

Utility: Anticipated, Experienced, and Remembered

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Modern conceptions of utility are rooted in the system that Jeremy Bentham proposed to determine which actions and laws most benefit the most people. Bentham believed that the value of every action could be quantified in terms of its *utility* – the intensity of pleasure or pain that it caused, as well as the duration of its influence, its uncertainty, and its propinquity or remoteness. The value of every action was thus a function of the total pleasure and pain it elicited, weighted by its duration, certainty, and when it would happen (Bentham, 1789). This system, which fell out of favor among economists of the twentieth century, serves as the basis of much of the research examining the pleasure and pain derived from experiences and normative decision making today (Bruni & Sugden, 2007; Read, 2007). In this chapter, I review the history of the concept from Bentham to the present (Historical Background), distinctions between different kinds of utility and judgments (Components and Judgments of Experienced Utility), how utility is measured (Measuring Instant and Total Utility), contextual factors that influence the utility associated with experiences (Context Dependence), how experienced utility is evaluated prospectively and retrospectively (Predicted and Remembered Utility), and why people make decisions that do not maximize utility (Maximization Failures).

Historical Background

Bentham recognized that the *cardinal utility* of a given action – the precise amount of pleasure or pain it would evoke – was not necessarily known before it was performed. Still, cardinal utility could serve as a normative and prescriptive standard by which to judge individual actions, decisions, and societies: If act X provides more pleasure and less pain than act Y , act X is better and should be chosen. If the citizens of society X experience more pleasure than the citizens of society Y , then society X is the better society. His conception of utility included more than sensory stimuli and

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physical actions. Bentham believed one could quantify the utility of a wide variety of stimuli and experiences such as memories, imagination, expectations, and regrets (Bentham, 1789), foreseeing many of the central topics studied by hedonic psychology and behavioral economics today.

Bentham's particular approach was not without its internal challenges (e.g., how to make interpersonal comparisons, account for contextual influences, and determine what the origin of measurement should be), but the primary challenge responsible for its abandonment was that a *hedonimeter*, a method of measuring the cardinal utility associated with an action or outcome, was deemed infeasible (Edgeworth, 1881; Read, 2007). A second important challenge was a reconceptualization of utility by economists of the Austrian School, including Menger, Wieser, and Böhm-Bawerk. They argued that utility is not a property inherent in a good or an experience; it is determined by the importance of the desire that an additional unit of that good or experience would satisfy. A glass of water, for example, can satisfy a more important desire when one is dehydrated than when one is hydrated. To determine the utility of a unit of a good, this school argued that one has to first form a ranking of wants or desires and then see which want or desire that unit would satisfy. Units satisfying a more important desire should have greater utility than those satisfying a less important desire (McCulloch, 1977).

Neoclassical economics eventually patched the measurement problem by assuming that people seek to maximize utility, and thus utility maximization can be best inferred from the preferences revealed by their choices (Read, 2007). The utility of some bundle of goods X , for example, could be described as the bundle of Y that had the same utility (Edgeworth, 1881). Pareto (1906) argued that rational choice (logic) should govern the economic study of utility (Bruni & Sugden, 2007).¹ He suggested that one could create a map of a person's preferences by examining the point of indifference between all pairwise bundles of goods (drawn along indifference curves). The utility of goods and experiences could thus be inferred from the ordinal ranking of preferences. This concept of ordinal utility departed further from that of the Austrian School as the cardinal utility provided by options did not matter in his system. With the loss of cardinality went the ability, at least in theory, to compare utilities between persons and the quantification of the precise differences in the utility of experiences within persons (Read, 2007).²

The proponents of ordinal utility theory did not believe the internal mental states associated with utility were necessary to understand preferences and economic behavior (e.g., Hicks & Allen, 1934; Robbins, 1932; in much the same way, internal mental states were then being disregarded as a topic of research by behaviorism in psychology (e.g., Skinner, 1938; J. B. Watson, 1913). Initially, ordinal utility theory did not seek to narrow the scope of human behavior that utility could explain but rather to broaden "a subjective theory of value into a general logic of choice" (Hicks & Allen, 1934, p. 45). Assuming consistency in her choices, for example, the *theory of revealed preferences* argued that the relative utility of goods, experiences, and policies for a person could be inferred by observing her choices (Samuelson, 1938). According to the Weak Axiom of Revealed Preferences, if Jane preferred experience X over experience Y under one set of circumstances when both were available to her one should assume

that experience X has greater utility than experience \mathcal{Y} , even if X is injecting heroin and \mathcal{Y} is cashing in a winning lottery ticket. The assumption of consistency in preferences dictates that if Jane is rational she should then again choose experience X rather than experience \mathcal{Y} when both are available to her in the future.

The Strong Axiom of Revealed Preferences further implies that preferences between options can be used to create a map of the utility of those options, if preferences are transitive. If Jane prefers X to \mathcal{Y} and prefers \mathcal{Y} to Z , Jane should prefer X to Z (Samuelson, 1938). Preferences may thus be used as indirect measures of the ordinal utility that rational actors expect to and do receive from different experiences (Sudgen, 1991), with rationality being equated to consistency in choice (cf. Simon, 1982). The adoption of revealed preferences theory further distanced the concept of utility from that suggested by Bentham. Inferring utility from choices means that one cannot test whether such choices are errors – if people ever choose options that bring them less pleasure than their alternatives (Read, 2007).

Cardinal utility was later brought back by von Neumann and Morgenstern's (1947) *expected utility theory*, which proposed four axioms that if met allowed a person's preferences to be described by a cardinal, additively separable, utility function. Although this theory brought back the notion of cardinal utility, it still referred to utility inferred from preferences rather than from direct measures of the pleasure and pain associated with experiences. Thus, the cardinal utility yielded by a particular experience still remained an open question, in the sense that differences in utility again became meaningful theoretically but could not be measured as they were indirectly inferred from choice behavior (Loewenstein, 1999).

In the twentieth century, research in the Benthamite tradition was out of favor in mainstream economics but not entirely dead. Some economists and many psychologists studied utility directly or indirectly as a component of decision making, emotion, happiness, life satisfaction, and well-being (e.g., Beebe-Center, 1932/1965; Clark & Oswald, 1996; Diener, Larsen, Levine, & Emmons, 1985; Keynes, 1936; Loewenstein & Elster, 1992; Parducci, 1995; Russell, 1980; Scitovsky, 1976; Strack, Argyle, & Schwarz, 1991; Tversky & Griffin, 1991). These areas of psychology and economics became connected at the end of the century, in part, in response to the reintegration of psychological phenomenon into economics through prospect theory (Kahneman & Tversky, 1979) and behavioral economics and by a later proposal by Kahneman and colleagues to break up the concept and study of utility according to two meanings of the term, *decision utility* and *experienced utility* (Kahneman, 1999; Kahneman, Wakker, & Sarin, 1997).

Decision utility describes the utility of experiences as inferred from revealed preferences, measured indirectly through choices between options or methods such as willingness to pay. *Experienced utility* describes the pleasure and pain elicited by a chosen stimulus while anticipating, experiencing, or remembering it. It is measured directly. These two forms of utility are likely to be correlated but are not logically the same. Deciding to eat a hot pepper does not guarantee that its consumption will be a pleasurable experience, and deciding to watch a movie rather than go skydiving does not necessarily mean that one would enjoy skydiving less than the movie. Kahneman and colleagues argued that sufficient progress had been made with regard to the

measurement of experienced utility that it is possible to scientifically study it, and that its study is important (Kahneman et al., 1997; Kahneman, Diener, & Schwarz, 1999).

The modern science of experienced utility is still subject to some of the same challenges that hindered the approach proposed by Bentham, but the advantages of studying experienced utility include (a) opening up the possibility of eventually quantifying the cardinal utility of experiences, (b) elucidating what properties of experiences endow them with utility or disutility, (c) identifying when predictions and retrospective assessments of experienced utility are made in error, and (d) enabling identification of when and why people fail to maximize utility – when decision utility and experienced utility conflict.

Components and Judgments of Experienced Utility

Experienced utility usually refers to outcomes that extend over time, whether that means years, months, days, minutes, or seconds. Each perceptible unit of time while one has an experience, in which one anticipates the experience and is influenced by memories of the experience contributes to the total amount of experienced utility derived from that experience. The complexity and fuzzy boundaries between these categories and their assessments requires distinguishing between several components of the temporal sequence of an experience. Figure 10.1 illustrates the time course of an experience that is chosen at t_0 , anticipated during t_1 , had during t_2 , and remembered during t_3 .

A first level of distinction is parsing *decision utility* from *experience utility*. Decision utility refers to the actions, goods, or experiences chosen and rejected (or their inferred value) at t_0 . It does not necessarily reflect any of the pleasure or pain elicited by the experience itself, that one predicts will be elicited by the experience, or that one remembers as having been elicited by the experience. An experience X is considered to have higher decision utility than experience Y if it is chosen when both X and Y are available (Samuelson, 1938) or if it is assigned a higher value (e.g., $X_{WTP} > Y_{WTP}$).

