals ("There but for the grace of God go I") should reduce one's reference point and improve well-being. Deliberate attempts to enhance affect by generating negative counterfactuals are not typically very effective, however. We cannot usually make ourselves happy by simply imagining more unfortunate individuals or more unpleasant situations. To influence our hedonic state, counterfactuals must be *plausible*, not just *possible*, alternatives to reality (see Kahneman and Miller 1986).<sup>41</sup>

## CONCLUSIONS

### *Limits of Adaptation*

The literature on adaptation has led some to the view that long-run happiness and life satisfaction do not depend much on one's objective circumstances (Lykken and Telligen 1996). However, anyone who has experienced extended periods of happiness in certain environments and unhappiness in others should be skeptical of this extreme conclusion. There are other reasons for skepticism as well. First, as our review suggests, adaptation is not observed in all domains, and there may even be some domains where *sensitization* is the rule. Both of us can think of ongoing features of our environments, such as a good or bad roommate, that were *increasing* sources of either pleasure or pain. Second, as argued earlier, some of the results indicating dramatic adaptation may be partly due to scale norming. Third, satisfaction with a particular outcome or outcome level is often influenced by social norms, social comparisons, and other salient referents that do not necessarily converge to our average experience. For example, if a person aspires to earn as much as his neighbor, the difference between his income and his aspiration level income may increase over time. Conversely, a prosperous individual who grew up in poverty may remain perpetually delighted with her luxurious lifestyle if her memory of her early days remains salient throughout her life. Fourth, and most obviously, some things are just inherently good or bad—they occupy only one side of a natural and immutable “zero point” (see Kahneman, this volume).

### *Costs of Adaptation*

Although hedonic adaptation confers enormous benefits by reducing the subjective effects of adverse conditions, it has associated costs as well. The most obvious cost of hedonic adaptation is that it occurs for goods as well as bads, creating what Brickman and Campbell (1971) have called the “hedonic treadmill”—the tendency for transitory satisfactions to eventually give way to indifference or even dissatisfaction. Scitovsky (1976) comments that “the attainment of a goal seems, when the moment of triumph is over, almost like a let-down” (62). Adaptation to pleasurable experiences may also be responsible for destructive

addictions, which are due in part to the decreasing pleasure from a given level of a good or activity and in part to the displeasure (craving) when consumption of the good or activity ceases (see, for example, Koob et al. 1989; Loewenstein 1996).

Second, the low sensitivity to differences in stimulus levels far from the adaptation level and the high sensitivity to differences near the adaptation level (see figures 16.1 and 16.2) may degrade the quality of decision-making, considering the experienced value of the relevant outcomes. For example, from the vantage point of a \$10,000-a-year graduate fellowship, the difference between a \$60,000 or \$65,000 starting salary may seem inconsequential and not even worth asking about, much less bargaining over. Yet just a few years later, when the student is a faculty member earning \$60,000, she may be willing to pack up, move, and sever friendships to earn \$5,000 more somewhere else.

Third, adaptation may erode our aesthetic standards. Dubos (1965) comments on adaptation to urban life:

This very adaptability enables [us] to become adjusted to conditions and habits which will eventually destroy the values most characteristic of human life. Millions . . . are so well adjusted to the urban and industrial environment that they no longer mind the stench of automobile exhaust, or the ugliness generated by the urban sprawl; they regard it as normal to be trapped in automobile traffic; to spend much of a sunny afternoon on concrete highways among the dreariness of anonymous and amorphous streams of motor cars. (278–79)

Fourth, adaptation may work against moral values. In his book *Nazi Doctors*, Robert J. Lifton (1990) describes a process whereby German doctors (who had taken the Hippocratic oath to do no harm) were gradually transformed into active killers. Doctors were first asked to be present when euthanasia took place, then to add their signature to a document, then to supervise a mercy killing, and so on, until they actually administered the lethal injections to “eugenically undesirable” persons. The famous Milgram experiment provides another example. Subjects were not asked to administer a potentially lethal shock immediately but were given a series of requests to increase the voltage slightly. Having just administered a one-hundred-volt shock to someone, it may be difficult to justify stopping at that particular level rather

than complying with the experimenter's request to increase the voltage to 105.

