Experienced Utility and Objective Happiness: A Moment-Based Approach

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Chapter 37 in:
D. Kahneman and A. Tversky (Eds.)
Choices, Values and Frames
New York: Cambridge University Press
and the Russell Sage Foundation
To appear: summer 2000

September 12, 1999

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Experienced Utility and Objective Happiness:
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The concept of utility has carried two different meanings in its long history. As Bentham (1789) used it, utility refers to the experiences of pleasure and pain, the "sovereign masters" that "point out what we ought to do, as well as determine what we shall do." In modern decision research, however, the utility of outcomes refers to their weight in decisions: utility is inferred from observed choices and is in turn used to explain choices. To distinguish the two notions I refer to Bentham's concept as ***experienced utility*** and to the modern usage as ***decision utility***. Experienced utility is the focus of this chapter. Contrary to the behaviorist position that led to the abandonment of Bentham's notion (Loewenstein, 1992), the claim made here is that experienced utility can be usefully measured. The chapter presents arguments to support that claim, and speculates about its implications.

This essay has three main goals: (1) to present a detailed analysis of the concept of experienced utility and of the relation between the pleasure and pain of moments and the utility of more extended episodes; (2) to argue that experienced utility is best measured by moment-based methods that assess the experience of the present; (3) to develop a moment-based conception of an aspect of human well-being that I will call "objective happiness." The chapter also introduces several unfamiliar concepts that will be used in some of the chapters that follow.

Pleasure and pain are attributes of a moment of experience, but the outcomes that people value extend over time. It is therefore necessary to establish a concept of experienced utility that applies to temporally extended outcomes. Two approaches to this task will be compared here.

(i) The ***memory-based*** approach accepts the subject's retrospective evaluations of past episodes and situations as valid data. The ***remembered utility*** of an episode of experience is defined by the subject's retrospective global assessment of it.

(ii) The ***moment-based*** approach derives the experienced utility of an episode from real-time measures of the pleasure and pain that the subject experienced during that episode. ***Moment-utility*** refers to the valence (good or bad) and to the intensity (mild to extreme) of current affective or hedonic experience. The ***total utility*** of an episode is derived exclusively from the record of moment-utilities during that episode.

The main novelty of the treatment proposed here is that it is thoroughly moment-based. Section 2 reviews some of the evidence that raises doubts about the validity of memory-based assessments. Section 3 presents the conditions that must be satisfied to permit an assessment of the total experienced utility of episodes from the utilities of their constituent moments. Section 4

[1] I thank Shane Frederick, Barbara Fredrickson, Laura Gibson, David Laibson, Nathan Novemsky, David Schkade, Cass Sunstein, Richard Thaler, Anne Treisman, and Peter Wakker for helpful comments. I also thank Peter Wakker for allowing me to use ideas and sentences that we had fashioned together, and Peter McGraw for extremely valuable assistance and useful suggestions.

introduces a moment-based concept of objective happiness, and examines the feasibility of its measurement. Section 5 exposes the ambiguity of a central idea of the well-being literature -- the hedonic treadmill -- and discusses how measures of objective happiness could contribute to the resolution of that ambiguity. A research agenda and some major objections are discussed in Section 6.

Insert Figure 1 about here

The main concepts of the present treatment are illustrated by Figure 1, which is drawn from a study of immediate and retrospective reports of the pain of medical procedures (Redelmeier and Kahneman, 1996). Patients undergoing colonoscopy were asked every 60 seconds to report the intensity of their current pain, on a scale where 10 was 'intolerable pain' and 0 was 'no pain at all'. These ratings were used to construct the profiles of ***moment-utility*** shown in the figure. The patients later provided several measures of the ***remembered utility*** of the procedure. They evaluated the entire experience on a scale, and they also compared it to a standard set of aversive experiences. The ***total utility*** associated with each patient's colonoscopy has a different nature. Unlike moment-utility and remembered utility, it is not an expression of a subjective feeling or judgment. Total utility is an objective assessment of the statistics of a utility profile.

The cases of patients A and B also illustrate the contrast between remembered utility and total utility. It is immediately apparent from inspection of Figure 1 that patient B had a worse experience than patient A,[2] and this impression will be confirmed by the analysis of total utility in section 3 (see Figure 2). However, patient A in fact retained a worse evaluation of the procedure than patient B. In this case, as in many others, remembered utility and total utility do not coincide, and outcomes will be ranked differently depending on whether experienced utility is assessed by a memory-based or by a moment-based method.

2. Memory-Based Assessment: Remembered Utility

Anyone who has cared for an elderly relative whose memory is failing has learned that there is a crucial difference between two ostensibly similar questions. The question "How are you now?" may elicit a confident and cogent answer while the question "How have you been?" evokes only confusion. This distinction is rarely drawn in other settings. We normally expect people to know how they have been as well as they know how they are. Memory-based evaluations of experience and reports of current pleasure and pain are treated with equal respect in routine conversations -- but the respect for memory is less deserved. Studies of the psychology of remembered utility are reviewed in detail in the next chapter. The main conclusions of this research are listed below, and illustrated by the colonoscopy study from which Figure 1 was drawn.

[2] On the assumption that the two patients used the pain scale similarly. This issue is discussed further in section 3.

Duration neglect. No one would deny that it is generally better for a colonoscopy to be short than to be long. At least in principle, then, the duration of a colonoscopy is relevant to its overall utility. However, memory-based assessments do not generally conform to this principle. For example, the colonoscopies studied by Redelmeier and Kahneman (1996) varied in duration between 4 and 69 minutes, but the correlation between the duration of a procedure and the patient's subsequent evaluation of it was only .03. Furthermore, the duration of the colonoscopy had no effect on patients' hypothetical choice between a repeat colonoscopy and a barium enema. Complete, or nearly complete neglect of duration has been found in other studies, using a variety of different research designs. A hypothesis of 'evaluation by moments' is introduced in chapter 38 to explain these findings: it asserts that the remembered utility of an episode is determined by constructing a composite representative moment, and by assessing the utility of that moment.

The Peak/End rule. The patients' subsequent evaluation of the procedure was predicted with relatively high accuracy (r = .67) from the average of the most intense level of pain reported during the procedure, and of the mean pain level reported over the last three minutes. Because the Peak/End average was higher for patient A than for patient B, this empirical rule predicts -- correctly -- that patient A would retain a more aversive memory of the colonoscopy than would patient B. Strong support for the Peak/End rule was obtained in several other studies, reviewed in detail in the following chapter.