Experienced utility refers to all of the pleasure and pain elicited by the action, good, or experience (Kahneman, 1999; Kahneman et al., 1997; Read & Loewenstein, 1999). Pleasure and pain are not direct sensations but rather are responses to stimulus input (Arnold, 1960; Beebe-Center, 1932/1965; Fernandez & Turk, 1992). Every instant of an experience that influences the pleasure or pain that we feel, whether elicited by anticipation of the experience (*savoring* and *dread*; t_1), having the experience (t_2), or remembering the experience (t_3) provides us with *instant utility*. The integral of all moments of instant utility provided by an experience are its *total utility* (t_{1-3}). Experienced utility also includes *predicted utility* and *remembered utility*, which



Figure 10.1 Utility of an experience across time.

are prospective and retrospective judgments of the instant and/or total utility of the experience (and are discussed in the Predicted and Remembered section of this chapter).

Instant utility is the basic unit of experience used to catalog the moment-by-moment pleasure and pain evoked by an experience. Each moment on the line in Figure 10.1 in which one feels pleasure or pain that is associated with the experience is instant utility associated with the experience. Instant utility is what would be measured by a hedonimeter (Edgeworth, 1881). Its value connotes positive or negative valence and intensity. Kahneman (1999) has suggested this instant utility of an experience can be represented as a value on a “good/bad dimension” and that it is best understood as the extent to which one wishes the current experience to continue or end.

Instant utility is not restricted to responses to sensory experiences. A sensory experience may evoke stronger physiological responses than does imagining that sensory experience (Drummond, 1995), but thoughts considerably influence instant utility. Mill (1879) went so far as to argue that utility from sensory experience is of secondary importance to the utility derived from thought. His most famous example contrasts whether it is better to be Socrates (who was sentenced to die for corrupting the youth of Athens) or a happy pig:

It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied. And if the fool, or the pig, is of a different opinion, it is because they only know their own side of the question. The other party to the comparison knows both sides. (Chapter 2)

Some schools of hedonism, such as the Cyrenaics, believed that pleasure and pain are derived solely through present experience (Redmond, 2012), but many of the pleasures and pains associated with an experience do appear to be derived from thinking about experiences before they happen and from remembering experiences after they have occurred (i.e., at t_1 and t_3 ; Elster & Loewenstein, 1992; Van Boven & Ashworth, 2007). Thoughts and mental imagery of a stimulus can evoke a constellation of emotional and physiological responses very similar to those associated with the physical presence or experience of that stimulus (e.g., Lang, 1977; Morewedge, Huh, & Vosgerau, 2010; Schwartz, Weinberger, & Singer, 1981), with more specific thoughts and images eliciting stronger emotional responses (Lang, 1984, 1993).

The instant utility of thoughts about experiences can sometimes outweigh the instant utility of the corresponding experiences. Students consider Saturday to be the best day of the week, but most prefer Fridays to Sundays – the last day of work is preferred to the last day of the weekend (Farber, 1953). Workers who knew they would be laid off because their plant was closing reported feeling worse more often while anticipating the loss of their jobs than during the period in which they actually became and remained unemployed (Kasl, Gore, & Cobb, 1975). Physiological arousal was greater while watching the moments of a video that lead up to an industrial accident than while watching the accident itself (Nomikos, Opton, Averill, & Lazarus, 1968). Some physical pains, such as that of a pinprick, cause meaningful psychological distress only during their anticipation (Lazarus, 1966). The ventral striatum (a brain region associated with reward) activates more to a cue signaling that one will be

exposed to a positive (sexual) stimulus than to the presentation of the stimulus itself (Knutson, Wimmer, Kuhnen, & Winkielman, 2008). Moreover, the human tendency to mind wander leads thoughts to drift away from what people are doing nearly half the time (~46%), and when people report how they feel those reports are better predicted by the content of their wandering thoughts than the particular activity they are performing (Killingsworth & Gilbert, 2010).

Savoring and *dread* refer to positive or negative instant utility evoked by the anticipation of a certain or probable experience (t_1). Winning a kiss from a movie star in a contest will improve one's mood, but people think they will be happier if they wait a few days to savor their prize before experiencing it (Loewenstein, 1987). Conversely, the mere thought of a future electric shock is discomfiting. Waiting an indefinite amount of time for an electric shock is such an aversive experience that most people prefer to receive a shock immediately than to wait (Berns et al., 2006; Cook & Barnes, 1964), and some people find this waiting so aversive that they prefer to receive a higher voltage shock sooner ("90% max in 3 seconds") rather than a lower voltage shock later ("60% max in 27 seconds"). Those who do prefer more pain now to less pain later tend to rate trials with longer waits to be more aversive, despite exhibiting a similar neurological response to shocks as do people who would prefer less pain later than more pain now. In other words, they do not seem to experience less pain from being shocked. They seem to experience more dread.

Observation of patients and students in field studies appears to corroborate the instant utility evoked by anticipation. Andrykowski, Redd, and Hatfield (1985) found that cancer patients with particularly negative reactions to chemotherapy exhibit anticipatory symptoms of the treatment such as vomiting and nausea in the day before their chemotherapy is scheduled. Students who think they did poorly on exam report more negative affect than students who think they did well while they wait to receive their grade (Golub, Gilbert, & Wilson, 2009). It is not yet clear to what extent instant utility from anticipation is analogous to instant utility from experience. There is considerable overlap in the neural regions most active when anticipating and receiving a reward, but there are also reliable differences in the neural regions most active during anticipation and experience (Knutson & Peterson, 2005).

Decisions beyond kisses and electric shocks suggest that people are aware of the instant utility derived from savoring and dread (Baucells & Bellezza, 2014; Kőszegi, 2010). Tourists enjoy booking vacations months in advance, and children often hoard their Halloween candy. Conversely, people prefer to hasten the date of dental appointments, the outcomes of medical tests, and negative financial results to diminish the anticipatory pain of the dread those experiences engender (Bentham, 1789; Loewenstein, 1987; Lovallo & Kahneman, 2000).

Preferences to hasten and delay experiences in order to minimize dread or maximize savoring should be most often observed for fleeting experiences such as rare treats and oral surgeries. There is little reason to delay a permanent pleasure such as a salary increase or hasten a permanent pain such as spending the remainder of one's life in prison. The motive to delay to savor and accelerate to avoid dread is also balanced by the devaluation of experiences as they are moved further into the future (Loewenstein, 1987), the ease of imagining the future experience (Nowlis, Mandel, & McCabe, 2004), and adaptation to events that one anticipates (Breznitz, 1984).

Remembering past experiences (t_3) can provide positive and negative instant utility. Most research examining the link between memory and emotion has tested how emotion influences the encoding and retrieval of memories, but the relationship runs both ways (Philippot, Schaefer, & Herbet, 2003). Recalling autobiographical memories can influence how one feels in the present. Recollection of negative events evokes negative emotional responses (Phillipe, Koestner, Lecours, Beaulieu-Pelletier, & Bois, 2011), and recollection of pleasant and nostalgic past events elicits positive emotional responses (Wildschut, Sedikides, Arndt, & Routledge, 2006).

The instant utility evoked by memories of experiences does not appear to be necessarily weaker than the instant utility derived from the corresponding experiences. Both positive and negative emotions evoked by the recollection of detailed autobiographical memories (“I was afraid last Thursday when I was chased by a dog while running on Walnut Street”) appear to be less intense than the emotions triggered by the events themselves. Engaging in a detailed reconstruction of a memory of an event appears to inhibit emotional response to that memory (Philippot et al., 2003). The positive and negative emotions evoked by the recollection of more general autobiographical memories (“I am afraid when I am chased by dogs while running”), however, can evoke emotions of the same intensity as were evoked by the event itself.

People know that memory can provide instant utility. They deliberately recall positive memories of the past to alleviate sad feelings in the present (Josephson, Singer, & Salovey, 1996) and will forego payment to recall positive rather than neutral memories when they are offered more money to recall neutral memories (Speer, Bhanji, & Delgado, 2014). Their awareness of the utility provided by memory is illustrated by the attempts made to preserve the utility of their pleasant memories. People avoid performing behaviors and making choices that will make pleasant memories more difficult to remember (Zauberman, Ratner, & Kim, 2009).

Total utility comprises the total impact of all moments of instant utility associated with an experience (Kahneman, 1999; Kahneman et al., 1997). People appear to intuitively calculate total utility, although no evidence suggests they do so through one particular process or method. *Commitment devices* binding one in marriage, to self-imposed deadlines, and to make automatic payroll deductions for retirement plans and health insurance constitute some evidence that people recognize that experiences have total utility and attempt to maximize utility in the long run (Brocas, Carrillo, & Dewatripont, 2004). People will actively choose to experience unpleasant negative emotions in the present that will help them achieve goals that confer greater total utility in the future (Tamir, 2009). Further evidence of the intuitive assessment of total utility is provided by the practice of labeling past decisions as “regrettable” or as “self-control failures” (e.g., Baumeister, Heatherton, & Tice, 1994; Gilovich & Medvec, 1995). Both labels imply that the decision maker computed a postmortem on her decision and determined that the option she chose had lower total utility than its alternatives.

