COGNITION AND EMOTION, 2000, *14* (4), 577–606

Extracting meaning from past affective experiences: The importance of peaks, ends, and specific emotions

Barbara L. Fredrickson
University of Michigan, USA

This article reviews existing empirical research on the peak-and-end rule. This rule states that people's global evaluations of past affective episodes can be well predicted by the affect experienced during just two moments: the moment of peak affect intensity and the ending. One consequence of the peak-and-end rule is that the duration of affective episodes is largely neglected. Evidence supporting the peak-and-end rule is robust, but qualified. New directions for future work in this emerging area of study are outlined. In particular, the personal meanings associated with specific moments and with specific emotions should be assessed. It is hypothesised that moments rich with self-relevant information will dominate people's global evaluations of past affective episodes. The article concludes with a discussion of ways to measure and optimise objective happiness.

INTRODUCTION

People's past and ongoing affective experiences guide their decisions about the future. These affective experiences include emotions, moods, and other subjective states like pleasure and pain, liking and disliking, hope and dread. We choose flavours of ice cream and vacation destinations—even our careers and our mates—by predicting how our choices will affect our future happiness (Loewenstein & Schkade, 1999). Not surprisingly, our predictions about future happiness are often based on our past affective experiences. A first approximation to understanding people's decisions and choices, then, is purely hedonistic: We seek to repeat in the future what we have liked or enjoyed in the past, and avoid or dread further experiences with what we have disliked or found aversive. But of course, it is not so simple. People do not simply maximise pleasant experiences and minimise unpleasant ones (Parrott, 1993). Instead, they knowingly pay to see deeply

Requests for reprints should be sent to Barbara L. Fredrickson, Department of Psychology, University of Michigan, 525 East University, Ann Arbor, MI 48109-1109, USA.

© 2000 Psychology Press Ltd
http://www.tandf.co.uk/journals/pp/02699931.html

disturbing movies, give up vacation days to work at stressful jobs, initiate painful arguments with their spouses to work through relationship problems, or take vows of celibacy. In short, it is not hard to find examples of normal individuals who choose more pain rather than less, or limit their opportunities for enjoyment.

Hidden within these violations of hedonism are lessons about the ways people extract meaning from past affective experiences to make choices about the future. This paper is about those lessons. It has three goals. First, to review the existing empirical research on this process and extract the lessons already learnt. Second, to suggest new directions within this research agenda and speculate about lessons still to come. Third, to draw out some of the implications these lessons have for the timeless prescriptive question posed variously by emotion researchers, decision researchers, and lay people alike: How can people optimise their overall happiness? Or, to use the terms of decision researchers, how can they maximise their overall utility?

RESEARCH REVIEW: EVALUATION BY MOMENTS

Differences between Past and Current Moments

One primary lesson about how affective experiences guide choices concerns timing and temporal extension: Current and instantaneous affective experiences appear to guide choices somewhat differently than do past and extended affective experiences. In the moment, when affect enters consciousness, less reflection on that affect is necessary for choosing responses. The affective state itself can be viewed as a *response tendency* that steers us toward certain people, things, thoughts, or actions, and away from others (Frijda, 1986; Levenson, 1994). People's choices based on their current emotions, then, do not so much concern what they *want* to do, for that is self-evident within the feeling state. Instead, people's choices centre on whether or not to act on their emotional urges. For instance, if you discover you have eaten spoiled food, there's no question that you want to spit it out. If you are at a dinner party, however, you might choose not to spit (or not to spit conspicuously) to protect your host's feelings.

Retrospections about past affective experiences might operate similarly, if they too were about precise instances. But typically they are not. In reflecting on the past, people tend to consider extended affective episodes, and not just a single moment. We ask one another "How was that dinner party?" "Did you like the movie?" "How is married life?" and "What's it like being a professor?" (Note that the first two queries target completed experiences, whereas the latter two target ongoing experiences.) To answer these sorts of questions, we must invoke both memory and

judgement processes. We need to recall how we felt during the targeted episode—which includes many moments—and come up with a way to summarise those momentary feelings into a meaningful and respectable answer. Certainly, conversational norms suggest we provide global assessments and not play-by-play accounts of momentary affect. But decisions also call for global assessments. On the whole, is the experience worth continuing? Would a similar experience be worth seeking? Would it be worth recommending to someone else?

When decisions about the future are made based on past affective experiences that extended over time, the ways that affect steers choices become less obvious. This is so because even though affect is often a distinct and self-evident feature of singular moments, it is not a simple feature of an entire episode. How do we extract meaning from affective experiences that are long-lasting, or that change in intensity or quality over time? Global evaluations of past affective experiences are not merely perceived or felt; they are constructed. Past research within emotion and cognition informs us that multiple factors can influence people's constructions of past affect. Current mood (Blaney, 1986; Parkinson, Briner, Reynolds, & Totterdell, 1995), affective traits (Barrett, 1997; Rusting, 1998), personel theories (McFarland, Ross, & DeCourville, 1989), and the ease with which counterfactuals come to mind (Kahneman & Miller, 1986; Medvec, Madey, & Gilovich, 1995), are but a few. More recent work suggests that, in addition, people's constructions draw on select moments of experience in an almost rule-like fashion. In the following sections, I review the set of experiments that revealed and subsequently tested what is now called the *peak-and-end rule*. This rule, it so happens, sometimes leads to curious choices.

The peak-and-end rule

Early empirical evidence

Anticipating an upcoming ending alters people's social priorities. For instance, empirical studies have shown that college seniors facing graduation, people considering a cross-country move, very old people, and younger people with terminal illnesses have at least one thing in common. They each show an increased preference to spend their social time with close and familiar others (Carstensen & Fredrickson, 1998; Fredrickson, 1995; Fredrickson & Carstensen, 1990). I proposed that these time-dependent changes in people's social priorities—what Carstensen (1993) terms socioemotional selectivity—occur because social endings carry symbolic value (Fredrickson, 1991). How a social relationship ends, I hypothesised, determines how people come to evaluate it in its entirety.

To test this hypothesis, I created short-term social relationships in a laboratory setting. I asked 64 college students, paired into 32 same-sex dyads, to converse for a series of "get acquainted" sessions, lasting 30 minutes each. After each session, each person viewed a videotaped portion of their conversation and used a 180 degree positive-negative affect rating dial to provide moment-by-moment ratings of how they were feeling during the actual interaction. (This rating dial technique is described more fully in Larsen & Fredrickson, 1999; validity data are available in Gottman & Levenson, 1985.) From these momentary data, I extracted indices of positive affect (proportion of time above 110 degrees) and negative affect (proportion of time below 70 degrees). I also manipulated anticipated endings in this study. Half the pairs believed that this new acquaintanceship would end the same day it started (Ending condition), and the remaining pairs believed it would continue both that day and on a subsequent day (Ongoing condition). At the end of the third session, all participants provided their global impressions of the relationship. To determine which moments of the relationship best predicted global impressions, I calculated the unique variance in global impressions accounted for by positive and negative affect in the first, second, and third conversations. For those in the Ending condition, affect experienced during the third session accounted for the most variance (positive affect: 26% variance accounted for, $P < .001$; negative affect: 9% variance accounted for, $P < .05$). By contrast, affect experienced during earlier sessions for those in the Ending condition, and all sessions for those in the Ongoing condition accounted for less than 5% of the variance each (all n.s.). This pattern of results suggests that affect experienced during known endings is weighted heavily in people's global evaluations of social relationships. Importantly, the data rule out the alternative explanation that endings gain prominence simply due to recency: Recent affect carried almost no weight when the relationship was construed as ongoing.

A similar impact of endings was observed in a study by Varey and Kahneman (1992, experiment 2). Forty-six participants made global evaluations of another person's discomfort, which was conveyed by schematic reports of momentary affect. The target person was said to have made a series of discomfort ratings on a 0–10 scale at 5-minute intervals during an unpleasant episode (e.g. exposure to loud noises, standing in an uncomfortable position). Recovery from discomfort was said to be immediate. Episodes ranged in length from 15 to 35 minutes, and varied in the intensity and trend of reported discomfort. Global evaluations were highly sensitive to the trend of discomfort, and much less sensitive to duration. A reanalysis of these data (reported in Fredrickson & Kahneman, 1993), produced the initial evidence for the peak-and-end rule: An average of the peak discomfort in the series and the end discomfort accounted for 94%

of the variance in global evaluations of discomfort. Episode duration accounted for only 3% of additional variance.