Fifth, adaptation may reduce our empathy toward others in different situations. People indignantly wonder: How can Donald Trump be so rapacious when he already has so many millions? Why is that academic, already so renowned, greedy for still more recognition and so reluctant to acknowledge the contributions of collaborators? How could a few misplaced items provoke such an impassioned response from our spouse when the apartment seems so immaculate by our former standards? All of these examples suggest the difficulty of empathizing with the motivations and behaviors of others who have adapted to situations different from our own.

Sixth, just as adaptation causes us to fail to understand the behavior of others, it may cause us to mispredict our own emotions or behavior under different future circumstances. For example, untenured academics overestimate how happy they will be if they get tenure or how unhappy they will be if they fail to get tenure (Gilbert et al. 1997). People also typically underestimate how attached they will become to objects that are not currently in their possession (Loewenstein and Adler 1995). Errors in predicting one's own feelings and behavior are the focus of Loewenstein and Schkade's chapter (this volume).

#### *Final Comments*

Existing research permits few general conclusions about hedonic adaptation. We have made an attempt to summarize results that recur in the small subset of rigorous studies and to at least broach some of the issues that remain unresolved. Clearly, more research is required in specific domains and on specific moderators of hedonic adaptation. However, perhaps the single most pressing need is for richer and more diverse measures of hedonic states. Along with subjective self-reports of sensation or affect, researchers should make greater use of alternative hedonic indicators, including: global measures of functioning, such as employment status, frequency of hospital visits, and quantity of psychiatric help sought; behavioral measures, such as tearfulness or facial expressions (see, for example, Husted Medvec, Madey, and Gilovich 1995), gross physiological correlates such as blood pressure; specific neurological correlates such as the relative activation between brain regions (for example, negative affect seems to be associated with activation of the right frontal hemisphere, whereas

positive affect seems to be associated with activation of the left frontal hemisphere—see Ito and Cacioppo, this volume); and performance in affect-mediated memory and decision-making tasks (see, for example, Arkes, Herren, and Isen 1988).<sup>42</sup>

Assuming that future research provides a deeper understanding of hedonic adaptation, is it likely that such information would cause people to conduct their lives differently? Would they stop wearing seatbelts with the assurance that they would get used to being paralyzed? Would they exploit an embezzlement opportunity knowing that prison wouldn't be all that bad in the long run? We suspect not. However, perhaps a few would be saved from the misery of renting a noisy apartment they would never have gotten used to.

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#### NOTES

1. Calling any behavior that reduces the effect of a stimulus an "adaptation" may be using the term too loosely. Suppose that a person who moves to a hot climate reports that she has gotten used to the heat. Does that report constitute evidence of adaptation if we know that she now wears lighter clothes, has purchased an air conditioner, and ventures outdoors less during the middle of the day? Is it correct to say that she has "adapted" to the heat or merely that she limited her exposure to it? Similarly, suppose a bereaved man destroys all pictures of a deceased loved one and moves to a different city to avoid contact with friends who might trigger disturbing memories. If those steps do, in fact, reduce emotional pain, would it be correct to say that he has successfully "adapted" to his bereavement?
2. Adaptation is the primary biological property differentiating physics and *psychophysics* (Shepard 1981). Compare how a thermometer and a human hand register temperature. Mercury has an invariant and unique response—its volume is always the same at fifty-five degrees, and always different at other temperatures. It does not matter whether the mercury was previously stored in an oven or an ice bath, or whether it was stored in either place for hours or days or years. Mercury has no memory for previous states. Humans and other organisms do not behave this way. Our subjective experience of, and response to, a stimulus depends on more than its current physical intensity; it also depends on the strength, duration, and recency of previously experienced stimuli. Our experience of fifty-five-degree water is neither *invariant*