The lack of a standard method to calculate total utility makes it difficult if not impossible to answer many basic theoretical and practical questions. One cannot determine the relative contribution to total utility from anticipation, consumption, and memory to the total utility of an experience. For instance, there is considerable debate over whether one derives more pleasure from the anticipation, experience, or recollection of a vacation (Nawijn, Marchand, Vennhoven, & Vingerhoets, 2010).

The absence of a standard method prevents the testing of models of, and lay beliefs about, their relative contributions (e.g., Baucells & Bellezza, 2014).

In line with early schools of philosophical thought such as the Cyrenaics (Redmond, 2012) people appear to believe that consumption utility is the largest contributor to the total utility of experiences. Figure 10.2 reflects the lay beliefs of a sample of Americans ($N = 54$, $M_{age} = 34.26$) whom I asked to describe the relative contribution (out of 100%) of anticipation, consumption (“while having the experience”), and memory to the total pleasure and pain derived from a variety of shorter and longer experiences. Not all three kinds of utility were perceived to provide an equal contribution to the total utility of experiences, $F(2, 22) = 96.71$, $p < .001$, $\eta_p^2 = .90$. Utility from consumption was assumed to be the primary contributor to total utility across all of the experiences (Fisher’s LSD), $p < .001$. Considering all items together, utility from anticipation and memory did not differ significantly, $p = .19$.³

This emphasis on the primacy of experiences in all cases seems questionable. It contradicts intuition in the case of fleeting experiences, such as a kiss, and contradicts decisions in the case of electric shocks. Over a lifetime, the utility provided by the memory of a kiss probably provides more pleasure than is provided by the kiss itself. Estimates of the greater contribution of the experience of an electrical shock are contradicted by the preference to receive a higher voltage shock immediately rather than wait to receive a lower voltage shock later (Berns et al., 2006; Cook & Barnes, 1964). Directly testing the accuracy of such lay beliefs, however, requires a method by which to compare the contribution of the instant utility of anticipation, consumption, and memory to total utility. And such a method does not yet exist.

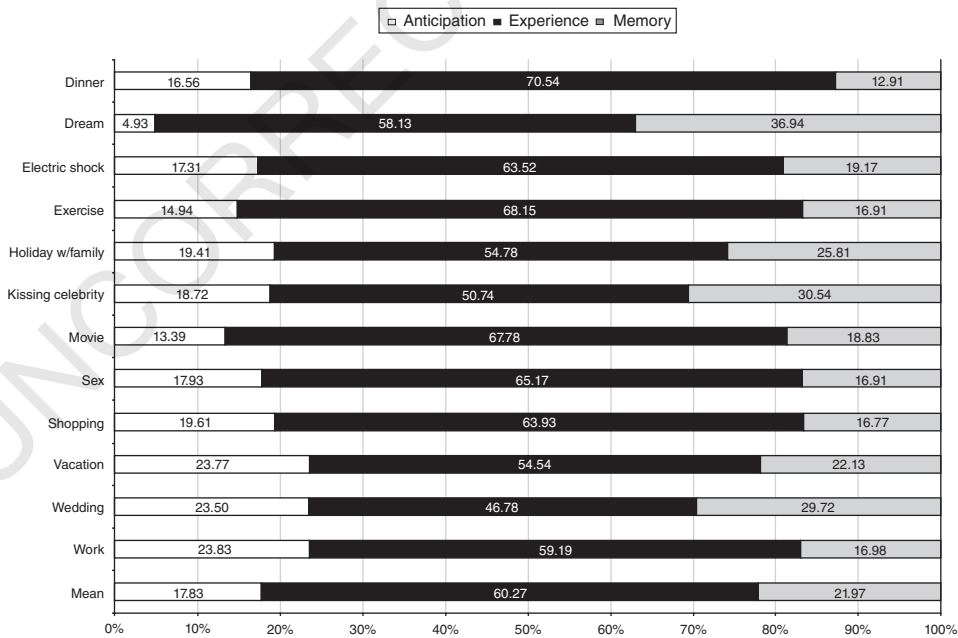


Figure 10.2 Mean (believed) contribution of anticipation, experience, and memory to the total utility of experiences.

Unconscious Utility? A topic of considerable debate is whether pleasure and pain of which one is not conscious provide one with instant or total utility. The reports illustrated in Figure 10.2 suggest that people believe at least one kind of unconscious experience – dreaming – can influence instant utility. People do exhibit behavioral evidence of unconscious affect (Winkielman & Berridge, 2004), but no empirical evidence has definitively demonstrated that unconscious affect is analogous to instant utility or contributes toward total utility (Kringelbach & Berridge, 2010). Indeed, the input of a pleasant or painful stimulus does not necessarily elicit a conscious response. Considerable pain can occur without tissue damage in conditions like phantom limb syndrome, and tissue damage can occur without pain in intense physical activities such as combat and sport (Fernandez & Turk, 1992). Rather than produce instant utility or contribute toward total utility, unconscious positive and negative affect may simply influence the associations paired with a stimulus or induce behaviors with downstream consequences for instant and total utility. A dream, although unconscious, may influence how one feels the next day as a result of its lingering after effects, or as a result of how one subsequently behaves toward the people who appeared in the dream (Morewedge & Norton, 2009; Selterman, Apetroaia, Riela, & Aron, 2014).

Measuring Instant and Total Utility

Instant utility is typically measured by self-report on unipolar or bipolar scales that connote the affective valence of the present state (i.e., positive or negative) and its degree of intensity. Instant utility, predicted utility, and remembered utility have all been evaluated with such self-report scales both within and between persons (e.g., Fredrickson & Kahneman, 1993; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). Typical endpoints include general terms indicating affective valence, such as “good–bad” or “pleasant–unpleasant” (Frijda, 1999), or positive and negative emotions, such as “extremely happy–extremely unhappy” or “extremely happy–not happy” (e.g., Killingsworth & Gilbert, 2010). A valence-based measure of utility can be used across cultures as “good” and “bad” are lexical universals, occurring in all languages (Wierzbicka, 1999). Some measures aggregate separate unipolar scales by subtracting the negative emotion reported as most intense from the intensity of reported happiness (e.g., the *u-index*; Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004) to compute the instant utility in the present moment.

Bipolar scales do make problematic assumptions. The origin of measures of instant utility is typically assumed to be the neutral point on a bipolar scale (“neither happy nor unhappy”) or the report of no affect on unipolar scales (“not at all happy”; Kahneman, 1999). This may imply that the neutral point of drive states such as hunger might be “not-hungry,” whereas the origin for such states is likely to be the most pleasant point, and any derivation from that origin is likely to be unpleasant (e.g., “slightly hungry” or “very full;” Read, 2007). Bipolar scales also imply that pleasure and pain lie on a continuum, for which there is both supporting and countervailing evidence (Cacioppo & Bertson, 1994; Kringelbach & Berridge, 2010). Bipolar scales are better predictors of behavior (e.g., choice) when they force judges to make direct comparisons between the intensity of positive and negative events rather than evaluate

experiences on a simple continuum from good to bad. People naturally evaluate events in relation to other events of the same valence, even when using bipolar scales, and may consequently exhibit insensitivity to the greater hedonic impact of negative than positive experiences if they are not directly compared (McGraw, Larsen, Kahneman, & Schkade, 2010).

Observational and physiological measures of affect have been developed to measure responses when it is socially undesirable to self-report feeling good, as when taking pleasure in the misfortune of a competitor or being pained by their good fortune (i.e., *schadenfreude* and *gluckschmerz*; Cikara & Fiske, 2012), when self-reports might influence the utility one experiences (e.g., Schooler, Ariely, & Loewenstein, 2003), to collect data from large or diverse samples (e.g., Golder & Macy, 2011), or when a person may be unaware of their present affective state (Winkielman & Berridge, 2004).

Observational measures include coding of facial expressions and posts on social media (Golder & Macy, 2011; Medvec, Madey, & Gilovich, 1995). Possible physiological markers of affect include facial expressions and electromyographic (EMG) activity in the corrugator supercillii and zygomaticus major (i.e., muscles involved in subtle frowning and smiling expressions respectively; Cikara & Fiske, 2012; Cohn & Kanade, 2007; Larsen & Norris, 2009), asymmetry in electrocortical activity between the left and right prefrontal cortex (Davidson, 2003; Urry et al., 2004), and electrophysiological and functional magnetic resonance imaging measures of activation in the orbitofrontal cortex (OFC; Grabenhorst & Rolls, 2011; Symmonds & Dolan, 2012). Whether some or all of these measures are markers of instant utility or merely represent value is uncertain. The OFC, for example, is only one in a network of several brain regions active when people calculate value (Berridge & Aldrige, 2008; Symmonds & Dolan, 2012). Whereas the OFC appears to be involved in the coding of outcome valence, other regions such as the amygdala appear to be more involved in coding the intensity of outcomes (A. K. Anderson et al., 2003).