Laboratory tests of duration neglect

This early evidence for people's sensitivity to peaks and ends suggested that these two moments mattered more in retrospective evaluations than all other moments combined. In particular, it seemed as though people almost totally neglected the duration of past affective episodes when judging them from hindsight. Kahneman and I tested this hypothesis of duration neglect in two studies of people's memory for emotional film clips (Fredrickson & Kahneman, 1993). In each study, participants viewed a series of 12 target films clips that varied in valence (6 pleasant, 6 unpleasant) and duration (approximately 30 or 90 seconds). For this work, we chose plotless clips, in which the affect-eliciting images were introduced in the initial moments of the clip (e.g. ocean waves, corpses), and remained present without substantive change until the end of the clip. This feature allowed us to create two versions of each clip—one short and the other about three times as long—without altering the basic meaning of the clips. Participants viewed short versions of some films and long versions of others (with clip duration and order counterbalanced across subjects).

In the first study, 32 participants viewed the clips while providing moment-by-moment affect ratings on a sliding meter similar to the one used in the work on social endings (Fredrickson, 1991, described earlier). After each clip, they provided a global evaluation on a visual analogue scale. From the momentary data, we extracted the most extreme affect rating (peak) and the affect ratings of the final moments (end). Using within-subject analyses, we predicted global evaluations from peak affect, end affect, their combination (peak + end), and duration. Because these predictor variables were often intercorrelated (not surprising, given the clips were plotless), we also computed partial correlations. Peak + end affect emerged as the best predictors of the global evaluations of the positive films (mean zero-order $r = .78$, $P < .001$), and duration did not matter at all (mean zero-order $r = .13$; mean partial r, controlling for peak + end = .06, both n.s.). For unpleasant films, peak affect emerged as the best predictor of global evaluations (mean zero-order $r = .76$, $P < .001$), end affect was no longer a significant predictor once peak affect was controlled (mean partial $r = .04$, n.s.), and duration hardly mattered at all (mean zero-order $r = .25$, $P < .01$; mean partial r, controlling for peak + end, $= -.02$, n.s.). These data support the hypothesis of duration neglect: People's global evaluations of past affective episodes could be predicted by the affect experienced during just one or two moments, and the duration of episodes, which varied considerably, contributed next to nothing.

In a second study, we tested the hypothesis that the small relationship found between episode duration and global evaluations (evident in the significant zero-order correlation for the unpleasant films) would disappear altogether under circumstances more typical of evaluation. More typical circumstances, we reasoned, would be to simply watch the films (without providing momentary ratings of affect) and then later provide global evaluations after some time elapsed (not immediately after each clip). Ninety-six participants viewed the same sets of clips under these conditions. They provided their global evaluations by choosing which of the pleasant (unpleasant) clips the experimenters should show other people assuming the goal was to create a set of clips that would *maximise* (minimise) the overall pleasantness (unpleasantness) viewers experienced. Participants indicated their choices by ranking the pleasant and unpleasant clips separately. Using a between-subjects design, half the participants made their choices from memory (i.e. with no forewarning of the choice task) and the remaining were forewarned about the choice task and encouraged to make their choices on-line. The on-line condition most closely approximated the first study, with its requirement to provide momentary affect ratings. The prediction that the small association between global evaluations and duration found for the unpleasant films would be decreased by delaying evaluations was confirmed (zero-order *r*s = .24 vs. .12, for on-line and delayed, respectively). Thus, under circumstances more typical of the ways people make retrospective global evaluations, the duration of past affective episodes mattered even less.

The odd implication of duration neglect is that—from hindsight—people do not seem to care whether an unpleasant episode continues, or a pleasant episode stops. This appears to violate a rule of *temporal monotonicity*: Adding moments of negative affect should make the overall experience worse, just as adding moments of positive affect should make it better. Graphically, temporal monotonicity suggests that the hypothetical construct of "total affect" is represented as the area-under-the-curve on a plot of affect intensity over time. Whereas temporal monotonicity may apply as affective experiences unfold, it does not appear to apply when these same experiences are recalled.

Although our studies based on film clips provided strong tests of duration neglect, they provided only weak tests of the peak-and-end rule. This was because manipulating clip duration without affecting the basic meaning of the clips required that we choose relatively unchanging, plotless clips. As such, peak and end affect were often confounded, either because people's affective reactions were essentially unchanged throughout the clips, or because their affective reactions grew more extreme with extended duration, a pattern common for the highly aversive clips (see Fredrickson & Kahneman, 1993, figure 2). To provide a stronger test of the peak-and-end

rule, we needed to decouple peak and end affect. We did this by moving to a simpler, more controllable affective experience: Physical pain induced by immersion in ice-cold water (Kahneman, Fredrickson, Schrieber, & Redelmeier, 1993).

In this study, 32 participants endured two separate painful experiences while providing moment-by-moment ratings of discomfort. In a short trial, they immersed one hand in painfully cold water (14°C) for 60 seconds. In a long trial, they immersed the other hand in water at 14°C for 60 seconds, then kept their hand immersed for 30 seconds longer while the water temperature was raised slightly (to 15°C), still well within the range of pain. Note that the long trial includes all the pain of the short trial, plus an extra period of slowly diminishing pain. Participants expected to have a third painful experience during the experimental session, and they were given a choice of whether to repeat the first or the second trials. (Order of trials and assignment to dominant and nondominant hands were counterbalanced across participants.) Based on the peak-and-end rule, we hypothesised that participants would retain a more favourable memory of the long trial, because it ended with a lower level of pain, and that, in violation of temporal monotonicity, they would choose to repeat that episode.

As expected, raising the water temperature slightly caused a significant drop in momentary discomfort for most participants (66% dropped their discomfort ratings by 2 or more points on a 15-point scale). Also as expected, the relative durations of the two trials were judged correctly by most. Even so, as hypothesised, most participants—69% of them—chose to repeat the long trial. This effect was especially pronounced among those individuals who registered improvements in experienced pain: 81% of these participants chose the long trial. Note that if participants' choices followed the rule of temporal monotonicity (i.e. if they were aiming to minimise their exposure to pain) these percentages would be zero. Instead, people's choices appeared to follow the peak-and-end rule: Adding more pain to the end of an episode can actually improve its retrospective global evaluation as long as the end pain represents an improvement over the peak pain. Again, although temporal monotonicity may apply as extended episodes unfold (i.e. we can assume that if, after 60 seconds of the long trial, participants were offered a dry towel, they would prefer that to continued immersion), temporal monotonicity does not appear to apply when those same episodes are judged from hindsight.

Field tests of duration neglect

Perhaps the most dramatic evidence for the peak-and-end rule and duration neglect comes from a series of field studies conducted by Redelmeier and Kahneman on unavoidable pain experienced during

medical procedures. In one study (Redelmeier & Kahneman, 1996), 101 patients undergoing colonoscopy indicated their current pain on a visual analogue scale every 60 seconds throughout the procedure. For an additional 53 patients, an observing research assistant made the on-line pain ratings instead of the patients themselves. Momentary pain levels varied substantially from minute-to-minute and 38% reported the maximum pain score at least once during the procedure. The duration of procedures also varied greatly across patients: Some colonoscopies were as short as 4 minutes, others were as long as 67 minutes (M = 23min, SD = 13min). Later, patients indicated their global evaluations of their colonoscopy experience in several ways. They rated the "total amount of pain experienced" on a 0–10 scale within the hour and again one month later; they also ranked the experience relative to other painful experiences. All measures indicated support for the peak-and-end rule and duration neglect. For example, the global assessment of total pain correlated with the average of peak pain and end pain at .67 ($P < .05$), but correlated with the duration of the procedure at only .03 (n.s.). Strikingly, the same sensitivity to peaks and ends, and neglect for duration emerged when observers and physicians rated the patients' momentary pain and then later evaluated it globally. For instance, physician's judgements about whether more anaesthetic should have been used correlated .40 ($P < .05$) with peak and end, and .05 (n.s.) with duration.

Redelmeier and Kahneman conducted another study (reported in Kahneman, Wakker, and Sarin, 1997) to test whether the lessons from our laboratory experiment with the ice-cold water (Kahneman et al., 1993) would generalise to unavoidable medical pain in a clinical setting. That is, would adding an extra period of pain improve patients' global evaluations of medical procedures, as long as the added pain represents a noticeable improvement? Six hundred and eighty-two patients undergoing colonoscopy participated in this experiment. Not known to the patients, half were randomly assigned to a condition in which the procedure was extended by leaving the colonoscope in place for about a minute after the clinical examination was completed. This added experience was mildly uncomfortable (certainly less preferred than the alternative of removing the instrument), but for many patients it was less painful than the preceding moments. The peak-and-end rule applied yet again: Prolonging the procedure in this manner improved patients' later global evaluations of their experience. This finding suggests that an intervention that improves the memory of a painful medical procedure—even if it adds to the total experience of pain—might increase patient's willingness to undergo further colonoscopies if needed.