- (fifty-five *feels* warmer to a hand previously immersed in ice water than to one previously immersed in hot water) nor *constant* (fifty-five feels different upon initial immersion than it does later) nor *unique* (fifty-five might feel the same to a hand previously immersed in ice water, as eighty does to a hand previously immersed in hot water).
3. Warr, Jackson, and Banks (1988) make a distinction between *resigned* adaptation and *constructive* adaptation. Resigned adaptation involves passive acceptance of one's condition, or reducing one's aspirations. Constructive adaptation, on the other hand, involves active attempts to mitigate one's loss or the adoption of different, but equally ambitious goals.
  4. Our eyes (just one of our five senses) can transmit between 1.6 and 3 million bits of information per second, thousands of times more information than our brains can process (Scitovsky 1976, 52). Thus, some mechanism must act as an informational filter to select which perceptual information is processed. Adaptation serves this role by relegating constant stimuli to the perceptual background and focusing attention on rapid changes in stimulus levels—perceptual signals most likely to require a behavioral response.
  5. For other examples of desensitization, imagine a commercial fisherman who develops thick calluses on his hands. Such calluses are an adaptation because they reduce the abrasive and lacerating effects of fishing nets and fish spines. However, the calluses will probably also cause a long-term reduction in overall tactile sensitivity, such as the ability to discriminate between different qualities of silk. Similarly, the destruction of cochlear cilia caused by continued exposure to loud noises may reduce the aversiveness of those loud noises but may also reduce sensitivity to changes in noise level at normal volumes (for example, when a baby's cry upstairs is added to the volume of a television show downstairs). Cometto-Muniz and Cain (1992) provide another example of desensitization. They found that exposure to airborne irritants like cigarette smoke increases mucus production, which physically impedes the transfer of molecules of airborne irritants from the air to the free nerve endings. This reduces the subjective intensity of airborne irritants, but it also reduces perceptual sensitivity to (and therefore the hedonic effect of) subtly pleasant smells. Linz and his colleagues (Linz, Donnerstein, and Penrod 1984, 1988; Linz, Donnerstein, and Adams 1989) have argued that repeated exposure to graphic sexual violence, such as "slasher" films, causes a type of emotional desensitization. They present evidence suggesting that viewers not only become less physiologically aroused and emotionally responsive while watching such films but less sympathetic to victims of violence in other, unrelated contexts.
  6. Despite reports of high-level pleasures from connoisseurs, there is little empirical evidence that total pleasure is increased. The refinement in the tastes of connoisseurs may increase their ability to discriminate and the pleasure they derive from small positive differences. However, such refinement may also increase the aversiveness of negative differences. Moreover, a greater proportion of experiences may fall short of the connoisseur's ever-increasing standards. It would be interesting to investigate this issue using objective measures of pleasure such as facial encoding.
  7. Berlyne (1970) offered a possible explanation for the apparent conflict between the adaptation literature, which

suggests that repeated exposure *reduces* the affective intensity of stimuli, and the "mere exposure" effect, which shows the opposite. He speculated that repetition of "simple" stimuli decreases liking and repetition of "complex" stimuli increases liking. Rozin and Vollmecke (1986) made a similar observation: "On the basis of the data on food and other research on exposure effects . . . it seems that exposure is more likely to enhance liking when it occurs at moderate frequency, and when the stimuli are novel, relatively complex, or both. For many novel items, there may be enhanced liking at moderate levels of exposure, followed by decreased liking when exposure becomes more frequent" (449). However, stimulus "complexity" is difficult to measure, or even define, for many hedonically relevant stimuli like tastes or smells (Bornstein 1989).