Violations of dominance. The Peak/End rule implies a counter-intuitive prediction: adding a period of pain to an aversive episode will actually improve its remembered utility, if it lowers the Peak/End average. For example, several extra minutes at pain level 4 would be expected to improve patient A's global evaluation of the procedure. A clinical experiment with 682 patients undergoing colonoscopy tested this prediction. Half of the patients were randomly selected for an experimental treatment, in which the examining physician left the colonoscope in place for about a minute after terminating the examination. The patient was not informed of the manipulation (Katz, Redelmeier and Kahneman, 1997).[3] The extra minute is distinctly uncomfortable, but not very painful. The effect of the experimental treatment was to reduce the Peak/End average for patients, such as patient A, who would otherwise have experienced considerable pain in the final moments of the procedure. As predicted by the Peak/End rule, retrospective evaluations of the procedure were significantly more favorable in the group that experienced the prolonged procedure than in the group that was treated conventionally.

Similar violations of dominance were also observed in choices: in one experiment, participants were exposed in immediate succession to two unpleasant sounds of similar composition. One of them lasted for 10 seconds at 78 db; the other consisted of the same 10 seconds at 78 db, followed by 4 seconds at 66db. When given an opportunity to choose which of the two sounds would be repeated later, most participants chose the longer (Schreiber and Kahneman, 2000; [ch. 38]). This choice is odd, because 4 seconds of silence would clearly be preferable to 4 seconds of 66 db noise. In this simple situation, decision utility appears to be

[3] The ethical justification for the experiment was the observation of poor compliance among patients who have had a painful colonoscopy and are instructed to schedule another.

determined directly by remembered utility: people choose to repeat the sound they dislike least, and the Peak/End rule determines that.

3. Moment-Based Assessment: Total Utility

The evidence reviewed in the preceding section suggested that memory-based assessments of experienced utility should not be taken at face value. The present section introduces a moment-based alternative, in which the ***total utility*** of an episode is derived from a temporal profile of moment-utility. The same analysis extends to related episodes separated in time, because utility profiles may be concatenated. For example, the total utility of a Kenya safari should include subsequent occasions of slide-showing and reminiscing.

Figure 2a presents the data of Figure 1 in the form of a decumulative function, which shows the amount of time spent at or above each pain level. If the measure of moment-utility on which it is based satisfies a stringent set of conditions, total utility can be derived from the type of representation illustrated in Figure 2 (Kahneman, Wakker and Sarin, 1997). Six conditions are listed below. The first four impose requirements on the measure of moment-utility. The last two conditions are normative in character; they specify how total utility is constructed from moment-utilities.

Figure 2 about here

Inclusiveness. In a moment-based approach the utility profile is a 'sufficient statistic' to determine the experienced utility of an extended outcome. The measure of moment-utility should therefore incorporate all the aspects of experience that are relevant to this evaluation. In particular, a measure of moment-utility should reflect the affective consequences of prior events (e.g., satiation, adaptation, fatigue), as well as the affect associated with the anticipation of future events (fear, hope).

Ordinal measurement across situations. The measurement of moment-utility must be ordinal or better. Experiences of different types (e.g., a stubbed toe and a humiliating rebuke) must be measured on a common scale.

Distinctive neutral point. The pain scale that was used in the colonoscopy study has a natural zero point. However, the dimension of moment-utility is bipolar, ranging from intensely positive to neutral, and from neutral to intensely negative affect. A distinctive neutral point ("neither pleasant nor unpleasant", "neither approach nor avoid") anchors the scale and permits comparisons across situations and persons.[4] As will be seen later, a stable zero is also essential for cardinal measurement of moment-utility on a ratio scale.

[4] Some authors consider valence as bi-valent rather than bipolar (e.g., Cacioppo, Gardner, and Berntson, 1999).

Interpersonal comparability. The scale must permit comparisons of individuals and groups. The next section shows that this requirement may be more tractable than is commonly thought.

The next two requirement are of a different nature. They involve normative assumptions about the nature of total utility. The assumptions of separability and time-neutrality are required to justify the transformation of utility profiles (e.g., Figure 1) into the decumulative format (e.g., Figure 2). The discussion of these assumptions highlights a critical difference between the present analysis and economic models of the utility of sequences of outcomes. These models generally describe outcomes as physical events (see, e.g., chapters 32-33). The analysis of total utility, in contrast, describes outcomes as moment-utilities.

Separability: *the order in which moment-utilities are experienced does not affect total utility*. Order effects are ubiquitous in experienced utility. For example, a strenuous tennis game and a large lunch yield a better experience in one order than in the other, because the enjoyment of the tennis game is sharply reduced when it follows lunch. The condition of separability states that the contribution of an element to the global utility of the sequence is independent of the elements that preceded and followed it. This condition is often violated when the sequences are described in terms of physical events, such as lunch and a tennis game. In a moment-based treatment, however, the elements of the sequence that is to be evaluated are not events -- they are moment-utilities associated with events. Because ***all*** the effects of the order of events are already incorporated into moment-utilities, separability can be assumed for these moment-utilities. Separability is necessary for the decumulative representation, which does not preserve order information. To appreciate the intuition, consider an individual who receives two unexpected prizes in immediate succession, one of $500, the other of $10,000, then promptly dies, or loses his memory. In evaluating the total utility of these experiences, we recognize that it would be better for the two prizes to arrive in ascending rather than in descending order – presumably because the enjoyment of the smaller prize is greater when it comes first. Now imagine that all you know is that just before he died (or became amnesic) an individual had two pleasurable experiences with utilities U_a and U_b, where $U_a >> U_b$, Would we still think that their order matters? When outcomes are moment-utilities, there is no compelling reason to reject separability.