There are certainly advantages to developing and validating observational and physiological measures of experienced utility. Self-reported measures serving as proxies for instant utility can be influenced by the context in which they are elicited and by the elicitation measures used (Schwarz & Strack, 1999). At present, however, self-reports remain the gold standard for measuring instant utility because self-reports are more portable, cheaper, and easier to use than observational and physiological measures, which must be validated by comparison to self-reports (Gilbert, 2006). If the self-reports upon which they rely are not valid then neither will these physiological measures be (Kelman, 2005).

Some have argued that self-reports of pleasure and pain are accurate when comparing states within an individual at different times but that comparisons between individuals at the same time must be made through methods such as cross-modality matching (Bartoshuk, 2014). Cross-modality matching is a method by which one compares the intensity of stimuli of one modality to the intensity of stimuli of another modality (e.g., the brightness of lights to the loudness of sounds). The advantage of this approach is that it accounts for systematic differences that change ratings and perceptions of pleasure and pain. A person who has experienced more intense pleasures and pains will use different scale anchors by which to evaluate the same experience to those used by a person who has experienced less intense pleasures and pains (Parducci,

1995). Women who have given birth appear to use labor pain as an anchor for pain ratings, for example, and have a higher pain threshold than matched female controls who have not given birth (Hapidou & DeCatanaro, 1992). One argument against this “experience-stretching” concern is that with sufficient statistical power and random assignment these differences should cancel out when comparing experiences across persons (Gilbert, 2006).

A two-factor valence and intensity approach to the measurement of instant utility has considerable construct validity. It is consistent with multiple models of affect positing that the two primary dimensions of affective experience are valence and arousal (e.g., Frijda, 1999; Russell, 1980; D. Watson & Tellegen, 1985).⁴ It is also consistent with a semantic differential approach, which suggests that two of the three primary dimensions used to differentiate stimuli are an evaluative, “good–bad,” dimension and a potency, “strong–weak,” dimension (Osgood, Suchi, & Tannenbaum, 1957).

A disadvantage of the valence-based affect approach to measuring instant utility is the loss of considerable predictive and explanatory depth when collapsing across emotions that share the same valence but have different influences on judgment and decision making, such as fear and anger (Lench, Flores, & Bench, 2011; Lerner & Keltner, 2001). Some experts have argued that specific emotions are not valid measures of utility as they are not instances of pleasure or pain (Frijda, 2010). A more nuanced specific emotions approach also introduces problems of considerable complexity concerning how to identify, measure, compare, and integrate multiple and mixed emotions into a measure of instant utility. Even reports of mixed positive and negative affect are difficult to interpret. Reporting that one feels both good and bad at the same time may indicate that both pleasure and pain are simultaneously experienced; that one is quickly oscillating between the two states; or that one experiences some combination of both pleasure and pain, such as their average (e.g., Carrera & Oceja, 2007; Larsen & McGraw, 2011).

Measuring *total utility* according to a temporal integration of instant utility was initially proposed by Edgeworth (1881) and has since been implicitly or explicitly endorsed by philosophers, economists, and psychologists examining utility or related concepts (Broome, 1991; Kahneman et al., 1997; Parducci, 1995). This approach considers the total utility of an experience a function of the instant utility of its moments weighted by their duration, which is somewhat similar to the quality-adjusted life-year approach used in medicine (Vergel & Sculpher, 2008). The formal temporal integration approach to the calculation of total utility makes several assumptions (Kahneman, 1999). It assumes ratings of instant utility capture all relevant information. It assumes that the scale has a stable zero point (e.g., not good or bad) and that positive and negative values of the scale are ordinal. Finally, it assumes that an observer can make comparative judgments about the utilities reported (e.g., a minute spent at “10” may be more pleasurable than two minutes spent at “5”), which would be used to rescale instant utility reports so they can be aggregated with respect to their duration.

No single method of measuring total utility has been widely adopted as a standard method. Short of the end goal of assigning cardinal values of total utility to experiences, the lack of a standard method by which to calculate total utility has left open many important basic questions and comparisons. Most researchers examining

predicted utility or affective forecasting, for example, compare the predicted and reported instant utility at specific moments rather than predicted total utility and reported total utility. Biases in remembered utility (retrospective valuation) are typically revealed through dominance violations in choice rather than by comparison of the total utility of experiences to retrospective reports of total utility (e.g., Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). From these limited moments and choices, broad assumptions about differences between predicted, experienced, and remembered utility are made. Furthermore, the lack of a standard method makes it difficult to test models of total utility (e.g., Baucells & Bellezza, 2014).

Despite the appeal of using instant utility and total utility to calculate the experienced utility associated with an action, good, or choice option, there is considerable debate over using the pleasure and pain derived from an experience as the primary determinant of its utility. Historically, pursuing the maximization of pleasure is a modern concept, only gaining general acceptance around the time of the Enlightenment (McMahon, 2006). Philosophers such as Aristotle suggested that a virtuous life was better to pursue than a pleasurable one (Haybron, 2008). Many human behaviors do not appear to maximize utility as Bentham conceived it. It is unlikely that people would go mountain climbing, eat painfully hot food, watch horror films, have children, or vacation in Third World countries if their choices were purely based on the pleasures and pains that those experiences yield (Andrade & Cohen, 2007; Loewenstein, 1999). Factors such as curiosity (Loewenstein, 1994), status (Frank, 1985), mastery, and meaning (Loewenstein, 1999) may be important contributors to the total utility of an experience that are not captured by measures of positive and negative valence.

Implications of crafting policy based solely on experienced utility call into question the wisdom of its maximization as an end goal for society. People are able to adapt to such poor health and living conditions (Brickman, Coates, & Janoff-Bulman, 1978; Diener, 2000) that an egotistic hedonism account (Sidgwick, 1874/1930) would suggest that a society should not spend its resources on costly medical procedures to prevent extremely negative health outcomes (e.g., renal failure and paraplegia) or attempt to improve the lives of those living in chronic deprivation. Many economists and policy analysts believe that the extent to which an alternative improves people's objective circumstances and meets their basic needs (i.e., an objective-list account) or satisfies their desires and preferences (i.e., a desire-fulfillment or preference-satisfaction account) is a more compelling account of utility (Dolan & White, 2007).

Context Dependence

The complexity of instant utility is not reflected in the simplicity of its measurement. Even Bentham identified that instant utility is not absolute, that the pleasure and pain elicited by stimuli are affected by their context, likelihood, and propinquity (1789). An experience can be more or less painful or pleasurable depending on the standard or reference point to which it is compared, whether it is perceived as a loss or a gain, whether it is the first or the twenty-first time one has had the experience, how likely the experience is to happen, and to whom and when.

Reference Dependence

The utility of a stimulus is not evaluated in isolation but by comparison to a judgmental standard or reference point (Helson, 1964; Kahneman & Tversky, 1979; Markowitz, 1952; Schwarz & Strack, 1999; Wedell & Parducci, 1988). Comparison standards can include past experiences, future experiences, goals, and alternatives, both present and imagined (Heath, Larrick, & Wu, 1999; Kahneman & Miller, 1986). There is no standard unit of utility (e.g., *hedons*), so the reliability of judgments within and between persons depends critically on whether they use the same comparison standards, such as using the same scale or modulus by which to evaluate a stimulus (e.g., Bartoshuk, 2014; Hsee, Loewenstein, Blount, & Bazerman, 1999; Morewedge, Kassam, Hsee, & Caruso, 2009; Stevens, 1975). Without the use of a common standard, judgments between persons can vary considerably, and even reverse with respect to whether an experience is perceived to be pleasant or unpleasant (Ariely, Loewenstein, & Prelec, 2003).

The reference-dependent nature of utility means that comparison standards not only allow reliability in judgment but also alter judgments of how much utility a stimulus provides. When a stimulus is compared to a superior or inferior standard, its judgment can be *assimilated* to the standard or the comparison can create a *contrast effect*. When people do not notice differences between a target stimulus and a standard (Martin, Seta, & Crelia, 1990; Mussweiler, 2003) assimilation may lead the target stimulus to be evaluated more positively when compared to a superior standard and more negatively when compared to an inferior standard. A wine tastes better when one is told that it costs \$90 than \$5 because the quality of wine is sufficiently ambiguous that it can benefit from high expectations (e.g., when one believes it is expensive) and suffer from low expectations (e.g., when one believes it is cheap; Plassmann, O'Doherty, Shiv, & Rangel, 2008; cf. Gneezy, Gneezy, & Lauga, 2014).