Marketing researchers have also taken interest in whether the peak-and-end rule and duration neglect apply to people's evaluations of televised

advertisements. Television airtime is sold by the second. If duration does not effect viewer's global evaluations, then, in theory, companies would create and air a 30-second commercial that would be just as effective—and less costly—than a 60-second commercial, provided that peak and end affects were comparable. Baumgartner, Sujan, and Padgett (1997) tested this hypothesis. Across three studies, 156 participants watched and later evaluated a series of commercials that varied in duration (from 30 to 90 seconds), intensity of positive affect, an latency of peak positive affect. In two studies, participants provided moment-by-moment affective reactions while viewing the adverts, whereas in a third study, they simply watched the adverts. Results indicated that viewers most preferred commercials that achieved a high peak positive affect and ended on a strong positive note. Viewers only liked longer adverts more when the added time was used to build to a higher peak experience (Baumgartner et al., 1997).

Related findings and boundary conditions

The research reviewed thus far indicates that empirical support for the peak-and-end rule is robust. People's global evaluations of their past affective experiences, as well as their choices about the future, can often be well predicted by a simple average of two moments: the most intense affective moment of that experience and the affect experienced at its end. One curious consequence of the peak-and-end rule is that the duration of past affective experiences carries hardly any weight at all. Findings of duration neglect violate the powerful intuition encapsulated by temporal monotonicity: Adding more moments of pain (or any other negative affect) should make the overall experience worse, not better.

It could be argued that duration neglect of the sort described here might be limited to humans. Humans, with their impressive cognitive abilities, have been known to think too much about simple choices and preferences, resulting in poorer quality decisions (Wilson & Schooler, 1991). But duration neglect is not limited to humans. Rats show it too. An early experiment by Mowrer and Solomon (1954) demonstrated that rats exhibit comparable fear responses to a conditioned stimulus (a blinking light) paired previously with either a 3-second or a 10-second electric shock (of equal intensity). Rats avoided activities that triggered the blinking light regardless of the duration of their past pain. Duration neglect in rats also applies to pleasurable experiences, like rewarding brain stimulation (Shizgal, 1997). Mark and Gallistel (1993) demonstrated that rats exhibit comparable subjective rewards to medial forebrain stimulation, regardless of stimulus duration, as long as the stimulation exceeds 1 second. Beyond this length, rats sought out activities that triggered the brain stimulation regardless of reward duration. These examples suggest that when rats make

behavioural choices based on past experiences, they—like humans—violate temporal monotonicity: Extended pain is not always worse, and extended pleasure is not always better.

The simplicity of the peak-and-end rule certainly creates parsimony. But perhaps it is too simple. Closely related research has shown that other aspects of affective experiences—perhaps in addition to peak and end affect—also predict people's global evaluations of episodes. Ariely (1998), for instance, has suggested that the trend of intensity change matters, especially late in an episode, and Hsee and colleagues (Hsee & Abelson, 1991; Hsee, Salovey, & Abelson, 1994) have suggested that the velocity of intensity change matters. Moreover, the duration of episodes is not always *completely* neglected (Ariely, 1998; Fredrickson & Kahneman, 1993; Varey & Kahneman, 1992).

Schreiber and Kahneman (2000), disbelieving the simplicity of the peak-and-end rule, set out to test its boundary conditions, as well as the magnitude of its effect on global evaluations relative to trend and velocity effects. Across four studies, 133 participants listened to and later evaluated annoying, computer-generated sounds. An initial study found that people's momentary annoyance ratings almost perfectly tracked changes in the sound intensity. This feature, together with the facts that these sounds are relatively short and easy to edit, makes these ideal stimuli for gaining tight experimental control over momentary changes in affective experience.

By and large, Schreiber and Kahneman's (2000) data provided powerful support for the peak-and-end rule—more powerful than they expected. Although they did uncover important qualifications to the effects of peaks and ends, in all cases, these qualifications marked much weaker effects, more like footnotes than competing rules of evaluation. For instance, in some tests (i.e. experiment 2), but not in others (i.e. experiment 1, see also a study by Schreiber cited in their footnote 6), small effects for trend were observed.[1] Likewise, in some tests (i.e. experiment 1), but not in others (i.e. experiment 2), small effects for velocity were observed. In addition, the relative durations of peak affect, and the recency of peak affect contributed marginally to global evaluations, whereas the number of peaks did not matter at all.

Most significantly, Schreiber and Kahneman (2000) found that duration contributed to global evaluations following an *additive extension effect*: All

[1] The peak-and-end rule and trend effects make the similar predictions when a constant aversive episode is compared to one that starts out just as bad but improves with time: Both predict that the improving episode will be preferred (as was found by Kahneman et al., 1993). They make divergent predictions when a constant aversive episode is compared to one that starts out milder, but worsens over time to be just as bad. The peak-and-end rule predicts two such episodes will be judged as equally bad, whereas a prediction based on trends suggests that the constant episode will be preferred.

else being equal, longer episodes were judged to be worse than shorter episodes, but this difference did not depend on the intensity of the experienced affect. Instead, episode duration was treated as an extra feature of the episode, one that people appeared to use to *adjust* the global assessment they formed based on select momentary experiences (e.g. "That episode wasn't so bad, but it was long"). Although this additive extension effect takes duration into account, it still violates the intuition of temporal monotonicity which implies that extending the duration an unpleasant episode should matter more for more intense episodes than for less intense episodes; in other words, duration and intensity should combine multiplicatively, not additively.

The evidence for the additive extension effect is important for another reason as well. It serves as a clear link between the work on duration neglect (reviewed here) and other core findings within the decision literature, such as the underutilisation of baserate information (e.g, What is the probability that Jack, a man described as "charming, talkative, clever, and cynical" is a lawyer, assuming that he was randomly selected from a set of 30 lawyers and 70 engineers?; Kahneman & Tversky, 1973), and the minimal influence of numbers of lives saved on people's willingness to pay for environmental problems (e.g. How much would you pay to save 20,000 (vs. 200,000) birds from drowning in ponds of spilled oil?; Kahneman, Ritov, & Schkade, in press). Schreiber and Kahneman (2000) argue that each of these core findings can be explained by a principle of *judgement by prototype*:

> The principle asserts that the global evaluation of a set is dominated by the evaluation of its prototypical element or exemplar. Because the size of the set is not included in the representation of a prototypical exemplar, judgment by prototype is associated with severe or complete *extension neglect*.

As such, the peak-and-end rule appears to be a special case of the more general principle of judgment by prototype. When applied to temporally extended episodes, this principle boils down to *evaluation by moments* (Kahneman, 1999). While hindsight evaluations of past affective experiences have been the focus of this review, the principle of evaluation by moments also applies to people's forecasts about their future affective experiences. Unlike affective retrospections, affective forecasts appear to be dominated by the initial moments of episodes, as people use the affect associated with the change to the new state as a proxy for their global evaluation. The famous example of the predicted happiness of paraplegics and lottery winners (Brickman, Coates, & Janoff-Bulman, 1978) can be understood as evaluations that privilege initial affect (Kahneman, 1999). The dominance of initial moments in affective forecasts accounts for the findings that people overestimate the overall intensity and duration of their

affective reactions to future events (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Schkade & Kahneman, 1998; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 1999).

So the peak-and-end rule appears to be very robust, and has been documented for a wide range of affective episodes, ranging from pleasant films (Fredrickson & Kahneman, 1993) to painful medical procedures (Redelmeier & Kahneman, 1996). Yet despite this strong evidence, it bears underscoring that these supportive data come from episodes that share specifiable features. In all cases, the episodes were clearly bounded, continuous, and completed. And although the intensity of affect often changed within an episode, the valence and specific type of affect rarely changed. By and large, episodes were also passively endured and were not considered a means to some other end. When these features are altered, peak and end affect may not make comparable contributions to global evaluations. First, when endings are not yet known, end affect (more aptly called recent affect) appears to contribute little to global evaluations, as was demonstrated by the study of anticipated social endings reviewed earlier (Fredrickson, 1991). Second, when episodes are directed towards goals, end affect may be all that matters because it comes to symbolise the outcome of the activity. This simpler "end only" rule was demonstrated by Carmon and Kahneman (1996, cited in Ariely & Carmon, in press), who found that people's experiences of waiting in line are dominated by end (but not peak) affect. Third, sometimes a simpler "peak only" rule appears to apply. At the moment when people are bracing themselves for the anticipated re-experience of an aversive episode, peak (but not end) affect predicts global evaluations (Branigan, Moise, Fredrickson, & Kahneman, 1997). Finally, it seems less likely that peak and end affect make substantive contributions to temporal episodes framed solely by clocks and calendars (e.g. a minute or hour; a day, week, or year; see Ariely & Carmon, in press, Barrett, 1997; Parkinson et al., 1995, for relevant tests). Perhaps people will only evaluate these "objective" units of time by the peak-and-end rule when the time-spans become marked and subjectively meaningful for reasons other than clocks or calendars (e.g. the hour with my therapist, my day in the hospital, my week at the beach, or my ten years in prison).