Time neutrality: *all moments are weighted alike in total utility.* Total utility is a measure on completed outcomes, and is therefore always assessed after the fact. Unlike decision making, in which the temporal distance between the moment of decision and the outcome may matter, the temporal distance between an outcome and its retrospective assessment is entirely irrelevant to its evaluation. Total utility is therefore ***time neutral***. In this important respect, it is unlike decision utility and remembered utility, which both assign more weight to some parts of the sequence than to others. The decision utility of outcomes that occur late in a sequence is often heavily discounted. In remembered utility, on the other hand, the last parts of a sequence are weighted more than those that came earlier -- a bias that is incorporated in the Peak/End rule. The normative status of both weighting schemes is dubious. If the benefits are obtained before the costs must be paid, discounting of delayed outcomes in decisions favors myopic preferences for options that do not maximize total utility. The overweighting of endings

may be equally unreasonable: an experience that ended very badly could still have positive utility overall, if it was sufficiently good for a sufficiently long time (Kahneman, Wakker and Sarin, 1997).

Measures of total utility

The representation of Figure 2 assumes both that a utility profile can be rearranged at will and that all its parts are weighted equally. Separability and time neutrality are therefore necessary, and together with the assumptions of inclusiveness and ordinal measurement, sufficient for the representation of utility profiles as decumulative temporal distributions. The total utility of episodes is a measure on these distributions.

Figure 2 illustrates two representations of temporal distributions of utility, which differ in their ordinates: time is shown in absolute units in panel (a), but in proportional units in panel (b). The representation of panel 2a is appropriate when the duration of the episode is relevant to its evaluation. Thus, it is reasonable to say that the colonoscopy of patient B was worse than that of patient A because it lasted longer. On the other hand, it does not make sense to say that Helen was happier last week than she was last Sunday because last week was longer than last Sunday. The representation of Figure 2b is correct when the duration of the period of evaluation is not relevant to its evaluation. It is the appropriate representation in the assessment of the well-being of individuals and groups, which is discussed in the next section.[5]

As Figure 2a illustrates, the ordinal measurement of moment-utility permits the detection of distributional dominance. By this simple test, patient B had a worse colonoscopy than patient A. The decumulative distribution can also be characterized by non-parametric statistics, such as the median and other fractiles. However, distributional dominance is a blunt measuring instrument, and no single non-parametric index captures all the relevant information contained in a temporal distribution of moment-utilities. Figure 2b presents decumulative distributions of moment-utility for two individuals, George and Helen. There is no dominance in this comparison, and the medians are close. The main conclusion that can be drawn is that George experienced more extremes of affect than Helen did.

Cardinal measurement of moment-utility would be desirable, of course. With cardinal measurement, the most natural index of total utility could be calculated: the temporal integral of moment-utility. The idea has a long history (Edgeworth discussed it in 1881) but it effectively requires a rescaling of moment-utility in terms of physical time, which is difficult to implement. This reasoning is explicit in the use of QALYs (Quality Adjusted Life Years) in medical decision making. QALY's are derived from judgments of equivalence between periods of survival that vary in duration and in level of health. For example, two years of survival at a QALY of 0.5 are equally desirable as one year in normal health (Broome, 1993).

[5] There are situations in which both representations are relevant. The total utility (or happiness) that Alan enjoyed while he was married to Helen may depend on how long they were married before she died in an accident. On the other hand, an assessment of how happy Alan was in his marriage should not be influenced by how long it lasted.

A formal analysis of the temporal integration rule was offered by Kahneman, Wakker and Sarin (1997). Their treatment invoked all the assumptions that were discussed in this section, including separability and temporal neutrality. In addition, it introduced an idealized objective observer, who assesses the total utility of utility profiles, such as those of Figure 1. The following axioms specify the logic of this assessment.

1. *The global utility of a utility profile is not affected by concatenation with a neutral utility profile.*
2. *Increases of moment-utility do not decrease the global utility of a utility profile.*
3. *In a concatenation of two utility profiles, replacing one profile by another with a higher global utility will increase the global utility of the concatenation.*

The following theorem can be proved: "The three axioms above hold if and only if there exists a non-decreasing ("value") transformation function of moment-utility, assigning value 0 to 0, such that global utility orders utility profiles according to the integral of the value of moment-utility over time." The proof is due to Peter Wakker.

The representation of total utility as a temporal integral implies a scale of moment-utility, monotonically related to the original scale, but now calibrated by its relation to duration. For example, suppose that an idealized observer who conforms to the axioms judges that 1 minute of pain that had been rated 7 on the original scale is equivalent to 2 minutes at a rating of 6. On the transformed scale, the value that corresponds to the original rating of 7 will be double the value assigned to a rating of 6. Idealized observers are hard to find, of course, and cardinal scaling of utility is therefore a conceptual exercise rather than a practical procedure. Fortunately, the decumulative representation is adequate for many purposes. The conditions identified by Kahneman, Wakker and Sarin (1997) are sufficient to guarantee this representation, without attempting cardinal measurement and without involving observers.

4. Objective Happiness: Concept and Measure

Moment-utility is the building block of the broader construct of experienced utility. It is also the building block for a construct of ***objective happiness***, with which the remainder of this chapter is concerned. Like total utility, objective happiness is to be derived from a distribution of moment-utility (see Figure 2b for an example) that characterizes an individual (George or Helen), a group (Californians, midwesterners, paraplegics), or a setting (the Washington subway, the New York subway). Like total utility, objective happiness is a moment-based concept, which is operationalized exclusively by measures of the affective state of individuals at particular moments in time. In this essential respect, objective happiness differs from standard measures of subjective well-being, which are memory-based and require the subject to report a global evaluation of the recent past. The term 'objective' is used because the judgment of happiness is made according to objective rules. The ultimate data for the judgment are, of course, subjective experiences.

In the special conditions of the clinic or laboratory it is sometimes possible to obtain continuous or almost continuous reports of experienced utility from patients or experimental subjects. Continuous measures are of course impractical for the measurement of objective

happiness over a period of time. Sampling techniques must be used to obtain a set of values of moment-utility that adequately represents the intended population of individuals, times and occasions. For example, a study of the objective happiness of Californians should use a sample of observations that reflects the relative amounts of time spent on the freeway and in hot tubs. Techniques for sampling times and occasions have been developed in the context of Experience Sampling Methodology (ESM) (Csikszentmihalyi, 1990; Stone, Shiffman and DeVries, 1999).[6]

Reporting the sign and intensity of current hedonic and affective experience is not essentially different from the standard psychophysical tasks of reporting color or smell. The report of affect is probably intermediate in difficulty between these tasks: somewhat more difficult than labeling colors, but much easier than describing smells. The worlds of affective experience and of color experience are similar in another important respect: they combine phenomenological richness with a simple underlying structure. A non-intuitive finding of color research is that, in spite of the enormous variety of subjective color experience, the world of color can be represented in a two-dimensional space -- the color circle -- with additional information provided in a third dimension of luminance. A major result of research on affect is that a similarly simple structure is found in that domain as well. Much of the variation among affective states is captured by specifying their positions in a two-dimensional space, which is defined by the major dimensions of valence (good to neutral to bad) and arousal (from frenetic to lethargic) (Plutchik and Conte, 1997; Russell, 1980; Russell and Carroll, 1999; Stone, 1995; Warr, 1999). As Figure 3 illustrates, the two-dimensional structure permits a distinction between two forms of positive affect—exuberant joy or serene bliss—and two forms of negative affect—agitated distress or apathetic depression.