When people do notice differences between the target stimulus and its comparison standard, a hedonic contrast effect may occur (Martin et al., 1990; Tversky & Griffin, 1991). A *negative contrast effect* occurs when the target stimulus is judged more poorly by comparison to a superior standard and a *positive contrast effect* occurs when the target stimulus is judged more favorably by comparison to an inferior standard. People are happier if their income is greater than that of their neighbors and unhappier if it is smaller (Luttmer, 2005). Winning \$5 is more pleasurable when compared to winning \$3 than when compared to winning \$7 (Kassam, Morewedge, Gilbert, & Wilson, 2011), and buying groceries feels less painful when their cost is compared to the larger amount of money in one's bank accounts than to the smaller amount in one's wallet (Morewedge, Holtzman, & Epley, 2007).

Contrast effects can sometimes make objectively superior outcomes feel worse than objectively inferior outcomes. Olympic silver medalists appear less happy on the medal stand than Olympic bronze medalists. Silver medalists presumably compare their outcome to winning the gold medal, whereas bronze medalists presumably compare their outcome to winning no medal (Medvec et al., 1995). People believe contrast effects are sufficiently strong that they prefer in some domains to sacrifice absolute value (e.g., having more) for relative value (e.g., having more than their peers). A majority of participants asked whether they would prefer to (a) earn an annual salary of \$50,000

in a world where their peers earn \$25,000 or (b) earn an annual salary of \$100,000 in a world where their peers earn \$200,000 preferred the former option, the lower salary that affords them fewer pleasures but is greater than the salary of their peers (Solnick & Hemenway, 2005).

The comparative nature of utility and its reference dependence can lead outcomes to be coded as good or bad – as *gains* or *losses* – depending on the standard or reference point to which they are compared (Tversky & Kahneman, 1981). A person with \$1,000,000 in her bank account today is very happy if she had \$0 in her account yesterday because her new level of wealth is coded as a \$1,000,000 gain, and she is miserable if she had \$2,000,000 yesterday because her new level of wealth is coded as a \$1,000,000 loss. A \$3,000 raise is exciting if one expected no raise and disappointing if one expected a raise of \$10,000. In other words, the same stimulus can provide utility or disutility depending on the comparison standard or reference point to which it is compared (Ariely, Loewenstein, & Prelec, 2006). Baucells and Sarin (2013) suggest formally expressing this as a simple function:

$$U_t = u(x_t - r_t). \quad (10.1)$$

Assuming some increasing function, u , experienced utility during time t (U_t) is a function of the difference between what is consumed at time t (x_t), and one's reference point at the beginning of time t (r_t). It is important to note that this may overstate insensitivity to the absolute utility derived from the experience itself, which is sometimes described as its *consumption utility* (Kőszegi & Rabin, 2006). Even disappointing pizza can still be pleasurable to eat.

A nice feature of this equation is that it conveys the greater sensitivity people exhibit to changes between states – differences between a stimulus and its reference point – than to the value of states that remain constant (Kahneman, 1999). Measures of subjective well-being such as happiness and life satisfaction suggest that people are permanently affected by some major life events such as winning the lottery and becoming disabled (e.g., Brickman, Coates, & Janoff-Bulman, 1978; Gardner & Oswald, 2007), but external factors one would expect to be particularly influential such as income and health account for a relatively small percentage of the variance in happiness and life satisfaction (Lucas, 2007). Their correlation with income, for example, is quite weak. Life satisfaction rises steadily with income but at a logarithmic rate. Happiness rises with income up to \$75,000, but it does not appear to rise further (Easterlin, 1974, 1995; Kahneman & Deaton, 2010).

Once being married or a higher income is adopted as the new reference point, one may exhibit *hedonic adaptation*. Marriage or a higher income may then provide one with less additional utility or no additional positive utility (Frederick & Loewenstein, 1999; Lucas, Clark, Georgellis, & Diener, 2003). Hedonic adaptation does not occur to all stimuli. People do not appear to adapt to stochastic stimuli, such as the noise of highway traffic (Frederick & Loewenstein, 1999). Adaptation appears to be contingent on a stimulus exhibiting a stable or consistent pattern. Perhaps some level of sufficient consistency is required for the reference point to be updated. Some have suggested that this process of adaptation can create a *hedonic treadmill* such that gradual improvements in objective standards such as income do not improve the overall happiness or subjective well-being of a person or nation (e.g., Brickman & Campbell, 1971;

Easterlin, 1974, 1995), but the data do not support the strongest of these assertions (Diener, Lucas, & Scollon, 2006).

Negativity Bias/Loss Aversion

Reference dependence is also important because the positive or negative framing of an experience can considerably impact its perceived intensity. Bads tend to have a greater psychological impact than equivalent goods. Events, emotions, social relationships, and feedback are just a few stimuli that adhere to this *negativity bias* (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). Whether an outcome is coded as an improvement or setback relative to a reference point, as a gain or a loss, consequently influences its impact and perceived intensity. The greater sensitivity to negative than positive stimuli is particularly clear when comparing gains and losses of equal size. Most people are *loss averse*. People weight losses more heavily than equivalent gains (Kahneman & Tversky, 1979; Tom, Fox, Trepel, & Poldrack, 2007; Tversky & Kahneman, 1991, 1992); formally (Baucells & Sarin, 2013),

$$-u(-x) > u(x). \quad (10.2)$$

When offered the chance to gamble on a single coin toss, for example, people will not play unless they stand to win at least twice as much as they stand to lose. Some attribute loss aversion to differences in the relative frequencies of larger and smaller positive and negative outcomes (Stewart, Chater, & Brown, 2006), whereas others attribute it to a greater allocation of attention to tasks involving losses than to those involving gains (Yechiam & Hochman, 2013).

Diminishing Marginal Utility

Experienced utility is not linearly related to the quantity of a pleasurable or painful experience. *Diminishing marginal utility* is the phenomenon that each unit of a stimulus has lower utility (or disutility) than the previous unit of the stimulus (Bernoulli, 1738/1954; Gossen, 1854/1983). This produces a concave function in the domain of gains and a convex function in the domain of losses. Note that these functions assume that as additional units of gain or loss are added their marginal value approaches (but never becomes) zero. Combined with loss aversion this produces a utility function analogous to the prospect theory value function (Kahneman & Tversky, 1979).

Sensitization/Satiation

Another nonlinear property of utility is that repeated or extended exposure to a stimulus changes the hedonic impact of the stimulus itself. Initial exposure to a stimulus may *sensitize* one to the stimulus, increasing its hedonic impact. A smell or small taste of cheeseburger can whet the appetite. Continued or additional exposure results in *satiation*, a reduction in the hedonic impact of each successive unit of the stimulus to which one is exposed. A tenth bite of cheeseburger produces less pleasure than the

first (Rolls, Rolls, Rowe, & Sweeney, 1981). Satiation is stimulus-specific. Eating one food does not satiate one to a different food. It may not even satiate one to the food one has already eaten if the food is presented in a different way the second time to the way it was the first time one ate it, such as when the same flavor of pasta is presented in two different shapes or textures (Rolls, Rowe, & Rolls, 1982). Sensitization does not appear to be as stimulus specific as satiation. An appetizer or sip of a sugary drink, for example, increases the enjoyment of most entrées that follow (Wadhwa, Shiv, & Nowlis, 2008).

Satiation is distinguished from diminishing marginal utility in that the marginal utility of a unit of a gain can approach zero but never become zero or negative. In contrast, if one is exposed to enough of a pleasurable stimulus satiation can lead exposure to additional units of a stimulus to have zero or negative value. Even a great song, for example, can become painfully annoying if played repeatedly.

Satiation is also different from *habituation*, which is a reduction in the motivation to consume the stimulus resulting from repeated or extended exposure (McSweeney & Swindell, 1999). Motivation to obtain a reward and the pleasure associated with its consumption are often but not always positively related, a distinction often referred to as wanting versus liking (Berridge & Robinson, 2003). Whether motivational (wanting) or hedonic (liking) processes are responsible for sensitization is not clear. A bite of chocolate could lead one to recognize the sensory properties of subsequent bites more easily, making them more cognitively fluent and consequently more enjoyable (e.g., Reber, Winkielman, & Schwarz, 1998). Alternatively, an initial bite of chocolate may increase motivation to consume the stimulus by initiating the pursuit of a goal or a drive-state (e.g., hunger), which increases the incentive salience of subsequent bites (Berridge & Robinson, 2003; Wadhwa et al., 2008).

Cognitive categorization appears to play an influential role in both diminishing marginal utility and satiation. If through *mental accounting* one segregates gains or losses by posting them to different mental accounts (e.g., monthly income versus poker winnings) the size of one gain or loss may not affect the marginal utility of another gain or loss (Thaler, 1985). One may no longer derive much pleasure from one's high income, for example, but still be excited when one wins \$40 in a poker game with friends. Satiation also occurs more slowly when stimuli are perceived to belong to different categories. When jellybeans are described according to their individual flavors rather than as "jellybeans," people continue to enjoy eating them longer (Redden, 2008). Even a short break in exposure to a stimulus such as a commercial break in the middle of a television show, may be sufficient to slow or reset satiation (Nelson, Meyvis, & Galak, 2009).