Summary

The primary lesson to be drawn from the existing empirical literature on the peak-and-end rule is that people evaluated certain kinds of past affective experience by referencing just a few selected moments. One or two moments, then, play a privileged role in guiding people's choices about which past experiences they would avoid, and which they would repeat, or recommend to others. In many cases, the privileged moments include the one that

contained the most intensely experienced affect, and the one that concluded the experience. As such, the peak-and-end rule is a powerful heuristic for determining global evaluations of past affective experiences. Like any heuristic, it is probably useful most of the time. But under certain circumstances it can also lead to biases and mistakes. A variety of studies have demonstrated that these mistakes may cause people to violate hedonism, and choose more pain rather than less.

NEW DIRECTIONS: EVALUATION BY MEANING

The empirical findings reviewed thus far raise one key question: Why? Of all the moments people could select to represent past affective experiences, why do they choose peaks and ends? Is it perceptual? Are peaks and ends simply more salient than other moments? This is unlikely to be the whole story. To begin unravelling this issue, I suggest we take steps to consider the *personal meanings* conveyed by these moments. Personal meaning refers to information that contributes to individuals' understanding of themselves *vis-à-vis* the world around them. Peaks and ends, I will argue, earn their privileged status because they carry more personal meaning than other moments. Considering meaning and not just moments also opens the door to other carriers of personal meaning, such as specific emotions. Taking this new direction, then, will push the current body of empirical work beyond the study of experiences that include only one type of affect, into studies of more complex experiences characterised by multiple or mixed affective states.

Peaks and ends as carriers of meaning

Subjective conceptions of time

A discussion of how time itself carries personal meaning provides an important backdrop. Under some circumstances, identifying certain moments as more important than others might be considered a mistake. Indeed, we have argued that people's memory-based preferences for a longer painful episode that includes a better end is a mistake because it does not coincide with what they would have chosen as the episode actually unfolded (e.g. Kahneman et al., 1993). Weighting certain moments of time more than others not only violates temporal monotonicity (as I have reveiwed earlier), but also violates the dominant view of time in many Western cultures: Time, according to this view, is objective, absolute, and homogenous. The measurement precision of clocks and calendars reifies this view. By implication, all equal-sized units of time are identical, and therefore interchangeable. This classic view of time can itself lead to some

curious equivalences: As Schroots and Birren (1990, p. 46) point out, it implies that "the first 20 years of life are equal to the middle or last 20 years of life", a statement that would give most people pause.

However dominant the objective view of time may be, it does not well capture how people experience time phenomenologically. People's subjective experiences of time track personally relevant events and experiences, not clocks and calendars (McGrath & Kelly, 1986). Most people, for instance, view the day as beginning when they wake up, not when the clock strikes 12.01 a.m. An episode, then, typically begins and ends with reference to personally relevant events. Patients in the studies by Redelmeier and Kahneman (1996), for example, framed their experiences with reference to events like "when the doctor inserted that instrument (into me)" and "when he removed it (from me)". Episodes are further differentiated by the personal experiences—in this case the pain—encountered in between such beginnings and endings. So, even though episodes coincide with objective time, they gain meaning through the personal experiences that "fill" them, not by the clocks or calendars that measure them. This more phenomenological view of time appears to be the dominant view in other cultures (Jones, 1988; Levine, West, & Reis, 1980), and can perhaps explain why Americans grow impatient with the "wasted time" they encounter when travelling abroad. Conceptualising time as subjectively perceived also makes people's emphasis on certain moments more understandable.

Peaks convey capacity requirements

What sort of personal meaning is conveyed by moments of peak affect? I suggest that peak affect is worth tracking and remembering not only because it indexes how good or how bad the experience can get, but also because it conveys the personal capacity necessary for achieving, enduring, or coping with that episode. In other words, the moment of peak affect intensity is the single moment that defines the personal capacity needed to face the experience again. For instance, a relatively low peak indicates that an episode presents no problem for coping, whereas a relatively high peak indicates that coping resources might be pushed to the limit. Although we typically think only of negative affect as straining our personal capacity, positive affect does as well. We can infer this because people cope with—or regulate—positive and negative experiences alike, trying either to inhibit or intensify them (Gross, 1998; Parrott, 1993). So, just as you need to know the maximum height of the sailing boat you are towing before you drive under a low bridge, peak affect is worth knowing to decide whether you can handle experiencing a particular affective episode again.

Importantly, people's capacity for coping with or otherwise regulating their affective states is not a stable personal attribute, but instead it varies across time and circumstance. Past research shows that coping resources are depleted by aversive experiences and renewed by rest and positive states (Folkman, 1997; Linville & Fischer, 1991). Because capacity levels fluctuate over time, it makes sense for people to track peak affect episode-by-episode, in addition to tracking their cumulative "grand peaks" (e.g. the worst and best moments of my life so far). Plus, people's momentary coping resources in part determine the quality and intensity of their momentary affect (Lazarus, 1991). So, as coping resources become depleted, peak affect intensifies, a pattern we saw with the longer versions of our most intense aversive films (e.g. a documentary showing victims of the Holocaust, and a medical film of an amputation; see Fredrickson & Kahneman, 1993, figure 2).

Consistent with the hypothesis that peaks convey capacity requirements, our data suggest that when coping requirements are most salient, peak (but not end) affect dominates global evaluations. Specifically, we found that peak affect mattered more than end affect in viewer's global assessments of aversive films (Fredrickson & Kahneman, 1993), and that peak affect alone predicted people's global assessments when they were bracing themselves for re-viewing a series of disgusting images (Branigan et al., 1997). Peak affect, then, appears to carry self-relevant information about the capacity a person needs to deal with the world he/she encounters.

Endings convey certainty

What do endings convey? First and foremost, endings convey that episodes can be assessed with relative certainty. Endings signal that episodes are completed, safely in the past, and therefore knowable. While experiences are still ongoing, people may hold their global impressions somewhat tentatively. After all, what lies ahead could still surprise them and change everything. But once endings have transpired, nothing new or surprising threatens to alter or transform the meaning of the experience. We have a range of clichés at our disposal that serve to remind ourselves and others to hold off on making global evaluations or decisions until endings have occurred: "It ain't over 'til it's over" or ". . . until the fat lady sings". After endings occur, other clichés serve as reminders to keep the focus on endings: "All's well that ends well". So in many cases, endings are in fact more important than the moments that precede: Endings provide people with one route to knowing—with great confidence—what their global impressions really are.

The dramatic increase in certainty that comes with endings is especially characteristic of episodes that are goal-directed. For episodes in which

people have been pursuing their goals, endings coincide with outcomes. Affect experienced during outcomes is perhaps the best proxy for whether the entire goal-directed episode—regardless of moment-by-moment affect—was worthwhile. Consider, for instance, episodes like arm-wrestling, working towards tenure, or being in labour for childbirth. If the ends justify the means, then end affect can eclipse most other moments of affective experience. Arguably, goal-directed experiences comprise the bulk of human experience (Spiegel, 1998). If so, people's sensitivity to end affect is not only understandable, but is also critical for sustaining motivation for living. The extent to which people can keep their "eye on the prize" can inspire them to endure the often inevitable bad experiences along the way.

Likely reflecting the weight placed on endings from hindsight, people's behaviour during interpersonal endings is governed by ritualised summary statements and expressions of positive affect (Albert & Kessler, 1976, 1978). Arguably, these social norms are entrenched because affect experienced during endings defines—and redefines—the quality of whole relationships. Suppose, for instance, a close friend of yours moves away without saying goodbye. This norm violation is likely to make you question how close the two of you really were. Data supporting the hypothesis that end affect is used to construct global social impressions come from the study on anticipated social endings described earlier (Fredrickson, 1991). The same study also provided data on the reconstruction process. Several days after their three 30-minute conversations, participants were told that the momentary affect ratings they made for the initial conversation were not registered by the computer because of equipment failure (this was deception). All agreed to re-do their ratings. Affect associated with the final conversation predicted degree of affective reconstruction, but only when the final moments were construed as an ending, not when they were considered part of an ongoing relationship (Fredrickson, 1991). These data fit the cynicism expressed by Zsa Zsa Gabor: "You never really know a man until you have divorced him" (cited in Adam, 1989, p. 57).