Insert Figure 3 about here

A significant limitation of the two-dimensional representation of affect is that it does not capture the nature of primary emotions, such as surprise or anger. Another objection to this scheme questions the assumption that valence is a single bipolar dimension. Cacioppo, Gardner, and Berntson (1999) point out that positive and negative affect are processed by different neural systems and may be activated concurrently. They suggest that a three-dimensional representation may be necessary, in which 'good' and 'bad' are independent dimensions. However, the systems are not functionally independent, and there is evidence that they inhibit each other. Lang (1995) has shown, for example, that watching pleasant pictures of food or smiling babies attenuates the startle response to a loud sound, whereas startle is actually enhanced in the presence of disgusting or otherwise awful pictures. For the present purposes, the description of valence as a bipolar dimension can be retained as a useful approximation, even if it is not perfectly correct (Russell and Carroll, 1999; Tellegen, Watson and Clark, 1999). Later in this section I discuss a physiological measure that can provide convergent validation of the measurement of valence.

[6] Participants in studies using ESM carry a palmtop computer that beeps at random times during the day. The palmtop computer then displays questions that elicit elicit information about the current setting and about the subject's present affective state.

The simplest method for eliciting a self-report of current affective state is undoubtedly the ***affect grid***: respondents describe their state by marking a single position on a grid defined by the two dimensions of valence and arousal (Russell, Wess and Mendelsohn, 1989). The affect grid appears to be applicable in all situations: any moment of life can be characterized by the attributes of valence and arousal. The characterization is incomplete, of course, but hardly irrelevant to an analysis of well-being. The affect grid can be used to derive a unidimensional distribution of affective values, as in Figure 2. Of course, finer-grain analyses that do not collapse over the arousal dimension are likely to be even more informative.

Next, I attempt to evaluate the affect grid in terms of the four criteria of adequate measurement of moment-utility that were considered in the preceding section. The purpose of this speculative discussion is to illustrate both the problems and the promise of measurement in this domain, not to endorse any particular measure.

Inclusiveness. Defining happiness by the temporal distribution of experienced affect appears very narrow, and so it is. The concept of objective happiness is not intended to stand on its own, and is proposed only as a necessary element of a theory of human well-being. A comprehensive account of well-being inevitably brings in philosophical considerations (Ryff and Singer, 1998) and a moral conception of "the good life" (Brock, 1993; Nussbaum and Sen, 1993), which are not easily reduced to experienced utility. However, good mood and enjoyment of life are not incompatible with other psychological criteria of well-being that have been proposed, such as the maintenance of personal goals, social involvement, intense absorption in activities, and a sense that life is meaningful (Argyle, 1999; Cantor and Sanderson, 1999; Csikszentmihalyi, 1990; Fredrickson, 1999). Clearly, a life that is meaningful, satisfying and cheerful should rank higher on the scale of well-being than a life that is equally meaningful and satisfying, but sad or tense. Objective happiness is only one constituent of the quality of human life, but it is a significant one.

Ordinal measurement across situations. The experiences of a stubbed toe and of a humiliating rebuke are both likely to be described on the affect grid as negative in valence and high in arousal -- but can the valence and the arousal be compared? It is a familiar psychological fact that comparison along a single attribute is especially difficult if the objects compared differ in other attributes as well. For example, it is more difficult -- but not impossible -- to compare the loudness of sounds that differ in pitch and timbre than to compare sounds that share these attributes. The question of whether people can compare physical and emotional pain, or the thrills of food and of music is ultimately empirical. In general, the coherence of judgments across categories is tested by examining the correspondence between ranking of objects in explicit comparisons and ratings of the same objects, considered one at a time (see chapter 36). This test is applicable to ratings and rankings of the utility of different kinds of experience, although it is complicated by the necessity of relying on memory for the comparison task.

Absolute zero point. Bipolar scales of judgment comprise scales for two qualitatively different attributes, separated by a distinctive neutral point. Familiar examples include the dimensions that run from hot to cold and from red to green. The neutral point that separates the reddish zone from the greenish zone of the red-green dimension is 'colorless gray or white'.

Similarly, 'neither cold nor warm' is the natural zero of the scale of subjective temperature. The stimulus that gives rise to a neutral experience may be different in different contexts, but the neutral experience itself is constant. For example, people can completely adapt to a range of different temperatures, and within that range any temperature to which one has fully adapted will evoke the same neutral experience. The natural zero of the scale of moment-utility should be 'neither pleasant nor unpleasant—neither approach nor avoid.' A distinctive zero permits a crude but useful assessment of well-being in terms of the amount of time spent on the positive and on the negative side of the neutral point (Diener, Sandvik and Pavot, 1991; Parducci, 1995). Because it is distinctive, the neutral value can be used with some confidence to match experiences -- whether thermal or hedonic -- across time for a given individual, and even across individuals (Kahneman and Varey, 1991).

Interpersonal comparability. Interpersonal comparisons of subjective experience can never be fully satisfactory, but the success of psychophysical research suggests that these comparisons do not present an intractable problem. Three illustrative lines of evidence will be mentioned in support of this conclusion. (i) There is substantial inter-subject agreement on the psychophysical functions that relate reports of the intensity of subjective experience to the physical intensity of the stimulus. For example, the relation between a measure of the physical strength of labor contractions during childbirth and self-reports of pain was generally similar for different women (Algom and Lubel, 1994). (ii) The design of the colonoscopy study (Redelmeier and Kahneman, 1996) included a group of 50 patients who were not required to report their pain every minute during the procedure. Assessments of the pain of these patients were made every 60 seconds by a minimally trained assistant, on the basis of what she could see and hear of the patient's reactions. The remarkable result was that the Peak/End average of the observer's ratings correlated quite highly ($r = .70$) with the patients' own global evaluations of the procedure, reported after its termination. The observer was evidently capable of meaningful comparisons of the immediate experiences of different patients. Furthermore, the pattern of results implies considerable agreement among patients in the use of the response scales. (iii) The observation of high correlations between self-reports and physiological measures, which is discussed next, provides further support of the feasibility of interpersonal comparisons.