Discounting

The experienced utility of experiences is discounted according to the likelihood of having the experience, when it will be experienced, and who will experience it. In other words, people perceive an event to have less value if it is unlikely to happen, will happen in the future, or will happen to someone else. Discounting was first formally considered as a way to determine the value of gambles. In the seventeenth century a correspondence between Pascal and Fermat developed into a formal theory of how to discount outcomes

by their probability (Ore, 1960). It was not until the nineteenth century that the concept of *expected value*, whereby the utility of an outcome should be discounted by the uncertainty of its occurrence, was formally articulated by Laplace (1814/1951). For instance, \$10 is the expected value of a gamble in which one has a 10% chance to win \$100 ($\$100 \times 0.10 = \10). Given a choice between receiving \$10 and playing the gamble, a risk neutral decision maker should be indifferent. She should also prefer playing the gamble to receiving \$9.99, and prefer receiving \$10.01 to playing the gamble.

According to prospect theory, people do not linearly discount the utility of outcomes according to their probability. Generally, low probabilities are overweighted and high probabilities are underweighted. Very small differences in probability can have large effects when they make outcomes impossible or certain (e.g., “There is a 0% [1%] chance that you can have a child” vs. “There is a 100% [99%] that you can have a child”; Kahneman & Tversky, 1979).

Temporal discounting occurs when people discount future pleasures and pains by their distance in time from the present. Given a choice between a small reward immediately and a larger reward later most people prefer to receive a smaller reward immediately rather than the larger reward later. This preference reverses such that they prefer the larger reward to the smaller reward if both are delayed (e.g., Ainslie, 2001). Several phenomena appear to contribute to temporal discounting. Pleasures and pains are believed to be more intense in the present than in the past and future (Caruso, Gilbert, & Wilson, 2008; Van Boven, White, & Huber, 2009). People do not perceive the passage of time at a linear rate – points in time seem further away in the present and closer together in the future – and they discount future rewards accordingly (Zauberman, Kim, Malkoc, & Bettman, 2009). Time delay and the uncertainty of future rewards are also deeply interrelated. Foregoing an immediate reward for a larger future reward introduces the risk that one may not receive the reward in the future. Discount rates are sensitive to the risk that the larger future reward will not be paid (Keren & Roelofsma, 1995).

People may also feel less connected to their self in the distant future than they do to their self in the present or near future – that future self may feel much like a different person (Bartels & Rips, 2010; Ersner-Hershfield, Wimmer, & Knutson, 2009; Hershfield et al., 2011; Parfit, 1984). If one cares more for one’s present than future self, it is rational to enjoy rewards in the present rather than the future. Indeed, the less personally connected one feels to another person the more one exhibits *social discounting*. People will forego a reward paid to them (e.g., \$75) so that another person will receive a reward that is larger (\$150), but the amount they are willing to forego to benefit that other person is sensitive to social distance. The size of reward that people are willing to forego is greater for a close friend than for a stranger (Jones & Rachlin, 2006).

Surprise and Mutability

Uncertainty leads to negative discounting of the utility of future events but can amplify the utility of past events. The more surprising an event, the greater the intensity of affect that event produces (Shepperd & McNulty, 2002). Outcomes that are highly *mutable*, for which a counterfactual alternative seems very easy to imagine, can produce a stronger affective response than outcomes that seem as though they were certain (Kahneman & Miller, 1986; Mellers, Schwartz, Ho, & Ritov, 1997), although

this effect has a larger effect on decision utility and predicted utility than on experience (Buechel, Zhang, Morewedge, & Vosgerau, 2014; Gilbert, Morewedge, Risen, & Wilson, 2004; Sedvalis & Harvey, 2007).

Sequence Effects

Many of the aforementioned contextual influences on utility are repeatedly demonstrated in isolated events such as responses to the outcome of single gamble. However, not all events are experienced in isolation. A four-course dinner, baseball game, week of vacation, year-long health treatment, and career are but a few examples of experiences that extend over time. Whereas people tend to exhibit discounting and a *positive time preference* for isolated events (i.e., prefer to have a reward now rather than later) they tend to exhibit a *negative time preference* when choosing between sequences of events. They prefer improving sequences (Loewenstein & Prelec, 1993) for both positive and negative outcomes, whether those sequences unfold over shorter or longer intervals (Chapman, 2000). Even in the case of wages, where earning more at the beginning of a job rather than at the end would allow one to make more money by investing those early earnings, a majority of people prefer a fixed total wage that is paid in increasing than decreasing amounts over time (Loewenstein & Sicherman, 1991). Preference for improving sequences appears to be multiply determined. Improving sequences may be more likely to elicit anticipatory savoring rather than dread, benefit from adaptation and loss aversion, and benefit more from recency bias – better memory for endings than beginnings (Loewenstein & Prelec, 1993). Baucells and Sarin (2013) argue that given the reference dependence of utility and several of its other contextual features, a J-shaped profile may be the optimal sequence to maximize the utility of extended experiences (an initial high point that drops off quickly and then gradually increases again).

Predicted and Remembered Utility

Evaluations of experienced utility that are not made while having an experience include decision utility, predicted utility, and remembered utility. Decision utility is indirectly inferred from choice and valuation processes such as willingness to pay. Predicted utility and remembered utility are evaluated by asking people to make affective forecasts or retrospective evaluations of the experienced utility associated with an experience – either its total utility or the instant utility of a single moment. These evaluations are then compared to logic (e.g., people should prefer less pain to more pain) or to the instant utility that the same people or other people report while having the experience.

Most research on predicted and remembered utility has examined the accuracy of these evaluations, but both evaluations influence behavior as well. The predicted utility of receiving a reward influences the effort that people expend to receive it (Morewedge & Buechel, 2013). The remembered utility of a past experience influences whether and how soon people desire to repeat it (Garbinsky, Morewedge, & Shiv, 2014a, 2014b; Redelmeier & Kahneman, 1996; Wirtz, Kruger, Scollon, & Diener, 2003).

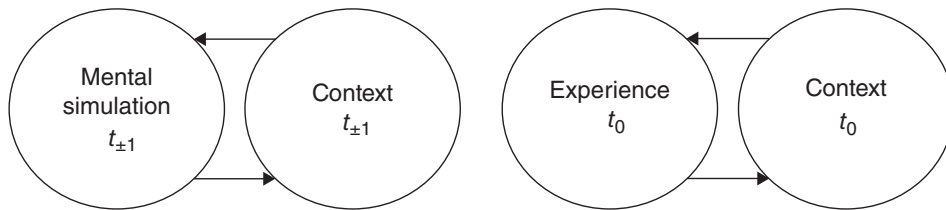


Figure 10.3 Predicted and remembered utility evaluated at $t_{\pm 1}$ rely on mental simulations of past or future experiences had at t_0 , corrected for differences between the context in which the experience is simulated ($t_{\pm 1}$) and the context in which it was or will be had (t_0).

Source: Adapted from Gilbert & Wilson (2007).

Evaluating predicted utility and remembered utility requires one to mentally simulate an experience other than the present, so there is considerable overlap in the neural machinery and cognitive processes that underlie both tasks. Both appear to involve prefrontal and medial temporal lobe regions, posterior regions, and a large-scale brain system including the hippocampal formation (Schacter, Addis, & Buckner, 2008). Whether one recalls the utility of a past experience or forecasts the utility of a future experience ($t_{\pm 1}$), one must construct a simulation of that past or future experience (t_0) and correct for differences in context at the time of simulation ($t_{\pm 1}$) and at the time of experience (t_0) (Figure 10.3). When predicting how much one will enjoy a meal or when recalling how much one did enjoy that meal, for example, one constructs a simulation of the meal and notes one's reaction to that simulation (at $t_{\pm 1}$). One must also account for differences in how hungry one is while making this prospective or retrospective evaluation (at $t_{\pm 1}$) and how hungry one was or will be when eating the meal (at t_0).

There are systematic differences between the instant utility reported while having experiences and prospective and retrospective evaluations of those experiences (for reviews, see, Fredrickson, 2000; Gilbert & Wilson, 2007; Lowenstein & Schkade, 1999). The considerable overlap in the processes that underlie these prospective and retrospective evaluations leads to considerable overlap in the kinds of bias observed in both judgments. Predicted and remembered utility differ in their perceived intensity and scope. The predicted utility of experiences tends to be more extreme than the remembered utility of experiences (e.g., Caruso, Gilbert, & Wilson, 2008) and what will happen is less constrained than what has already transpired (e.g., Van Boven, Kane, & McGraw, 2009). However, evaluations of the predicted and remembered utility of an experience have more in common with each other than does either with evaluations made during the experience itself (e.g., Klaaren, Hodges, & Wilson, 1994; Mitchell, Thompson, Peterson, & Cronk, 1997; Novesmyky & Ratner, 2003; Schacter et al., 2008).