8. In Helson's model,  $AL$  is the *arithmetic* mean of the psychological values or the *geometric* mean of the objective stimulus level, because it was assumed that the psychological magnitudes are a logarithmic function of the objective, physical stimulus magnitudes.
9. Parducci (1995) does posit that stimuli experienced in the distant past drop out of the judgmental context, though the model does not explicitly suggest the rate or degree to which they do.
10. For the multiple-period case, the formula can be simplified to:

$$AL_t = \sum_{\tau=-\infty}^t \alpha(1-\alpha)^{t-\tau} x_{\tau}. \quad (16.5)$$

11. Brown (1953) found that the effects of previous stimuli on subjects' assessments of weights were influenced much more when those stimuli were normal-looking laboratory brass weights than when they were metal trays of equal mass.
12. It is not clear that even this modification would be adequate, because the formulation still implies that introducing sufficiently excellent pizza into one's consumption history could render the experience of average pizza unpleasant. Note that if  $f(X_t - AL_t)$  is a monotonically decreasing function of  $AL$ , and  $AL$  is a weighted average of previous stimulus levels,  $X_{t-1}, \dots, X_{t-n}$ , introducing a sufficiently extreme experience would raise  $AL$  enough to make the entire expression  $(c + f[X_t - AL_t])$  negative.
13. Van Praag and his colleagues have conducted some of the most careful studies focusing on the functional form of hedonic adaptation. In the late 1960s, van Praag developed a survey item that asked respondents to state the weekly, monthly, or yearly incomes they associated with six different descriptors: "very bad," "bad," "insufficient," "sufficient," "good," and "very good." Van Praag defined the individual's adaptation level income as the midpoint of the interval between insufficient and sufficient. He and his colleagues have conducted several studies to determine how the adaptation level income changes over time as a function of past, current, and anticipated income. His estimates based on British data suggest that the current period's reference point is an additive function of these three variables, with a weight of .16 for last year's income, .75 for this year's income, and .09 for next year's (anticipated) income. However, he notes, weight on the future is almost certainly underestimated owing to er-