Physiological validation

The fundamental simplicity of affective space and the speed of developments in brain research make it likely that physiological correlates of moment-utility (affective valence) will be found. The difference between levels of electrical activity in the left and right hemispheres of the prefrontal cortex appears to meet most criteria for such a measure (Davidson, 1998). Positive and negative affect are respectively associated with greater activity in the left and in the right prefrontal regions. Neurologists have long known that the misery of a stroke that affects the prefrontal area is much worse if the damage is in the left hemisphere -- the happier region, where opportunities for approach appear to be calculated (Sutton and Davidson, 1998). A simple measure of the difference in the levels of activity in the two hemispheres has been validated as a measure of mood and of the response to affectively relevant stimuli. Stable individual differences in the characteristic value of this difference are highly correlated with differences in individual temperament and personality, both in adults (Davidson & Tomarken,

1989; Sutton and Davidson, 1998) and in babies (Davidson & Fox, 1989). Correlations with questionnaire measures of approach and avoidance tendencies, and of positive and negative affect are strikingly high (Sutton and Davidson, 1997; Tomarken et al, 1992). This result demonstrates, in passing, that the function that relates self-reports to brain states must be quite similar across people.

A different approach to the physiology of well-being has been adopted by investigators who study physiological markers of long-term cumulative load on coping resources (Ryff and Singer, 1998; Sapolsky, 1999). It is tempting to speculate that these measures of stress-induced physiological wear and tear could be correlates of long-term objective happiness. It is not science fiction to imagine that physiological measures will eventually contribute to the solution of enduring puzzles in the study of experienced utility and of well-being, and provide a criterion for the validation of self-report measures.

In conclusion, the prospects are reasonably good for an index of the valence and intensity of current experience, which will be sensitive to the many kinds of pleasure and anguish in people's lives: moods of contentment or misery, feelings of pride or regret, aesthetic thrills, experiences of 'flow', worrying thoughts and physical pleasures. However, the limits of what is claimed here should be made explicit. No one will wish to argue that the affect grid or a measure of prefrontal electrocortical asymmetry convey all that we would wish to know about an individual's affective and hedonic experience, just as no one would argue that a measure of the pooled activity levels in the red-green and blue-yellow channels convey the experience of seeing a view. The claim made here is not that the dimension of valence in experience is all we need to know -- only that we need to know the valence of experience.

5. The ambiguity of treadmill effects

The fundamental surprise of well-being research is the robust finding that life circumstances make only a small contribution to the variance of happiness—far smaller than the contribution of inherited temperament or personality (Diener et al, 1999; Lykken and Tellegen, 1996; Myers and Diener, 1995). Although people have intense emotional reactions to major changes in the circumstances of their lives, these reactions appear to subside more or less completely, and often quite quickly (Headey and Wearing, 1992; Frederick and Loewenstein, 1999). As a consequence, cross-sectional correlations between life circumstances and subjective happiness are low. Between 1958 and 1987, for example, real income in Japan increased fivefold, but self-reported happiness did not increase at all (Easterlin, 1995). The most famous observations in this vein were made by Brickman, Coates, and Janoff-Bulman (1978), who reported that after a period of adjustment lottery winners are not much happier than a control group and paraplegics not much unhappier. In a now classic essay, Brickman and Campbell 1971 used the term ***hedonic treadmill*** both to describe and to interpret such observations. I will use the term ***treadmill effect*** to refer to the general observation, while reserving the term hedonic treadmill to refer to a particular explanation of the effect.

Treadmill effects

Brickman and Campbell (1971) based their conception of the hedonic treadmill on a notion of adaptation level, which Helson (1964) had introduced earlier to explain phenomena of adaptation in perception and judgment. Anyone who has bathed in a cool pool, or in a warm sea, will recognize the basic phenomenon. As one adapts, the experience of the temperature of the water gradually drifts toward 'neither hot nor cold', and the experience of other temperatures changes accordingly. A temperature that would be called warm in one context may feel cool in another. Brickman and Campbell proposed that a similar process of adaptation applies to the hedonic value of life circumstances.

The prevalence of treadmill effects is of psychological interest for two separate reasons. First, because of the ironic light it sheds on the pursuit of happiness. Second, because its suprise value is itself surprising: if the treadmill effect is a common fact of life, why do people not seem to know about it? As the next chapter shows, the extent and the speed of treadmill effects in self-reported happiness are not anticipated. A study conducted among students in California and in the Midwest was designed to examine both the reality of regional effects in life satisfaction and beliefs about these effects (Schkade and Kahneman, 1998). The results showed no trace of a difference between Californians and Midwesterners in overall life satisfaction. However, they revealed a widespread expectation, shared by residents of both regions, that the self-reports of Californians would indicate more happiness than the self-reports of Midwesterners.

Beside their robustness and their unexpectedness, studies of treadmill effects share a third characteristic: they are not entirely persuasive. Skeptics argue that the null results are due, at least in part, to differences in the use of scales of happiness and life satisfaction. If people whose life circumstances differ use the scales differently, there may be less hedonic adaptation to circumstances than surveys of subjective well-being suggest. Frederick and Loewenstein (1999) present an extensive list of reasons that may lead paraplegics to overstate their “true happiness”. The main claim of the present section is that these doubts are not mere quibbles, and that demonstrations of treadmill effects are subject to a critical ambiguity, which can only be resolved by measuring objective happiness.

What do people mean when they assert that Californians are, in fact, happier than other people, although Californians do not report themselves as happier? The possibility that Californians have more meaningful lives than others is rarely advanced. Rather, the proposition that Californians are happier appears to mean that Californians are objectively happier: their lives are richer in pleasures and less burdened by hassles, and they are consequently in a better mood, on average, than most other people. In this view, a treadmill effect is observed because Californians use the happiness scale differently than other people. The same argument could of course be extended to the Japanese who reported equal happiness in 1987 and in 1958 despite a large increase in standard of living. It could also apply to paraplegics. If this view is accepted, the evidence for a happiness treadmill unravels. Perhaps life circumstances do, after all, have a greater effect on well-being than surveys of subjective happiness indicate. A specific hypothesis about a mechanism that could produce spurious evidence for a hedonic treadmill is introduced next.