Errors in predicted and remembered utility occur when simulations made at $t_{\pm 1}$ are inaccurate representations of experiences had at t_0 or when insufficient correction is made for the influence of different contexts at time of evaluation $t_{\pm 1}$ and experience t_0 . Gilbert and Wilson (2007) identified four general kinds of cognitive bias that introduce such errors into evaluations of predicted utility (affective forecasts). Many of these cognitive biases are also observed in judgments of remembered utility. To facilitate comparison, biases in both judgments are organized according to this taxonomy, along with a fifth kind of bias due to motivated reasoning.

- 1 ***Simulations are unrepresentative.*** Evaluations of predicted and remembered utility rely on memories of past experiences (Schacter et al., 2008). The memories that people recall when making these evaluations, however, tend to be unrepresentative. People tend to recall atypical instances of past experiences. When asked to recall any one baseball game, fans tend to recall the best baseball game that they can remember (Morewedge, Gilbert, & Wilson, 2005). Similarly, the single most painful moment of a recent medical procedure (the “peak” moment of pain) tends to stand out in memory (Redelmeier & Kahneman, 1996). As a consequence of their greater accessibility, these atypical instances are overweighted in judgments of predicted and remembered utility (Fredrickson, 2000; Kahneman et al., 1993; Morewedge, 2013; Morewedge et al., 2005). People only correct for the atypicality of the instances that they recall when making these judgments if their atypicality is obvious or is made obvious (Ariely & Loewenstein, 2000; Morewedge, 2013; Morewedge et al., 2005, 2009; Morewedge & Todorov, 2012).

An additional source of unrepresentativeness in simulations of the past is biased forgetting. People exhibit *fading affect bias* – better autobiographical memory for positive than for negative experiences, which increases with the passage of time (Walker, Skowronski, & Thompson, 2003). Because people do not realize they have forgotten more bad experiences from the distant than the recent past, the greater accessibility of atypically positive autobiographical memories gives rise to *nostalgic preferences* (Morewedge, 2013; cf. Eibach, Libby, & Gilovich, 2003). Regardless of the era in which they were born, most people believe that the music, movies, movie stars, fashion models, and automobiles that were popular when they were young were superior to their modern counterparts (Holbrook & Schindler, 1989; Schindler & Holbrook, 2003).

- 2 ***Simulations omit inessential features.*** Simulations tend to include the features of experiences that are essential to defining it but omit many of the features that comprise the event that are shared with other experiences (Liberian, Sagristano, & Trope, 2002). More generally, events take on a narrative form when they are anticipated or remembered (Baumeister & Newman, 1994), and features that do not support the narrative may be overlooked in prospect or hindsight. Women who believe that menstruation induces particular psychological and physical discomfort remember having experienced more intense negative emotions during menstruation than they reported during the experience (McFarland, Ross, & DeCourville, 1989). Similarly, cyclists are more likely to focus on the best moments of a long bicycle ride and less on its disappointing moments when anticipating or recalling the ride than while on the ride itself (Mitchell et al., 1997).

This influence of narrative on memory is driven, in part, by a greater reliance on semantic memory and associations than episodic memory as the elapsed time between an event and its recollection increases (T. E. Robinson & Clore, 2002). The tendency to focus on more abstract features of experience also becomes more pronounced as the temporal distance between the experience and the present increases. Consequently, the greater the delay between the time when one has an experience and when it is forecasted or recalled the more judgments should neglect narrative-inconsistent concrete details (Trope & Liberman, 2003).

Focalism during prediction and recollection is another bias leading simulations to omit inessential features of experience. During prediction, people tend to fix

their attention on the focal event and overweight its impact while neglecting to consider other concurrent features of their experience. People overestimate how much happier they would be with a higher salary, for example, because they neglect to think about all the nonpecuniary factors that influence their quality of living (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2006). Students overestimate how happy they will be if their school wins a football game because they neglect to consider all of the other day-to-day events that will influence how they will feel (Wilson, Wheatley, Meyers, Gilbert, & Axson, 2000), and Midwesterners overestimate how much happier they would be if they moved to California because they focus on the superiority of its climate and neglect to consider how increased traffic, impoverished state and local governments, and higher pollution would influence their lives (Schkade & Kahneman, 1998).

Focalism similarly influences evaluations of remembered utility. Supporters of Bush and Gore in the 2000 U.S. presidential election, not only overestimated the intensity of their hedonic response to the outcome of the election when making affective forecasts but also overestimated how happy or unhappy they felt on the day the Supreme Court determined the outcome of the election, when recalling that day four months later (Wilson, Meyers, & Gilbert, 2003).

- 3 ***Simulations are abbreviated.*** When people imagine the future or remember the past, their simulations do not comprise the entirety of the experience. People tend to focus to a greater extent on the most proximal moment of the experience, whether that be the beginning of a future experience or the end of an experience in the past. When forecasting how it would feel to buy a new car or undergo dialysis people think of how those experiences will initially impact on their life. They do not anticipate how they will feel once the new state is routine and has become their reference point (Riis et al., 2005; Wang, Novemsky, & Dhar, 2009). This focus on the initial transition between states, and failure to account for the ability to adapt to both mundane and extraordinary changes over time, leads predictors to overestimate the hedonic impact of future experiences (Ubel, Loewenstein, & Jepson, 2005).

When evaluating past experiences, people remember the beginning of the experience better than the middle, and best remember the ending of the experience (Ebbinghaus, 1913; Murdock, 1962). This recency bias results in the overweighting of endings when evaluating the remembered utility of past experiences (Fredrickson & Kahneman, 1993) and in making decisions based on their remembered utility (e.g., Garbinsky et al., 2014a, 2014b; Wirtz et al., 2003). Coupled with better memory for atypical moments, this generates a *peak-end* bias that can be sufficiently strong to cause *dominance violations*, instances when people exhibit preferences for outcomes that clearly yield less utility than their alternatives. Research participants in one study held one hand in 14°C water for 60 seconds and held the other hand in water that after 60 seconds at 14°C was raised to 15°C for an additional 30 seconds (the order was random). When participants chose which experience to repeat, the majority preferred the latter, more painful experience with the better ending (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993).

Kahneman and colleagues have suggested that the peak-end bias leads evaluations of remembered utility to exhibit insensitivity to the duration of experiences. However, this *duration neglect* appears to be limited to experiences that are unfamiliar such as novel sounds (Schreiber & Kahneman, 2000), plotless films

(Fredrickson & Kahneman, 1993), heat probes (Ariely, 1998), cold-pressor tasks (Kahneman et al., 1993), and invasive medical procedures (Redelmeier & Kahneman, 1996). When people have sufficient familiarity with an experience to know its average duration (e.g., their daily commute, a telephone ring) or are given a standard with which to evaluate novel experiences they do incorporate the duration of the experiences into their evaluations of its remembered utility (Ariely & Loewenstein, 2000; Morewedge et al., 2009).

- 4 ***Simulations are decontextualized.*** The context in which one has an experience is often quite different from the context in which one predicts or recalls it. A failure to correct for contextual differences is a fourth source of systematic bias in predicted and remembered utility. One reason people fail to make this correction is that they simply lack awareness of the differences between the context in which the experience is predicted or recalled and the context in which it is had. Predictors are often not aware of the different comparison standards that will be salient while having an experience (Hsee & Zhang, 2004) and overestimate their ability to compare an experience to its alternatives while having that experience (Buechel et al., 2014; Morewedge, Gilbert, Myrseth, Kassam, & Wilson, 2010).

Empathy gaps between the circumstances in which an experience is had and is evaluated are another source of errors (Loewenstein & Schkade, 1999; Van Boven & Loewenstein, 2003). Diners underestimate how much they will enjoy a meal if they forecast their enjoyment of the meal on a full stomach (Gilbert, Gill, & Wilson, 2002) and smokers well acquainted with nicotine cravings who are in a “cold state” after smoking underestimate how much money they will be willing to forego to have a cigarette when in a “hot state” of craving (Sayette, Loewenstein, Griffin, & Black, 2008). An example of this error in remembered utility is lacking access to what was enjoyable about debaucheries one committed the night before (Loewenstein, 2005).