Finally, endings also carry residual meaning about personal capacity. After all, by definition, if you have encountered the end of an episode, you have survived it—you lived to tell the story. In fact, only after the episode has ended can you be certain which of the extreme moments was actually the peak. For instance, a major fright, as it unfolds, might raise the question of how much you can endure. Yet this question can be readily answered once the episode has ended. The ending reveals the peak, and the peak reveals the capacity required and achieved. So, only from the relative comfort of hindsight can individuals fully take stock of their coping capacity. In addition, once episodes have ended, extreme peaks carry information about the tested boundaries of personal capacity. This

analysis can shed light on why some people seek out extreme and dangerous experiences (e.g. bungee jumping, mountain climbing). Living to tell stories of high adventure demonstrates how much one can handle.

Summary

A look to the personal meanings carried by certain moments raises the possibility that the peak-and-end rule does not simply reflect perceptual salience. Or perhaps, better said, peaks and ends may be salient precisely because they carry a wealth of self-relevant information. As such, these two moments may in effect become bouillon cubes of personal meaning: From them a person can efficiently and effectively reconstruct the whole past episode. In particular, with just these two moments a person can represent both how much personal capacity the experience required and whether it was worthwhile in the end. The personal meanings carried by peak and end affect also make us question whether and when reliance on the peak-and-end rule should be considered a mistake. Certainly, bias can and will occur in any reconstruction process. But for all practical purposes, peak and end affect may carry enough of self-relevant meaning to justify people's reliance on the rule. If so, peak and end moments may in fact be more important than other moments.

Specific emotions as carriers of meaning

Specific emotions convey core relational themes

Debates about whether the full realm of affective experience is best represented by continuous dimensions (e.g. valence, arousal) or by discrete emotion families (e.g. anger, fear, disgust) go back more than 100 years and continue to this day (for reviews see Izard, 1993; Lazarus, 1991). Focus on the personal meanings associated with different affective states strengthens the case for discrete models. Specific emotions convey distinctive information about an individual's position in the world. In particular, specific emotions go hand-in-hand with what Lazarus (1991) calls *core relational themes*, or the central harm or benefit within a particular person-environment relationship. Harmful and beneficial person-environment relationships come in multiple forms. The theme for anger, for instance, is a demeaning personal offence: That for fear is an immediate and overwhelming personal danger, and that for shame is a failure to live up to an important personal ideal (Lazarus, 1991). Because specific emotions map onto distinct core relational themes, experiences of specific emotions carry meaning about a person's momentary standing *vis-à-vis* the world.

Measurement issues

A key limitation of the research reviewed earlier is that it has virtually ignored specific emotions. Affect, the measures used would imply, varies along a single bipolar "good-bad" dimension. This oversimplified empirical realisation of affect was chosen for two, interwoven practical reasons. First, the affect-inducing stimuli employed in this research have been fairly uniform, likely to produce variations in valence and intensity, but not in specific emotions. Second, the goal of collecting continuous, real-time ratings of momentary affect necessitates limiting self-reports of emotions to just one dimension, whether it be bipolar or unipolar. Certainly it is *technically* feasible to create a whole bank of rating dials, reflecting each of several discrete emotional states. But would it be *psychologically* feasible for respondents to track the ebb and flow (onsets, dynamics and offsets) of multiple discrete emotions simultaneously, in real time? (For a discussion of measurement issues in emotion research see Larsen & Fredrickson, 1999.) Yet, as we have seen, real-time measures of affect are not always needed to test hypotheses in this research area. Preliminary studies that unpack the moment-by-moment changes in affect produced by known and replicable stimuli can provide reference data for later studies (e.g. Fredrickson & Kahneman, 1993; Schreiber & Kahneman, 2000). As such, techniques other than the rating dial can be used to assess momentary changes in multiple, specific affects. (One viable technique is Rosenberg and Ekman's cued-review; see Larsen & Fredrickson, 1999.) In any event, steps to collect data on specific affects will be critical in future work because distinct affective states of the same valence and intensity carry different personal meanings.

Relative meaning

I would add that some specific affects matter more to most people than others. For instance, although love and sensory pleasure are both positive states, relative to experiences of sensory pleasure, experiences of love carry information about a person's current social standing and future social resources. Not surprisingly then, experiences of love seem to matter more to most people than experiences of sensory pleasure. As such, when extracting meaning from past experiences that include both love and sensory pleasure, a reasonable hypothesis would be that people will weight moments that include love more heavily than those moments—however pleasurable—that are devoid of love. Relatedly, when deciding which experiences to seek out in the future, love should again carry more weight. To draw an example from the realm of negative affect, anxiety seems to be a relatively tolerable negative affect, whereas shame is not.

Indeed, some theorists have argued that shame is so intensely aversive that actual experiences of shame are relatively rare for adults because they so adeptly follow social norms in order to avoid shame (Scheff, 1988). So when extracting meaning from past experiences that include both anxiety and shame, moments of shame are likely to dominate. Likewise, when deciding which experiences to most actively avoid, shame again should carry more weight.

It appears reasonable to hypothesise then, that specific positive and negative affects can be ordered, or classified as having relatively low or high personal meaning. A high meaning emotion is one that carries relatively more information about a person's current position *vis-à-vis* the world, as well as their future prospects. Positive affects with low meaning might include sensory pleasure, and feelings of safety, satiation and/or comfort (states that money can buy), whereas those with high meaning might include joy, love, and interest/flow (states that money cannot buy). Discussion of the adaptive significance and psychological repercussions of these high meaning positive emotions is beyond the scope of this article. Interested readers are directed to Csikszentmihalyi and Rathunde (1998) and Fredrickson (1998, in press). Negative affects can be similarly divided into those with low and high meaning. Those with low meaning might include pain, disgust, and anxiety, whereas those with high meaning might include shame, guilt, and remorse. Obviously, these divisions represent only a first step toward assessng the relative meaning of specific affects. Even so, it is noteworthy that affective states most closely linked with future-oriented social relations and/or personal growth carry relatively high meaning (e.g. love and shame), whereas those most closely linked with immediate individual survival carry relatively low meaning (e.g. pleasure and pain).

In opening this paper I stated that a first approximation to understanding people's decisions and choices follows pure hedonism: They strive to repeat what they have liked or enjoyed, and avoid or dread further experiences with what they have disliked or found aversive. Yet I was quick to add that it is not so simple, in part, because hedonism is silent on the differences among affects of the same valence. To the basic tenets of hedonism, I would add that normal individuals strive harder—and suffer more costs—to repeat experiences that include high meaning positive affects (e.g. love, interest/flow) than to repeat those that include only low meaning positive affect (e.g. pleasure, comfort). Likewise, they most actively avoid experiences that include high meaning negative affects (e.g. shame, remorse), but may routinely endure those that include only low meaning negative affect (e.g. anxiety, disgust). Moreover, these relations should hold *regardless of affect intensity*. Even moderate intensity episodes of remorse, for example, may be dreaded more than high intensity episodes of anxiety.

Compounded and mixed meanings

An additional layer of complexity that awaits study within this research tradition concerns mixed or compounded affects. Some affective states beget other affective states, either sequentially or simultaneously. For instance, people seek out horror films or tear-jerkers because they sometimes *enjoy* feeling the emotions that these films arouse. This appears to be true so long as the negative emotions experienced do not signal threats to the viewer's personal well-being (Murry & Dacin, 1996). When these movie-goers provide global evaluations of the films they have chosen, the secondary and positive state of enjoyment is likely to dominate the initial and negative states of fright or sadness. Relatedly, Mancuso and I have found that for individuals who hold the personal ideal that they should *not* experience anger, experiences of anger become blended with shame. (Mancuso & Fredrickson, 1996). In both these cases, the personal meanings carried by secondary emotions are likely to dominate people's later global evaluations.

Summary

As research on global evaluations of past affective experiences refines and deepens its measures of momentary affect, I suspect that new lessons will emerge about the importance of personal meanings. First, I have speculated that peak affect and end affect serve as proxies for global evaluations to the extent that they provide information about capacity requirements and outcomes, respectively. Second, I have speculated that moments associated with relatively high meaning specific emotions—like love and shame—will also serve as proxies for global evaluations. These various sources of personal meaning are expected to dominate people's thinking when they use past affective experiences to make decisions about the future.