The satisfaction treadmill

Brickman and Campbell explained treadmill effects by invoking the notion of an adaptation level (Helson, 1964). I propose an alternative hypothesis, called a ***satisfaction treadmill***, which draws on another venerable psychological concept: the aspiration level (Irwin, 1944). The aspiration level is a value on a scale of achievement or attainment that lies somewhere between realistic expectation and reasonable hope. The essential observation is that people are always satisfied when they attain their aspiration level, and usually quite satisfied with slightly less. The best-established finding about aspiration levels is that they are closely correlated with past attainments. Current income, for example, is the single most important determinant of the income that is considered satisfactory for one's household (Van Praag and Frijters, 1999).

To illustrate the difference between a hedonic treadmill and a satisfaction treadmill, consider a former graduate student, who will be called Helen. Assume that Helen regularly eats in restaurants, and that she has a well-defined ranking of experienced utility for a set of entrées, which is perfectly correlated with their price. In her graduate-student days Helen was constrained by her budget to consume mostly mediocre dishes. Now she has taken a lucrative job which allows her to consume food of higher quality. In tracking her overall satisfaction with food over the transition period, we observe that her satisfaction rises initially, then settles back to its original level. This is the standard pattern of a treadmill effect. Now consider two mechanisms that could produce this effect.

(i) The hedonic treadmill hypothesis invokes the hypothesis of an *adaptation level* for palatability, which is determined by a weighted average of the palatability experienced on recent occasions. Helen's pleasure from food rises initially, because the food she consumes exceeds the adaptation level that was established in her graduate student days. As time passes, however, her adaptation level will catch up to her consumption, and her pleasure from food will return to its original level. After she has adapted to the new level of pleasure, she will consume better entrées than she did as a graduate student, but will enjoy each of them less than she had in the past. On the hypothesis of a hedonic treadmill, Helen's reports of subjective satisfaction correctly reflect the changes in her enjoyment of food.

(ii) The hypothesis of a satisfaction treadmill invokes the notion of a changing *aspiration level*, which is determined in large part by the level of pleasure recently derived from food. For the sake of an extreme example, assume now that there is no hedonic adaptation at all, and that the experienced utility that Helen derives from any entrée does not change. As the quality of her entrées improves, so does the overall pleasure that she derives from them. Suppose, however, that Helen has an aspiration level for *food pleasure*: as the pleasure that she obtains from food increases, her aspiration level gradually follows, eventually adjusting to her higher level of enjoyment. After this adjustment of aspirations, Helen reports no more *satisfaction* with food than she did when she was poorer, although she actually draws more pleasure from food now than she had done earlier.

The concept of a satisfaction treadmill extends readily from food pleasure to happiness. Only one additional assumption is needed: that people require a certain balance of pleasures and

pains to report themselves happy or satisfied with their lives. On this hypothesis, Californians could indeed enjoy life more than others. However, if they also require more enjoyment than others to declare themselves happy, they will not report higher subjective happiness. Californians might be happier than other people objectively, but not subjectively.

The statistical test for the hypothesis of a satisfaction treadmill is straightforward: if such a treadmill exists, the regression lines that describe the relation between subjective and objective happiness will not be the same for groups in different circumstances. At any level of objective happiness, people with a higher aspiration level will report themselves less happy and less satisfied than others whose aspirations are lower. If the results for both groups fall on the same regression line, there is no satisfaction treadmill.

A satisfaction treadmill and a hedonic treadmill may co-occur, both contributing to observed treadmill effects. The critical conclusion of the analysis is that the relative contributions of the two mechanisms cannot be determined without direct measurements of experienced utility. The hypothesis of a satisfaction treadmill is both plausible and effectively untested, and the interpretation of treadmill effects observed with measures of satisfaction and subjective happiness is correspondingly indeterminate. A substantial amount of well-being research might have to be redone to resolve this ambiguity.

6. Discussion

The premise of this essay was a distinction between two meanings of the term 'utility', which were labeled experienced utility and decision utility. Decision utility is about wanting, experienced utility is about enjoyment. This basic dichotomy has been discussed elsewhere (Kahneman 1994 [ch.42]; Kahneman, 1999). The focus of the present discussion was the further distinction between two approaches to the interpretation and measurement of experienced utility, which were called moment-based and memory-based.

Wanting or not wanting is not the only orientation to future outcomes. People sometimes also attempt to forecast the affective or hedonic experience -- the experienced utility -- that is associated with various life circumstances. These are judgments of ***predicted utility*** (Kahneman, Wakker and Sarin, 1997), or affective forecasting (Gilbert et al, 1998). With the inclusion of predicted utility, the number of distinct concepts of the utility of extended outcomes -- bounded episodes or states of indefinite duration -- rises to four. The concepts are distinguished by the operations on which they are based:

(i) *Decision utility* is inferred from observed preferences.
(ii) *Predicted utility* is a belief about future experienced utility.
(iii) *Total utility* is a *moment-based* measure of experienced utility. It is derived from measurements of moment-utility, statistically aggregated by an objective rule.
(iv) *Remembered utility* is a *memory-based* measure of experienced utility, which is based on retrospective assessments of episodes or periods of life.

Decision utility is the almost exclusive topic of study in decision research and economics, and memory-based self-reports are the almost exclusive topic of study in the

domain of Subjective Well-Being (SWB) research. The various concepts of utility suggest a rich and complex agenda of research; they also suggest different interpretations of utility maximization.

To extend an example already discussed, consider families that move (or might move) fromCalifornia to Ohio. The *decision utility* of families that consider relocation could be studied by eliciting their global preferences, as well their preferences for different attributes of the two locations. Whether or not people maximize utility is interpreted in this context as a question about the coherence of preferences: would the choice that the family makes survive reframing, or a new context? The *predicted utility* which the decision makers associate with the alternative locations could be studied by eliciting their general beliefs about the experience of living in the two places, and their particular beliefs about what they might enjoy or dislike. There is considerable evidence that this task of affective forecasting is not one in which people excel (see, Gilbert et al, 1998; Kahneman,1999, [ch. 38]; Kahneman and Schkade, 1999; Loewenstein and Adler, 1995 [ch. 40]; Loewenstein and Schkade, 1999; Schkade and Kahneman, 1998) . Another question of some importance is whether people even consider the uncertainty of their future tastes as part of the activity of decision making (March, 1978; Simonson, 1990 [ch. 41]).