- rors in variables, since he estimates the equation using *actual* future income (identified by the researcher after the fact) as a proxy for *expected* future income.
14. The second author has collected a large amount of data on escape attempts in different states in an attempt to test this anomaly. The data proved extremely difficult to analyze owing to a combination of reporting irregularities, statistical complications, and other problems. However, conversations with wardens revealed that they had not, in general, noticed any pattern of late-stage escape attempts. Several did mention, though, that prisoners often attempt to escape after parole applications they had expected to be affirmed are rejected, a phenomenon that is consistent with a type of anticipatory adaptation.
  15. Unless utility is a linear function of income, single and multiple reference points yield different utilities. With a single reference point formulation,  $u = f(\$40,000 - [\alpha \$20,000 + (1-\alpha) \$50,000])$ , where  $\alpha$  designates the weighting of the two referents in determining the average reference value. With a multiple reference point formulation,  $u = \alpha f(\$40,000 - \$20,000) + (1-\alpha) f(\$40,000 - \$50,000)$ , where  $\alpha$  designates the fraction of time or attention devoted to each referent.
  16. This criticism is not applied to all of the phenomena Helson cites in support of his theory. Stevens does not, for example, take issue with Helson's earlier work on changes in visual perceptions of color, which he admits as "real" adaptation. In other cases, like the judged darkness of different shades of gray, both real adaptation and semantic norming may be occurring.
  17. Of course, such social comparisons may have real hedonic consequences as well as influencing how people interpret response scales.
  18. All but one of the sixteen subjects who had previously suffered severe injuries held their finger in the water for the entire experiment (sixty seconds), whereas none of the other twenty-four subjects did so.
  19. A similar focusing effect may occur when people predict the hedonic impact of future events. Simply asking people about how an event would affect their well-being seems temporarily to raise its prominence, leading to an overprediction of its actual impact (Loewenstein and Frederick 1997; Schkade and Kahneman 1998).
  20. For example, Ross (1989) cited a study in which people who completed a weight-loss program remembered themselves as having been heavier at the outset of the program than they actually were, enabling them to maintain the (mistaken) belief that the program had been effective. Likewise, women's memories of menstrual pain bear little resemblance to their actual prior pain ratings. Instead, the pain ratings appear to be reconstructed from implicit (and inaccurate) theories about menstrual pain (McFarland, Ross, and DeCourville 1989).
  21. The authors did not, however, find differences in tolerance with respect to other types of pain.
  22. The set of experiential components we choose to call pain are themselves a subset of the aggregate experience. People who are congenitally unable to feel pain can nevertheless *detect* that they are being burned, pinched, or pricked—they simply do not experience those sensations as unpleasant (Cabana 1971).
  23. To illustrate some of the problems with the literature on adaptation, we excerpt some lamentably characteristic passages below, without attribution:
    - "Problems relating to deprivation of liberty . . . were ranked as the most severe problems among the American long-term prisoners."
    - "Parents generally suffer mood disturbances after the death of an infant. Depression and sadness is a very common reaction."
    - "Major life changes . . . make demands that are larger and broader than those made by smaller ones."
    - "High self-esteem may contribute to the sense of personal confidence."
    - "Knowing that one experiences a positive event . . . yields the knowledge that something good has happened."
    - "Enhanced motivation is associated with greater persistence at tasks."
    - "Almost all children of divorce regard their childhood and adolescence as having taken place in the shadow of divorce."
    - "Each individual is constrained in his or her actions by capability constraints."
    - "When the processes of recovery are blocked, the result is a failure to recover."
    - "Research on depression among people with Parkinson's disease . . . suggest that between 4 percent and 90 percent of this population are clinically depressed."
  24. The fact that the initial shock of imprisonment gives way to substantial adaptation is evident from the statistic that 50 percent of suicides in prisons occur within the first twenty-four hours of imprisonment (Hayes 1983).
  25. The evidence of hedonic adaptation in the paper is not overwhelming—paraplegics rate their happiness as 2.96 on a 5-point scale, compared to 3.82 for a control group. This seems to be a substantial difference, especially considering the tendency for subjects to avoid extreme response categories (Poulton 1989).
  26. However, the authors noted that one of the respondents "frequently cried during the interview, and asked the interviewer to get a gun and kill him."
  27. Caine (1973) did not find similarly successful adaptation among adult amputees, however. Perhaps adults suffer more "phantom limb" pain (Katz and Melzack 1990), which may be difficult to adapt to.
  28. The authors suggested that the ecstasy accompanying the lottery win may have created a high reference point against which the rest of the winner's life then compared unfavorably. They noted that the lottery winners rated everyday activities (for example, eating breakfast, reading a magazine) as less pleasurable than did control subjects. The potential costs of intense positive affect are also discussed by Parducci (1984), Diener and his colleagues (1991), and Tversky and Griffin (1991).
  29. Over 95 percent of rhinoplasty (nose job) patients were satisfied with the results (Klabunde and Falces 1964). The short-term postoperative satisfaction rate of women receiving breast enlargements ranges from 72 percent (Beale et al. 1985) to 86 percent (Young et al. 1994) to 89 percent (Ohlsen, Ponten, and Hamber 1978).
  30. As noted by the authors, the reduced satisfaction may have been due to objective changes in the shape or softness of the breasts.
  31. Beale and his colleagues (1985) comment on the strong demand effects to report satisfaction with the results of breast enlargements: "The women who have