PRESCRIPTIVE IMPLICATIONS: OPTIMISING HAPPINESS

The research and new directions discussed thus far have implications for the timeless prescriptive question of how people can optimise happiness. Or, in the language of decision researchers, how they can optimise utility. Certainly, people pursue activities and experiences that they expect will contribute to their overall happiness. And, as we have seen, their decisions about what to pursue are often based on global evaluations of their past affective experiences. Do people pursue things that optimise their overall happiness? Do their choices maximise overall utility? If not, how could they do better?

Defining happiness

Answers to these questions depend critically on how happiness and utility are defined. Although many contemporary decision researchers assume that utility is revealed through choices, Kahneman (1999; Kahneman et al., 1997), has worked to resurrect the 18th century economist Jeremy Bentham's definition of utility. As Bentham (1789) used it, utility referred to affective experiences themselves, not to choices about those experiences. To distinguish among various definitions of utility, Kahneman advocates using the term *experienced utility* to capture Bentham's view, and *decision utility* to capture the contemporary usage. When people base their decisions on past affective experiences, the distinctions among *instant utility, total utility, remembered utility* and *predicted utility* become important as well (for a review see Kahneman et al., 1997). Instant utility refers to the affect experienced in the moment, and serves as the basic building block of experienced utility. Total utility refers to the normative concept most closely tied to the notion of temporal monotonicity (described earlier) and is represented as area-under-the-curve on a plot of instant utility over time. According to Kahneman, total utility represents "the objective function that a benevolent social planner would wish to maximize" (Kahneman et al., 1997, p. 389). Remembered and predicted utilty are evaluations of past and future affective experiences, respectively.

The research reviewed in this article can be profitably reframed in terms of these various conceptions of utility (e.g. Kahneman et al., 1997, figure 1). Doing so reveals that decisions based on past experience typically optimise remembered utility, not experienced utility. More relevant to the current objective, however, is Kahneman's (1999) provocative proposal that various conceptions of utility can be used to define both subjective and objective happiness. Subjective happiness—the answer a person supplies if you ask them: "Overall, how happy are you?"—corresponds to remembered utility. By contrast, objective happiness, according to Kahneman, corresponds to total utility, or the record of instant utility over time.

A first approximation for measuring objective happiness

Self-report measures of happiness (or subjective well-being) are notoriously context dependent and highly influenced by momentarily accessible information (Schwarz & Strack, 1999). This poses grave methodological problems for those interested in tracking the progress of social policy interventions aimed at improving the quality of life. To circumvent this problem, Kahneman (1999) suggests that economic and social policy decisions should be based on bottom-up assessments of people's objective

happiness, rather than self-report measures of their subjective happiness. The bottom-up approach privileges instant utility, or momentary affect as it is experienced. Kahneman recognises that the requirements on the measure of instant utility are formidable, for it must include all the information for an adequate assessment of total utility. Even so, he suggests that a good first approximation would be to measure instant utility along a single good-bad dimension that has a distinct and clear neutral (zero) point. Profiles of instant utility could then later be aggregated over time (either as the integral or average, depending on contextual properties) to calculate objective happiness.

Although momentary good-bad ratings need only be ordinal when they are generated, Kahneman (1999, p. 6) emphasises that before decision-makers aggregate those good-bad ratings they must convert them into a ratio scale that calibrates affect intensity relative to duration. This can be done based on observed equivalences:

> For example, suppose that the observer judges that 1 minute of pain at level 7 is as bad as 2 minutes of pain at level 6. According to the theory, this judgment implies that the original reports of pain should be rescaled, assigning level 7 a value that is twice as high as the value assigned to level 6. . . . [T]he theory asserts that a consistent rescaling is possible, yielding a ratio scale for instant utility that is calibrated by its relation to duration. The rescaling procedure is a close cousin of the method used in medical research to estimate Quality-Adjusted Life Years (QALYs), by establishing equivalences between years of survival in normal health and years of survival at some lower level of health.

The logic is that once momentary good-bad ratings are calibrated against time, they provide objective information about the quality of life. So if, to borrow Kahneman's example, you wanted to determine "How happy was Helen in March?" you would calculate the average height of the *rescaled* utility profile constructed from the momentary good-bad ratings Helen made during that month.

Optimising objective happiness

Optimising positive states

Certainly, one basic prescription for optimising objective happiness (or total utility) would be to attend to the valence and intensity of affective experience, and maximise positive states. According to this view, people can improve their happiness by experiencing a preponderance of positive states over negative states (cf. Diener & Larsen, 1993). Kahneman (1999, p. 7) suggests that:

> as a first approximation, it makes sense to call Helen "objectively happy" if she spent most of her time in March engaged in activities she would rather have continued than stopped, little time in situations she wished to escape, and—very important because life is short—not too much time in a neutral state in which she would not care either way.

This analysis implies that people can optimise objective happiness by following the *guide of hedonism*: Do what feels good and avoid what feels bad. Few could argue this logic as a first approximation. Even so, as we have seen, violations of hedonism are common (Parrott, 1993), and in addition, most people describe themselves as happy (Diener & Diener, 1996). This combination of observations raises the possibility that following the guide of hedonism will not fully optimise happiness. Other guides may be needed as well. Two more are suggested by the work and ideas reviewed thus far.

Optimising endings

Another prescription for optimising objective happiness (or total utility) would be to optimise endings. If, as I have argued, peaks and ends carry more importance than other moments, then efforts spent optimising these moments should have a larger pay-off than efforts spent optimising other moments. Although the peak affect experienced in any given episode may often be beyond a person's control, end affect may be more tractable. As an episode nears completion, people can actively pursue a happy ending, or at least a better ending. When physicians arranged to give their patients a better end to painful medical procedures, patients reported better experiences overall. Other research has demonstrated that people reliably seek out better endings on their own. For instance, when ending social interactions, people put a positive spin on their accomplishments (e.g. "At least we got the hardest part of the job done"), express positive sentiments (e.g. "This was fun!"), and wish one another well (e.g. "Have a good weekend") (Albert & Kessler, 1978). Other research demonstrates that people prefer to arrange sequences of pleasant and unpleasant experiences in ways that produce happy endings—exhibiting what economists call *negative time discounting*—for instance, by visiting a good friend after a depressing relative rather than vice versa (Loewenstein & Prelec, 1993; Ross & Simonson, 1991). Evidence that people actively construct better ends suggests that ending moments are objectively more important than other moments. As such, I propose that, in addition to the guide of hedonism, another prescription for happiness is the *guide of better ends*: People can improve objective happiness by working to create better endings to affective episodes.

Optimising meaning

If, however, endings contribute to happiness primarily because they are carriers of personal meaning, then striving for better ends in and of themselves may still fall short of optimising objective happiness. Perhaps instead, people should optimise personal meaning. It so happens that one strategy for doing so would be to pursue better ends, especially when those ends signify successful goal completion. Working to optimise the ends of goal-directed episodes assumes importance because pursuing and attaining goals is a key path to achieving meaning, and has been found to predict overall happiness (Cantor & Sanderson, 1999; Emmons, 1996), even during periods of severe distress (Folkman, 1997; Stein, Folkman, Trabasso, & Richards, 1997). So the close link between goal achievement and personal meaning gives an additional reason to pursue better endings.

Another strategy for optimising personal meaning—which should in turn optimise objective happiness—would be to consider the relative meanings of the various specific affects experienced. Positive and negative emotions with high meaning, I have argued, carry more information about a person's position in the world and their future prospects. If empirical tests uphold this prediction, people should be able to improve their overall happiness by seeking out a preponderance of high meaning positive affects—like love and interest/flow—over low meaning positive affects—like pleasure and comfort. In addition, people could minimise threats to their happiness by staunchly avoiding high meaning negative affects—like shame and remorse—while accepting as inevitable low meaning negative affects—like anxiety or irritation. These prescriptions fit well with Ryff and Singer's (1998) recent urgings to conceptualise happiness from philosophical perspectives. They argue that happiness—or human flourishing—is most closely tied to having quality connections to others and leading a life of purpose. I would add that people can obtain these "goods" by striving for high meaning positive emotions: Quality relationships are indexed by experiences of love, and purposeful living is indexed by the interest and vigour with which goals are pursued. Moreover, I have argued elsewhere (Fredrickson, in press) that cultivating these sorts of positive emotions can optimise physical health and psychological resilience in addition to happiness. Thus, alongside the guides of hedonism and better ends, I propose that another prescription for happiness is the *guide of high meaning:* People can optimise objective happiness by selectively cultivating high meaning positive affects.