As we have seen in preceding sections, different conclusions about the outcomes of families that did move to California could be reached, depending on whether the outcomes are assessed by moment-based or by memory-based techniques -- by measures of total utility or objective happiness on the one hand, of remembered utility or subjective happiness on the other. Self-selection and dissonance reduction would predict high subjective happiness among people who moved voluntarily. Treadmill effects, on the other hand, predict that people who moved will eventually return to their characteristic level of subjective happiness. The argument of the preceding section was that these memory-based measures do not tell us what we would really want to know: whether people who move to California are *really* happier there than they were earlier. In the approach adopted here, this question must be answered by obtaining moment-based measures, using either self-reports or physiological techniques.

The distinctions that have been drawn between variant concepts of utility are directly relevant to normative issues in the domain of policy, as the following list of questions illustrates. “Does the presence of trees in a city street affect the mood of pedestrians?” “What is the contribution of an attractive subway system to the well-being of city residents?” “What are the well-being consequences of inflation, unemployment, or unreliable health insurance?” Here again, it is possible to ask what the public wants, perhaps by asking people how much they are willing to pay for the provision of some goods. It is also possible to elicit people's opinions about the welfare effects of particular public goods, to obtain a measure of predicted utility. Finally, it is sometimes possible to measure the experienced utility associated with public goods. Again, this can be done either by moment-based or by memory-based methods.

Conventional economic analyses of policy recognize only one measure of the value of public goods: the aggregate willingness of the public to pay for them. There are serious doubts about the coherence of this concept

and the feasibility of measuring willingness to pay (see, e.g., Kahneman, Ritov and Schkade, 1999 [ch.36]). A more fundamental question is whether willingness to pay should remain the only measure of value. The present analysis suggests that moment-based measures of the actual experience of consequences should be included in
assessments of outcomes and as one of the criteria for the quality of decisions, both public and private.

Treadmill effects raise difficult normative questions. If there is a hedonic treadmill, then changes in circumstances will often have less long-term effects on human welfare than might be inferred from their *ex ante* desirability or from the initial hedonic response that they evoke. Should policy resist calls for the provision of desirable goods that convey no long-term utility benefits? And if there is a satisfaction treadmill, then clients of policies will never be satisfied very long even when an improvement in their circumstances makes them permanently (objectively) happier. Furthermore, false negatives occur in all prediction tasks: people may fail to identify some circumstances that would actually make them happier. Do policy makers have a duty to provide goods that make people truly better off, even if they are neither desired *ex ante* nor appreciated *ex post*? The easy answer is no, but it is perhaps too easy. Dilemmas of paternalism are raised again in chapter 42.

The moment-based approach to experienced utility and happiness which has been presented here runs into two strong objections. The first is that there is more to human well-being than good mood. The second is that the moment-based view is based on abstract arguments and on logical construction, and fails to reflect the role of memory in the subjective reality of mental life. Both objections have much merit, but neither should block the judicious use of moment-based measures.

Objective happiness is not proposed as a comprehensive concept of human well-being, only as a significant constituent of it. Maximizing the time spent on the right side of the affect grid is not the most significant value in life, and adopting this criterion as a guide to life may be morally wrong, and perhaps also self-defeating. However, the proposition that the right side of the grid is a more desirable place to be is not particularly controversial. Indeed, there may be more differences among cultures and systems of thought about the optimal position on the arousal dimension -- some prefer the bliss of serenity, others favor the exultation of faith or the joys of participation. Objective happiness is a common denominator for various conceptions of well-being. Furthermore, when it comes to comparisons of groups, such as Californians and others, or to assessments of the value of public goods such as health insurance or tree-lined streets, experienced utility and objective happiness may be the correct measure of welfare.

In a memory-centered view of life, the accumulation of memories is an end in itself. A clear statement of this position is offered by Tversky and Griffin (1991 [ch. 39]), who speak of the stock of memories as an endowment, which is enriched by storing new memories of good experiences. The moment-centered approach that has been proposed here does not deny the importance of memory in life, but it suggests a metaphor of consumption rather than of wealth. Without a doubt, the traveler who goes to a Kenya safari may continue to derive utility from that episode long after it ends, whether directly—by "consuming" the memories in pleasant or

unpleasant reminiscing—or, perhaps more importantly, by consuming the experience of the self as it has been altered by the event (Elster and Loewenstein, 1992). However, the moment-based approach raises a question that should not be dismissed too lightly: how much time will be spent in such consumption of memories, relative to the duration of the original experience? The weight of memory relative to actual experience is likely to be reduced when time is taken seriously.

The memory-based and the moment-based views draw on different intuitions about what counts as real. There is an obvious sense in which present experience is real and memories are not. But memories have an attribute of permanence which lends them a weightiness that the fleeting present lacks: they endure and populate the mind. In the words of the novelist Penelope Lively (1993, p.15), “A narrative is a sequence of present moments but the present does not exist.” Because memories and stories of the past are all we ultimately get to keep, memories and stories often appear to be all that matters. These common intutitions are part of the appeal of Fredrickson's (1999) eloquent critique of the idea -- central to the notion of total utility and objective happiness -- that all moments of time are weighted equally. The argument for meaning is memory-based: memory certainly does not treat all moments equally, and meaningful moments must be memorable. Indeed, the statement "I will always remember this" is often proffered, not always correctly, at meaningful moments. Futhermore, the immense importance that most of us attach to deathbed reconciliations suggests that who does the remembering may not greatly matter in conferring meaning, so long as someone does.

The goal of this discussion is not to reject the memory-based view, which is indeed irresistibly appealing, but to point out that intuition is strongly biased against a moment-based view. The approach proposed here is bound to be counter-intuitive even if it has merit -- that was one of the reasons for proposing it. Although wholly devoid of permanence, the experiencing subject deserves a voice.