- complied with an augmentation mammoplasty have suffered; they have gone through laborious interviews, waited for years, and finally they have taken the risk of being operated on. All this is done by free choice and many times against the advice of relatives and doctors. Against this background, it seems impossible to admit to the interviewer, or even to oneself, that the operation was a failure" (484).
32. Laan and Everaerd (1995) noted an interesting contradiction—that evidence of adaptation to sexual stimuli has been used to explain both *inhibited* and *extreme* sexuality (*inhibited* because repeated behavior ceases to be sufficiently arousing, and *extreme* because people engage in increasingly intense sexual activities to maintain prior levels of gratification).
- For both males and females, the literature consistently found that arousal diminished more slowly to varied or novel stimuli than to constant stimuli (the same slide repeatedly viewed). In fact, novelty may not only diminish the effects of adaptation but reverse them. Consider, for example, the "Coolidge effect," which refers to the tendency for new sexual partners to restore the sex drive of previously satiated male animals (Bolles 1975; Dewsbury 1981).
33. Because rapidly repeated consumption of a specific food temporarily reduces its subjective pleasantness compared to other foods, access to a wide variety of foods serves to maintain the pleasantness of continued consumption. Indeed, increasing food variety has been shown to increase caloric intake in rats, cats, and humans (Rolls et al. 1981) and may partly explain the higher rates of obesity in cultures where a wide variety of foods are readily available (Rolls et al. 1981).
34. Indeed, Cometto-Muniz and Cain (1992) found very little sensory adaptation to pungent, harmful chemicals.
35. The recent rapid growth of specialized "support groups" may reflect a growing belief in the benefits of social contact with people who are experiencing similar problems. However, people's self-reports that they have been helped by a group are notoriously invalid measures of their actual hedonic change (see Ross 1989). For example, a recent study by Helgeson and her colleagues (1997) compared the effectiveness of two types of support interventions for women who had undergone breast surgery—an education program and a support group—against a control condition in which women were simply referred to their general practitioner. Although there was no difference in self-reported satisfaction with the two interventions, women who participated in the support group actually came out worse on a variety of psychological and health measures than either the education or control groups at a six-month follow-up.
36. Preadaptation may occur for divorce as well as death. Melichar and Chiriboga (1988) found that the psychological adjustment among women who initiated divorce was positively correlated with the time since their (private) decision to seek divorce, holding constant the time since the physical separation.
37. In practice, however, it is probably exceedingly difficult to separate the effect of forewarning from the effects of other attributes that correlate with forewarning and may themselves influence grief. For example, most of the deaths with no forewarning are likely to occur from homicides and auto accidents, whereas deaths with long forewarning are primarily from diseases such as cancer. If the group with no forewarning is adapting more poorly, it could be because of the lack of forewarning or because of the particular characteristics of deaths accompanied by little or no warning—for example, their violence or their "preventability."
38. The difficulty of adapting to loss in the face of uncertainty is evident in two passages from Sebastian Junger's best-seller *The Perfect Storm*, which is about a storm in the Atlantic Ocean that that cost the lives of men on the fishing boat Andrea Gail. As Sebastian recounts,
- If the men on the Andrea Gail had simply died and the bodies were lying in state somewhere, their loved ones could make their goodbyes and get on with their lives. But they didn't die, they disappeared off the face of the earth and, strictly speaking, it's just a matter of faith that these men will never return. Such faith takes work, it takes effort. The People of Gloucester must willfully extract these men from their lives and banish them to another world. (273)
- Writing about the wife of one of the missing men who was lost at sea in the same storm, Sebastian relates "After almost a month, Marianne Smith is able to start absorbing the loss of her husband. As long as the planes are going out she holds on to some shred of hope, and that keeps her in a ghastly kind of limbo." (283)
39. Uncertainty seems to impede adaptive behaviors in less weighty domains as well. For example, people seem far more reluctant to replace an item they have misplaced than one they have broken, even for items that cost only a few dollars and which exhaustive searches have failed to locate. It is very difficult to accept the fact that the ice cream scoop is "gone" if we do not know where it has gone to and this somehow seems to block or greatly delay the adaptive behavior of buying a new one.
40. Weiss (1971a, 1971b) found that laboratory rats who sit and endure electric shocks do not show as many stress symptoms as those who try, unsuccessfully, to avoid the shocks—thus obtaining feedback that their coping responses have been ineffective.
41. On this point, Parducci (1995, 179) comments: "Reminding well-fed children that the starving waifs of Africa would be grateful for the food they refuse to eat will not improve its taste. The well-fed child can hardly believe that he or she could just as well be among the starving. But knowing full well how freezing it would be outside, the same child might derive enhanced pleasure from snuggling beneath a down comforter on a cold winter night. There would have been ample experience with cold, perhaps as recently as when first slipping down between the cold sheets."
42. These ideas for alternative measures of happiness were stimulated by a discussion with Jonathan Schooler.

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