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Cognitive Correlates of Subjective Well-Being: The Processing of Valenced Life Events by Happy and Unhappy Persons

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In a two-phase study, we examined the relations of subjective well-being with the cognitive processing of affectively valenced life events. In Phase 1, both more intense and more enduring reactions to positive life events than negative ones were associated with higher well-being, and for intensity of reactions, this relation was stronger for those events that were subsequently recalled. When equal numbers of positive and negative life events were eligible for recall, well-being was unrelated to the relative likelihood of recalling the two types of events. Phase 2 suggested that life events are organized in memory according to the domain in which they occur but not according to their valence. However, neither the organization nor the retrieval of life events correlated with well-being. In combination, these findings suggest that cognitive processes associated with the encoding of life events, but neither the organization nor the retrieval of these events, are associated with subjective well-being.

A major focus of attention in personality and clinical psychology has been on the determinants and consequences of subjective well-being (Costa & McCrae, 1980; Diener, 1984; Emmons & Diener, 1986; Headey & Wearing, 1990). Subjective well-being or happiness appears to be a fairly stable personality characteristic (Costa & McCrae, 1980, 1984; Sandvik, Diener, &

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Seidlitz, 1993), despite transitory effects of life events (Headey & Wearing, 1990; Reich & Zautra, 1983) and situationally-induced mood (e.g., Schwarz & Clore, 1982). This raises the question as to how subjective well-being is in fact maintained over time. To understand this question, it is necessary to understand the cognitive processes that underlie people's reactions to positive and negative life experiences and how these experiences are related to well-being.

The need to attain this understanding was made salient by a recent study conducted by Seidlitz and Diener (1993) in which happy participants recalled a greater number of positive life events, and fewer negative events, than did unhappy participants. Seidlitz and Diener's results suggested that this recall difference was due to two factors: (a) happy participants objectively experienced more positive versus negative events than unhappy participants (see also Headey & Wearing, 1990), and (b) happy participants interpreted their life circumstances more positively than unhappy participants (see also Forgas & Moylan, 1988; Mayer, Gaschke, Braverman, & Evans, 1992). This recall difference, however, might also have occurred because (c) happy participants paid more attention to positive versus negative experiences at the time they occurred than unhappy participants and therefore were more likely to encode them into memory; (d) life events are organized in memory according to their valence, and this organization facilitated recall of positive events in happy participants more than in unhappy ones; and (e) happy participants, relative to unhappy ones, employed strategies of retrieving events from memory that favored the recall of positive versus negative events. Although the effects of differences in subjective well-being on the cognitive processing of life experiences have not been firmly established, there is evidence that transitory differences in affect can influence the selective encoding of information (Bower, Gilligan, & Monteiro, 1981), the interpretation of this information (Forgas & Moylan, 1988; Mayer et al., 1992) and the selective retrieval of information from memory (Riskind, 1983; but see Wyer & Srull, 1989, for an alternative view). Chronic differences in affective states might have analogous effects.

In the present investigation, we examined whether subjective well-being was related to (a) the attention paid to positive versus negative life events, (b) the organization of events in memory according to whether they were positive or negative, and (c) the selective retrieval of positive versus negative events. The data we collected were obtained from a single group of participants who were enrolled in a subjective well-being research course and were administered a number of different measures over the course of the semester. We have divided the report of the investigation into two phases because the hypotheses, methods, and the number of participants who completed the measures pertinent to the two phases differed substantially.

In Phase 1, the amount of attention paid to positive and negative events

was measured through the self-rated intensity and duration of participants' reactions to the two types of events. In Phase 2, the organization of events in memory was measured in a cued recall task in which the time required to recall each of a series of life events was analyzed as a function of the event's valence and the life domain in which it occurred, as well as the valence and life domain of the preceding event. Selective retrieval was measured in Phase 1 by examining differences in the recall of participants' positive and negative events, controlling the numbers of events of each type that were eligible for recall. Selective retrieval was measured in Phase 2 by the time taken by participants to recall positive versus negative events. The objective of both phases was to examine differences in the cognitive processing of positive and negative events—both at the time they occur and when they are later recalled—that might contribute to the development and maintenance of subjective well-being. After reporting on the two-phase study bearing on these issues, we suggest a preliminary conceptualization of the development of subjective well-being and participants' criteria for evaluating it that takes into account the findings we report.

PHASE 1

In Phase 1, participants reported the best event and the worst event that occurred each day over a 43-day period. They also estimated the intensity of their emotional reactions to each event and the length of time these reactions occurred. Later, they were asked to recall the events they had reported.