- 5 ***Motivated Reasoning.*** In addition to cognitive biases in predicted and remembered utility, motivation can influence the simulations created to imagine the future and remember the past. People may exaggerate the predicted utility of future events and the remembered utility of past events as a means to motivate them to produce those events or repeat them. People are more likely to overestimate how happy they would be if they won a contest if they have committed to winning it than if they have not yet decided whether to commit to winning it. This appears to be strategic because the happier people think winning would make them feel the harder they work to win the contest (Morewedge & Buechel, 2013). People also appear to combine and segregate past events in memory to make those events appear to have been more pleasant when they want to repeat them. Problem gamblers engage in *hedonic editing* strategies, retrospectively separating and combining past wins and losses in a manner that allows them to favorably remember those experiences (Cowley, 2008). Prediction and recollection may also be used as a means with which to regulate present mood. People exaggerate the positivity of future events to elevate negative present moods (Buehler, McFarland, Spyropoulos, & Lam, 2007), and they remember past events more favorably when focusing on the emotional impact of remembering events than on remembering them accurately (Kennedy, Mather, & Carstensen, 2004).

Simulation Versus Theory

There are two theoretical accounts of how predicted utility is anticipated, a simulation-based account and a theory-based account. The simulation accounts suggest that people use their affective response to the simulation they generate as a proxy for the affect that the event will produce (Gilbert & Wilson, 2007). In other words, the response they feel toward the simulation serves as a “prefeeling” that acts as the basis for their prediction. Consequently, errors in affective forecasting are due to a failure to correctly simulate the event (Morewedge et al., 2005), or to make sufficient corrections for differences in the context in which the event is simulated and the context in which the event is experienced (Morewedge, Gilbert et al., 2010).

The theory-based account suggests that people imagine the event, anticipate its consequences, and then attempt to anticipate the affective impact of those consequences (Loewenstein & Lerner, 2003). People may take a reason-based approach, for example, when predicting how a previous event might influence their satisfaction with one that follows. People assume they would enjoy a positive event more if they recently experienced a similar negative event (Tversky & Griffin, 1991). This account suggests that errors in affective forecasting are due to erroneous implicit or explicit theories about the circumstances and consequences of the simulated event, or about the emotions that those circumstances and consequences will evoke. For instance, forecasters are better able to recognize that they will be hesitant to tell a joke in front of a large group of their peers if they are in a high state of arousal while forecasting than if they are in a calm state. When not in a high state of arousal at the time of prediction, forecasters fail to appreciate how anxious telling a joke in public will make them feel and how likely they will be to “chicken out” (Van Boven, Loewenstein, Welch, & Dunning, 2012).

Maximization Failures

Most economists and laypeople assume that they should choose options that maximize their total experienced utility. This presumes that the option with the highest decision utility maximizes experienced utility, and that the decision utility of an option accurately reflects the experienced utility provided by the option if it is chosen (Bentham, 1789; Bruni & Sugden, 2007; Samuelson, 1938). Often people do make choices that provide them with the greatest total utility, but many cases have now been documented in which decision utility inferred from choices systematically fails to maximize experienced utility as inferred from predicted, instant, and remembered utility (e.g., Gilovich, Griffin, & Kahneman, 2002). These systematic failures are important not only for their practical implications but also for their theoretical implications. They constitute serious challenges to rational-actor theories based on the idea of *discovered preferences*, which assume that people choose what best satisfies their preferences if they have prior experience with those choice options (Bruni & Sugden, 2007).

Maximization failures can generally be attributed to a failure to identify which option maximizes utility, a failure to choose the option identified as maximizing utility, or both (Hsee & Hastie, 2006). In the section Predicted and Remembered

Utility I have articulated numerous reasons why predicted utility often fails to reflect the instant or total utility derived from experiences. These biases in prediction suggest many cases in which people will fail to maximize utility simply because they do not accurately predict what action or option will yield the most instant or total utility. These errors in predicted utility do not only occur for novel experiences. People exhibit an *impact bias*, overestimating the hedonic impact of positive and negative events, for familiar events that they have experienced before (e.g., Gilbert et al., 2004; Meyvis, Ratner, & Levav, 2010).

Perhaps more troubling for the assumptions underlying decision utility is that even when predicted utility is accurate people often do not choose the option that would maximize their experienced utility. This failure can be attributed to cognitive or environmental constraints when attempting to select that option and to factors preventing the implementation of the option they selected. People are bounded in their rationality. Although they do seek to behave rationally, cognitive abilities are limited, time is finite, and the environment often does not clearly provide the information necessary to choose the best option in a choice set. Many choice sets are sufficiently large or complex that it is too difficult or impossible to identify which option will maximize utility given time, effort, and cognitive capacity constraints (e.g., buying a house or car).

People often resort to *satisficing* as a decision strategy (Simon, 1982) under these circumstances, choosing an option that simply meets or surpasses their aspiration level. A family buying a home may first use a noncompensatory choice strategy to eliminate all options without the desired attributes most important to them (e.g., three bedrooms, two bathrooms, in a good school district). Once they have reduced the size of their consideration set, they may then use a compensatory strategy in which they attempt to calculate and compare the utility of each option in that smaller set of remaining options (e.g., houses X, Y, and Z). More simple decisions may merely involve serially evaluating options. Instead of evaluating the quality of every avocado at the supermarket, a shopper might inspect avocados one at a time until she has found three suitably ripe avocados.

If choices are too complex or anxiety provoking people may defer choice until later or choose to not make a decision (C. J. Anderson, 2003). Virtually any retirement savings strategy is better than not saving. Yet, the feeling that one cannot identify the best option may lead people to postpone making any investment at an enormous cost to their future selves (Iyengar, Huberman, & Jiang, 2004).

If people do accurately identify the best option that will maximize their utility, they must then implement it if the utility is to be maximized. Implementation failures may arise if impulsivity or an intense visceral state undermines their self-control (Ainslie, 2001; Loewenstein, 1996). Many smokers realize that their lives would be improved if they quit smoking but succumb to urges triggered by smoking-related cues even after their physiological addiction to nicotine has subsided (T. E. Robinson & Berridge, 2003). Failures also arise when what would bring people most pleasure and what they most want diverge (Berridge, Robinson, & Aldridge, 2009). Sexual arousal leads people to endorse activities and exhibit preferences that they consider unwise or distasteful when not aroused (Ariely & Loewenstein, 2006).

Finally, overadhering to rules that usually maximize utility or improve self-control can, paradoxically, create failures to maximize utility (Hsee & Hastie, 2006). People have difficulty saving, for instance. When an opportunity to easily save presents itself,

to compensate, they may spend so much time and energy saving that they leave themselves too little time to enjoy all that they have acquired (Hsee, Zhang, Cai, & Zhang, 2013). Consequently, they may later regret overly virtuous behavior and feel they missed out on the pleasures of life (Kivetz & Keinan, 2006). It is usually good to avoid wasting money, but once money has been spent, focusing on *sunk costs* can lead to choices that do not maximize utility. Of students who imagined having inadvertently purchased both a nonrefundable \$100 ticket for a less enjoyable ski trip to Michigan and a nonrefundable \$50 ticket for a more enjoyable ski trip to Wisconsin on the same weekend, only 46% said they would go on the trip to Wisconsin. Despite having spent \$150 no matter what they decided, the majority reported that they would go on the less enjoyable but more expensive trip to Michigan to feel as though they wasted less money (Arkes & Blumer, 1985).

Summary

The attempt to define, measure, and quantify experienced utility has afforded considerable insight into the ability to maximize utility, the comparative value of experiences, the psychological processes by which utility and value are evaluated, and the reasons for maximization failures. Psychological measures of experienced utility are available. These measures are far from perfect and may fail to capture important facets of total utility. Yet, they have allowed for the identification of cognitions and contextual influences that profoundly affect experienced utility (e.g., anticipatory thoughts, memories, and comparisons) and factors that influence experienced utility less than intuition and introspection suggests (e.g., income, health, and major life events).

A systematic understanding of contextual influences on experienced utility is developing alongside a better understanding of the process by which experienced utility is evaluated. Considerable evidence now suggests that the utility of an experience is evaluated quite differently depending on whether its evaluation is made before, during, or after the experience. Moreover, this evidence suggests that decision utility is not only an indirect measure of experienced utility. It is often systematically wrong, and a distinction between decision utility and experienced utility is required. Much has been learned from readopting a psychological approach to the study of utility, and there is much more to look forward to learning.

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Notes

1. Pareto also argued that a move from a standard of utility based on hedonic or sensory properties to rational choice would serve economics as a science because it would distinguish it from psychology (Bruni & Sugden, 2007).

2. An important point lost in many later adaptations of his theory was that Pareto believed rational choice required considerable familiarity with the choice options. One could not expect a person to choose the option with higher utility if she was not already familiar with those options (Bruni & Sugden, 2007).
3. It is important to note that the experiences that participants evaluated were not selected systematically. A more systematic selection of experiences, or a different method of belief elicitation, may yield different results.
4. Whether core affect then is assigned an emotion label, or if emotions such as happiness, sadness, anger, and fear are directly evoked, is a topic of considerable debate between two-factor theorists and theorists advocating a *basic emotions* perspective (Ekman & Cordaro, 2011), in which there are at least distinct emotions that all humans experience, with unique psychological and physiological antecedents, expression, and consequences.

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