A second approximation for measuring objective happiness

Kahneman's first approximation for measuring objective happiness, although path-breaking, implies that people (and benevolent social planners) can optimise happiness by following the guide of hedonism. The measurement strategy he proposes—collecting and then later aggregating good-bad ratings of instant utility—ignores the evidence that certain moments and affective states matter more to people than others. So a second approximation for measuring objective happiness seems necessary. The strategy I propose reflects the view that people who wish to optimise happiness should follow multiple guides: The guide of hedonism along with the guides of better ends and high meaning.

The goal to assess the relative meaning of different affective states raises a separate measurement problem—that of shifting standards in self-reports (Biernat, Manis, & Nelson, 1991). Let us return to Helen for an example. Suppose Helen gives a +7 to one moment and describes it as love (e.g. experienced while playing in the park with her young son), and a +10 to a separate moment and describes it as pleasure (e.g. experienced while eating the best tuna steak she's ever had). Are her ratings made on the same ordinal scale? Should a benevolent social planner arrange for Helen to have more days with tuna steak and fewer days with her son in the park? Probably not. Ratings and labels for affective states are almost inevitably ambiguous. As such, it seems reasonable to suspect that moments of love at +7 are evaluated against one set of states, whereas moments of pleasure at +10 are evaluated against a different set of states. (For evidence of shifting standards in emotion measurement see Grayson, 1998; Winkielman, Knauper, & Schwarz, 1998.)

I propose that both these dilemmas—the smaller one of shifting standards, and the larger one of measuring the relative meanings associated with different moments and affects—can be remedied by adapting Kahneman's recalibration technique described earlier. That is, before the observer aggregates a target person's measures of instant utility to determine her objective happiness, the original reports should be rescaled not only to calibrate intensity against duration (as Kahneman suggested), but also to calibrate intensity against relative personal meaning. Again, in theory this calibration could be accomplished through empirical observations of equivalences or trade-off points. If, for example, empirical observation finds that 10 minutes of love at +5 "is as good as" 5 hours of sensory pleasure at +5, then the target person's original reports should be rescaled, assigning love a value that is 30 times higher than value assigned to sensory pleasure. Relevant equivalences could be approximated empirically through: (a) naturalistic observations, (b) forced-choice experimental

paradigms, or (c) willingness to pay/work experimental paradigms. (See Shizgal, 1999, for related ideas on determining the subjective pay-offs of diverse rewarding stimuli.)

In sum, because some positive states are more uplifting than others, some negative states are more devastating than others, and some moments of time are more important than others, a second approximation to the measurement of objective happiness appears warranted. This second approximation should include momentary affect ratings that identify the boundaries of personally meaningful episodes as well as specific affective states. When these momentary data are coupled with additional data from observed equivalences, momentary affect ratings can, in theory, be recalibrated to account for the greater personal meaning associated with certain affective states and certain moments of time. A benevolent social planner would need this fuller array of information to fully optimise objective happiness.

CONCLUSIONS

I began this article with a detailed review of the empirical evidence that supports and qualifies the peak-and-end rule. From that evidence we can conclude that when people evaluate and make decisions based on certain types of past affective episodes, a few select moments can serve as proxies: The moment of peak affect intensity and the ending. The duration of the episode hardly matters at all.

In discussing why the peak-and-end rule is so robust, I suggested that a critical new direction for this area of research is to examine how personal meaning is extracted from past affective experiences. I suggested that peaks and ends gain prominence because they carry self-relevant information. Specific emotions also carry self-relevant information. Noting this, I speculated that as empirical strategies within this research tradition begin to assess specific and compounded affective states, certain states—namely, those that carry the most self-relevant information—will be found to dominate people's retrospective evaluations. So, although current research supports the principle of evaluation by moments, I propose that future research will support a principle of evaluation by meaning.

With meaning at the forefront, the prescriptive implications of this research tradition gain nuance. As it stands, the existing research—coupled with proposal that objective happiness is better indexed by experienced utility than remembered utility—has been used to suggest that the guide of hedonism points the way to optimal happiness. In contrast, the new directions proposed here suggest that the guide of hedonism should confer with the guide of better ends and the guide of high meaning before pointing out the way to optimal happiness. Future research might

investigate whether certain individuals have an intuitive understanding of these proposed guides to happiness, and in consequence, live better lives.

Manuscript received 22 June 1999

REFERENCES

Adam, A. (1989). *An uncommon scold*. New York: Simon & Schuster.

Albert, S. & Kessler, S. (1976). Processes for ending social encounters. The conceptual archaeology of a temporal place. *Journal for the Theory of Social Behavior*, *6*, 147–170.

Albert, S., & Kessler, S. (1978). Ending social encounters. *Journal of Experimental Social Psychology*, *14*, 541–553.

Ariely, D. (1998). Combining experiences over time: The effects of duration, intensity changes and on-line measurements on retrospective pain evaluations. *Journal of Behavioral Decision Making*, *11*, 19–45.

Ariely, D., & Carmon, Z. (in press). Gestalt characteristics of experiences: The defining features of summarized events. *Journal of Behavioral Decision Making*.

Barrett, L.F. (1997). The relationships among momentary emotion experiences, personality descriptions, and retrospective ratings of emotion. *Personality and Social Psychology Bulletin*, *23*, 1100–1110.

Baumgartner, H., Sujan, M., & Padgett, D. (1997). Patterns of affective reactions to advertisements: The integration of moment-to-moment responses into overall judgments. *Journal of Marketing Research*, *34*, 219–232.

Biernat, M., Manis, M., & Nelson, T.E. (1991). Stereotypes and standards of judgment. *Journal of Personality and Social Psychology*, *60*, 485–499.

Blaney, P.H. (1986). Affect and memory: A review. *Psychological Bulletin*, *99*, 229–246.

Branigan, C., Moise, J., Fredrickson, B.L., & Kahneman, D. (1997, October). *Peak (but not end) ANS reactivity to aversive episodes predicts bracing for anticipated re-experience*. Paper presented at the meeting of the Society for Psychophysiological Research, Cape Cod.

Brickman, P., Coates, D., & Janoff-Bulman, R. (1978). Lottery winners and accident victims: Is happiness relative? *Journal of Personality and Social Psychology 37*, 917–927.

Cantor, N., & Sanderson, C.A. (1999). Life task participation and well-being: The importance of taking part in everyday life. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology*, (pp. 230–243). New York: Russell-Sage.

Carstensen, L.L. (1993). Motivation for social contact across the life span: A theory of socioemotional selectivity. In J. Jacobs (Ed.), *Nebraska symposium on motivation: Vol. 40. Developmental perspectives on motivation* (pp. 209–254). Lincoln, NE: University of Nebraska Press.

Carstensen, L.L., & Fredrickson, B.L. (1998). Influence of HIV status and age on cognitive representations of others. *Health Psychology*, *17*, 494–503.

Csikszentmihalyi, M., & Rathunde, K. (1998). The development of the person: An experiential perspective on the ontogenesis of psychological complexity. In W. Damon (Series Ed.) & R.M. Lerner (Vol. Ed.), *Handbook of Child Psychology: Vol. 1. Theoretical models of human development* (5th ed., pp. 635–684). New York: Wiley.

Diener, E., & Diener, C. (1996). Most people are happy. *Psychological Science*, *7*, 181–185.

Diener, E., & Larsen, R.J. (1993). The experience of emotional well-being. In M. Lewis & J.M. Haviland (Eds.), *Handbook of emotion* (pp. 405–415). New York: Guilford Press.

Emmons, R.A. (1996). Striving and feeling: Personal goals and subjective well-being. In P.M. Gollwitzer & J.A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 313–337). New York: Guilford Press.

Folkman, S. (1997). Positive psychological states and coping with severe stress. *Social Science Medicine*, *45*, 1207–1221.

Fredrickson, B.L. (1991). Anticipated endings: An explanation for selective social interaction (Doctoral dissertation, Stanford University, 1990). *Dissertation Abstracts International*, *3*, AAD91–00818.

Fredrickson, B.L. (1995). Socioemotional behavior at the end of college life. *Journal of Social and Personal Relationships*, *12*, 261–276.

Fredrickson, B.L. (1998). What good are positive emotions? *Review of General Psychology*, *2*, 300–319.

Fredrickson, B.L. (in press). *Cultivating positive emotions to optimize health and well-being. Prevention and Treatment.*

Fredrickson, B.L., & Carstensen, L.L. (1990). Choosing social partners: How old age and anticipated endings make people more selective. *Psychology and Aging*, *5*, 335–347.