A major objective of Phase 1 was to clarify the interpretation of Seidlitz and Diener's (1991) findings described earlier. To reiterate, participants in the earlier study recalled more positively valenced life events and fewer negatively valenced events if they were high in subjective well-being than if they were low. This could simply reflect a difference in the relative proportions of positive and negative life events that happy and unhappy persons have previously encoded into memory and therefore were available to be recalled. If this is the case, the relation of subjective well-being to the relative likelihood of recalling positive and negative events should be eliminated if the number of each type of event that is eligible for recall is controlled. On the other hand, suppose happy and unhappy persons tend to selectively retrieve events that are affectively congruent with their feelings about life as a whole. Then, they should differ in the recall of these events even if equal numbers of positive and negative life events exist in the population of events from which persons retrieve them. Because the number of positive and negative experiences that were eligible for recall in the present study was equal (43 ''best'' events and 43 ''worst'' ones), these alternative possibilities could be evaluated.

A second objective of Phase 1 was to investigate the effects of differences in people's perceptions of life events at the time the events occur. Two fac-

tors of particular importance to consider in this regard are the perceived intensity and duration of participants' reactions to these events, both of which were assumed to reflect the amount of attention they paid to the events. There are at least two ways in which these factors might affect the impact of life events on subjective well-being.

1. Controlling for differences in the relative numbers of positive and negative events initially encoded into memory, stronger emotional reactions to events at the time they occur (as reflected in their perceived intensity and duration) may increase the likelihood that the events are recalled, and by increasing memory for the events, increase their impact on well-being.

2. Controlling for differences in the relative numbers of positive and negative events initially encoded into memory, stronger emotional reactions to particular types of events at the time the events occur might not affect the likelihood of recalling the events, but might increase the effect of recalling these types of events on subjective well-being, these effects corresponding to the duration and intensity of the initial reactions to the events.

For either of these reasons, subjective well-being was expected to increase with the intensity and duration of reactions to positive events, but decrease with the intensity and duration of reactions to negative ones. The extent to which these relations depended on participants' ability to recall the events that produced these reactions was expected to permit the alternative hypotheses outlined above to be evaluated.

Method

Participants

Participants were 156 (72 women and 84 men) undergraduate students who enrolled in a course in subjective well-being research. One emphasis of the course was on participation in a large scale research project on personality and well-being. In this context, participants completed numerous measures throughout the semester. Those measures that were pertinent to the present study are described in the section that follows.

Measures

Subjective well-being measures. An index of subjective well-being was derived from measures of global life satisfaction, the frequency of experiencing positive affect, and the frequency of experiencing negative affect (see Diener, 1984, for a discussion of the theoretical structure of subjective well-being). Global life satisfaction was measured with the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985; Pavot, Diener, Colvin, & Sandvik, 1991). This scale consists of five statements expressing general life satisfaction (e.g., ''In most ways my life is close to my ideal''), and participants rate their agreement with each item on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree).

In addition, participants estimated the frequency with which they experienced six emotions: *joy, love, sadness, fear, anger,* and *shame.* Joy was represented by four adjectives and the remaining emotions by five adjectives each. Participants rated how frequently they experienced the emotion described by each adjective on a 7-point scale ranging from 1 (never) to 7 (always).

Positive affect was inferred from the average rating of adjectives denoting joy and love. Negative affect was inferred from the mean rating of adjectives denoting sadness, fear, anger, and shame.

The SWLS and the two affect measures were each administered on two different occasions that did not coincide with the main experimental session, and were averaged across the two occasions to obtain a single score for each subject. Finally, the three indices were entered into a principal components factor analysis. The indices had loadings of .71 (positive affect), −.71 (negative affect), and .87 (life satisfaction) on the first component, which had an eigenvalue of 1.76 and accounted for 58% of the variance. Each subject's factor score on this component served as an index of the participant's subjective well-being.

Daily diary Each day for 43 days, participants completed a questionnaire related to their moods and activities during the day. Two open-ended items asked participants to describe clearly and concisely their best event of the day and their worst event of the day. The participants typically used about four or five words to describe each of these events. Participants also rated the intensity of their emotional reactions to these events on a scale ranging from 1 (no emotional reaction at all) to 9 (extraordinary intense—as intense as can be), and estimated the duration of their reactions along a scale from 1 (no emotional reaction at all) to 9 (more than 8 h). These reports were typically completed each evening or early the following day and turned in the next afternoon. The Friday through Sunday reports were all due on Monday.