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Figure 1: Pain intensity reported by two colonoscopy patients

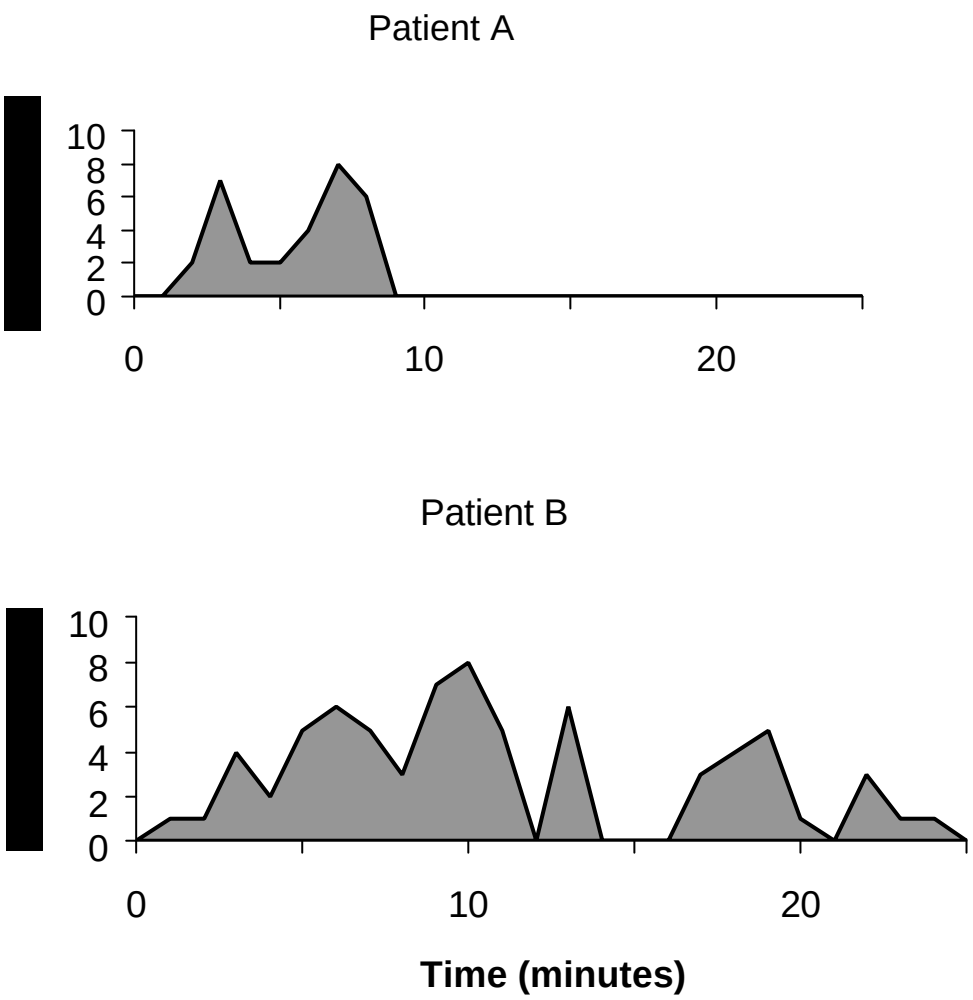

Figure 2a: Decumulative temporal function representing pain profiles of Patients A & B

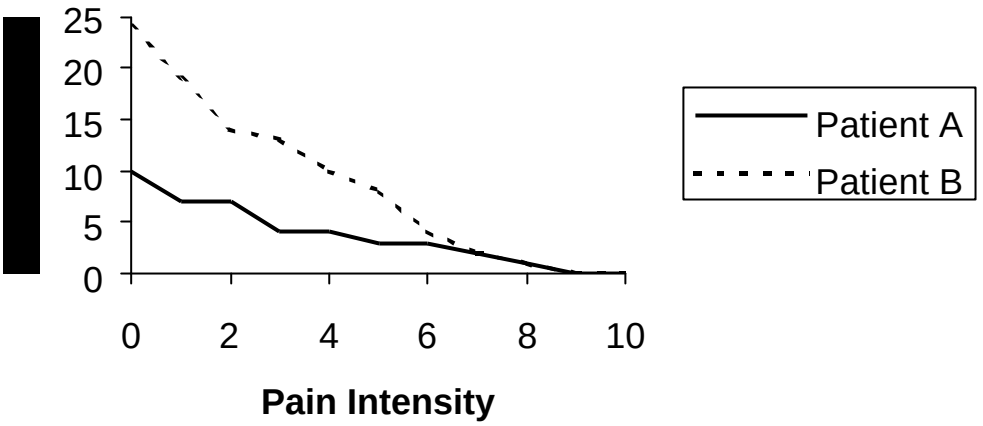

Figure 2b: Fictitious decumulative functions representing the objective happiness of two individuals over a period of time

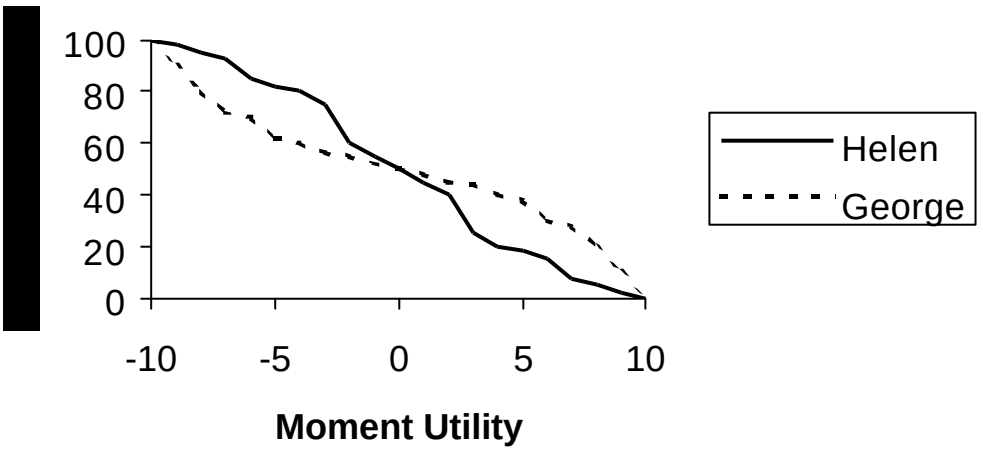

Figure 3: A representation of affective space