Fredrickson, B.L., & Kahneman, D. (1993). Duration neglect in retrospective evaluations of affective episodes. *Journal of Personality and Social Psychology*, *65*, 45–55.

Frijda, N.H. (1986). *The emotions.* Cambridge, UK: Cambridge University Press.

Gilbert, D.T., Pinel, E.C., Wilson, T.D., Blumberg, S.J., & Wheatley, T.P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology*, *75*, 617–638.

Gottman, J.G., & Levenson, R.W. (1985). A valid procedure for obtaining self-report of affect in marital interaction. *Journal of Consulting and Clinical Psychology*, *53*, 151–160.

Grayson, C. (1998). *When a 5 isn't a 5: Sex, prototypes, stereotypes, and standards of comparison in emotion judgments in self and others.* Unpublished doctoral dissertation, University of Michigan.

Gross, J.J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*, 271–299.

Hsee, C.K., & Abelson, R.P. (1991). Velocity relation: Satisfaction as a function of the first derivative of outcome over time. *Journal of Personality and Social Psychology*, *60*, 341–347.

Hsee, C.K., Salovey, P., & Abelson, R.P. (1994). The quasi-acceleration relation: Satisfaction as a function of the change of velocity of outcome over time. *Journal of Experimental Social Psychology*, *30*, 96–111.

Jones, J.M. (1988). Cultural differences in temporal perspectives: Instrumental and expressive behaviors in time. In J.E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 21–38). Newbury Park, CA: Sage.

Izard, C.E. (1993). Organizational and motivational functions of discrete emotions. In M. Lewis & J.M. Haviland (Eds.), *Handbook of emotion* (pp. 631–641). New York: Guilford Press.

Kahneman, D. (1999). Objective happiness. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology* (pp. 3–25). New York: Russell-Sage.

Kahneman, D., Fredrickson, B.L., Schreiber, C.A., & Redelmeier, D.A. (1993). When more pain is preferred to less: Adding a better end. *Psychological Science*, *4*, 401–405.

Kahneman, D., & Miller, D. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, *93*, 136–153.

Kahneman, D., Ritov, I., & Schkade, D. (in press). *Economists have preferences, psychologists have attitudes: An analysis of dollar responses to public issues. Journal of Risk and Uncertainty.*

Kahneman, D., & Tversky, A. (1973). On the psychology of prediction. *Psychological Review*, *80*, 237–251.

Kahneman, D., Wakker, P.P., & Sarin, R. (1997). Back to Bentham? Explorations of experienced utility. *Quarterly Journal of Economics*, *112*, 375–405.

Larsen, R.J., & Fredrickson, B.L. (1999). Measurement issues in emotion research. In D.

Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology* (pp. 40–60). New York: Russell-Sage.

Lazarus, R.S. (1991). *Emotion and adaptation*. New York: Oxford University Press.

Levenson, R.W. (1994). Human emotions: A function view. In P. Ekman & R. Davidson (Eds.) *The nature of emotion: Fundamental questions* (pp. 123–126). New York: Oxford University Press.

Levine, R.V., West, L.J., & Reis, H.T. (1980). Perceptions of time and punctuality in the United States and Brazil. *Journal of Personality and Social Psychology, 38*, 541–550.

Linville, P.W., & Fischer, G.W. (1991). Preferences for separating or combining events. *Journal of Personality and Social Psychology, 60*, 5–23.

Loewenstein, G., & Prelec, D. (1993). Preferences for sequences of outcomes. *Psychological Review, 100*, 91–108.

Loewenstein, G., & Schkade, D.A. (1999). Wouldn't it be nice? Predicting future feelings. In D. Kahneman, E. Diener & N. Schwarz (Eds.) *Well-being: Foundations of hedonic psychology* (pp. 85–105). New York: Russell-Sage.

McFarland, C., Ross, M., & DeCourville, N. (1989). Women's theories of menstruation and biases in recall of menstrual symptoms. *Journal of Personality and Social Psychology, 57*, 522–531.

Mancuso, R.A., & Fredrickson, B.L. (1996, June/July). *Emotion self-standards encourage negative self-focused emotions*. Presented at the meeting of the American Psychological Society, San Francisco.

Mark, T.A., & Gallistel, C.R. (1993). Subjective reward magnitude of medial forebrain stimulation as a function of train duration and pulse frequency. *Behavioral Neuroscience, 107*, 389–401.

McGrath, J.E., & Kelly, J.R. (1996). *Time and human interaction: Toward a social psychology of time*. New York: Guilford Press.

Medvec, V.H., Madey, S.F., & Gilovich, T. (1995). When less is more: Counterfactual thinking and satisfaction among Olympic medalists. *Journal of Personality and Social Psychology, 69*, 603–610.

Mowrer, O.H., & Solomon, L.N. (1954). Contiguity vs. drive-reduction in conditioned fear: The proximity and abruptness of drive reduction. *American Journal of Psychology, 67*, 15–25.

Murry, J.P., & Dacin, P.A. (1996). Cognitive moderators of negative-emotion effects: Implications for understanding media context. *Journal of Consumer Research, 22*, 439–447.

Parkinson, B., Briner, R.B., Reynolds, S., & Totterdell, P. (1995). Time frames for mood: Relations between momentary and generalized ratings of affect. *Personality and Social Psychology Bulletin, 21*, 331–339.

Parrott, W.G. (1993). Beyond hedonism: Motives for inhibiting good moods and maintaining bad moods. In D.M. Wegner & J.W. Pennebaker (Eds.), *Handbook of mental control* (pp. 278–305). Englewood Cliffs, NJ: Prentice Hall.

Redelmeier, D.A., & Kahneman, D. (1996). Patient's memories of painful medical treatments: Real-time and retrospective evaluations of two minimally invasive procedures. *Pain, 116*, 3–8.

Ross, W.T., Jr., & Simonson, I. (1991). Evaluations of pairs of experiences: A preference for happy endings. *Journal of Behavioral Decision Making, 4*, 273–282.

Rusting, C.L. (1998). Personality, mood, and cognitive processing of emotional information: Three conceptual frameworks. *Psychological Bulletin, 124*, 165–196.

Ryff, C., & Singer, B. (1998). The contours of positive human health. *Psychological Inquiry, 9*, 1–28.

Scheff, T.J. (1988). Shame and conformity: The deference-emotion system. *Sociological Review, 53*, 395–406.

Schkade, D.A., & Kahneman, D. (1998). Does living in California make people happy? A focussing illusion in judgments of life satisfaction. *Psychological Science, 9*, 340–346.

Schreiber, C.A., & Kahneman, D. (2000). *Determinants of the remembered utility of aversive sounds. Journal of Experimental Psychology: General.*

Schroots, J.J.F., & Birren, J.E. (1990). Concepts of time and aging in science. In J.E. Birren & K.W. Schaie (Eds.), *Handbook of the psychology of aging* (3rd ed., pp. 45–64). San Diego, CA: Academic Press.

Schwarz, N., & Strack, F. (1999). Reports of subjective well-being: Judgmental processes and their methodological implications. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology* (pp. 61–84). New York: Russell-Sage.

Shizgal, P. (1997). Neural basis of utility estimation. *Current Opinion in Neurobiology, 7*, 198–208.

Shizgal, P. (1999). On the neural computation of utility: Implications from studies of brain stimulation reward. In D. Kahneman, E. Diener & N. Schwarz (Eds.) *Well-being: Foundations of hedonic psychology* (pp. 500-524). New York: Russell-Sage.

Speigel, D. (1998). Getting there is half the fun: Relating happiness to health. *Psychological Inquiry, 9*, 66–68.

Stein, N.L., Folkman, S., Trabasso, T., & Richards, T.A. (1997). Appraisal and goal processes as predictors of psychological well-being in bereaved caregivers. *Journal of Personality and Social Psychology, 72*, 872–884.

Varey, C., & Kahneman, D. (1992). Experiences extended across time: Evaluation of moments and episodes. *Journal of Behavioral Decision Making, 5*, 169–186.

Wilson, T.D., & Schooler, J.W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology, 60*, 181–192.

Wilson, T.D., Wheatley, T.P., Meyers, J.M., Gilbert, D.T., & Axsom, D. (1999). *Focalism: A source of durability bias in affective forecasting.* Manuscript submitted for publication.

Winkielman, P., Knauper, B., & Schwarz, N. (1998). Looking back at anger: Reference periods change the interpretation of emotion frequency questions. *Journal of Personality and Social Psychology, 75*, 719–728.