Recall Task

On the 44th day after the daily diary was begun, participants were given a surprise recall test of the events they had reported during the previous 43 days. They were asked to recall as many of the best and worst events of the day they had described in their diaries as they could, to describe these events in words as similar as possible to those they had used originally, and to list the events in the order they came to mind. They were also asked to rate the positivity–negativity of each event that was recalled on a 1 (very negative) to 7 (very positive) scale. After 7 min nearly all participants had stopped writing and the recall task was concluded.

Preliminary Data Coding and Analyses

The lists of recalled events were compared to the lists of events in the daily diaries for matches by either the principal investigator or one of two student assistants. The principal investigator was consulted when the assistants were uncertain about their judgments. Judgments of matches between events in the two lists were based on their having the same essential meaning rather than on having identical wording, and were made while blind to the participants' level of subjective well-being. It should be noted that although participants were instructed otherwise, they sometimes described the same event in their diaries on several different days, or described their events vaguely such that some events were indistinguishable from events described on previous days. Therefore, events that were described at the time of recall sometimes matched more than one event described in the diaries. Repeated events that were recalled were counted as a single event, and both the intensities and durations of reactions to repeated events were averaged in the analyses. To examine the reliability of judgments of matches between the events described at the time of recall and those described in the daily diaries, a fourth independent judge subsequently coded matches between the two sets of event descriptions for 15 (10%) randomly-chosen subjects. The latter's judgments of whether an event in the daily diaries matched an event on the lists of recalled events agreed with those of the original judges on 87 percent of the 1290 (43 days × 2 valences × 15 participants) events.

Results

Relation of Well-being to the Selective Retrieval of Positive and Negative Events

Participants listed a mean of 31.69 ($SD = 6.97$) unique positive events and a mean of 32.67 ($SD = 6.86$) unique negative events in their daily diaries. Subjective well-being was uncorrelated with the numbers of unique positive ($r = .03$) or negative ($r = .00$) events that were described in the daily diaries. Because approximately equal numbers of positive and negative events were eligible for recall, differences between happy and unhappy participants in the recall of these types of events would reflect differences in their retrieval rather than in their incidence or selective encoding into memory. Participants recalled a mean of 7.64 ($SD = 2.63$) of the unique positive events and a mean of 5.15 ($SD = 2.22$) of the unique negative events, a significant difference ($t = 10.45$, $p < .001$).[1] A mean of 2.37 ($SD = 2.52$) events were recalled that did not match events in the daily diaries (false positives). Subjective well-being was nonsignificantly correlated with the difference between the number of positive and negative events that were recalled ($r = -.04$, *ns*) or with the proportion of recalled events that were positive ($r = .04$, *ns*). These data suggest that when the numbers of positive and negative life events that are eligible for recall are controlled, happy and unhappy participants do not differ in their relative likelihood of recalling the two types of events.

Emotional Reactions to Daily Events

As discussed previously, differences in the intensity or duration of participants' affective reactions to life events might influence subjective well-being by affecting the likelihood of recalling the positive versus negative events, or by affecting the impact of the recalled events. Determining whether the relations of intensity or duration of reactions with subjective well-being depended on whether the events were recalled would enable these alternatives to be evaluated.

Two separate, repeated-measures multivariate regressions were computed analyzing either the intensities or the durations of participants' reactions to the positive and negative daily events that were recalled and not recalled. Both the intensity and the duration of reactions were viewed as reflecting the amount of attention paid to the events and were correlated for both positive (.56) and negative (.61) events. Separate analyses were conducted on these two components of the reactions to simplify the presentation and inter-

[1] Women recalled more positive events than men, but a similar number of negative ones. The results on gender are, however, presented in separate article (in press) because they involved complex issues that could not be adequately addressed in the scope of the present study.

TABLE 1
Mean (SD) Intensity and Duration of Reactions to Recalled and Nonrecalled Daily Events

	Intensity		Duration	
	Best	Worst	Best	Worst
Recalled events				
High well-being	6.39 (1.08)	5.48 (1.08)	6.56 (0.80)	6.17 (0.94)
Low well-being	5.73 (1.18)	5.61 (1.11)	6.45 (0.82)	6.25 (0.93)
Nonrecalled events				
High well-being	5.94 (0.95)	5.12 (0.82)	6.28 (0.77)	5.94 (0.76)
Low well-being	5.52 (0.90)	5.26 (0.79)	6.30 (0.64)	6.17 (0.81)
All events				
High well-being	6.03 (0.95)	5.17 (0.83)	6.33 (0.74)	5.97 (0.75)
Low well-being	5.57 (0.91)	5.29 (0.79)	6.33 (0.64)	6.18 (0.80)

Note. Intensity and duration ratings were on 1–9 scale. Participants were classified into high and low well-being groups based on a median split of their subjective well-being scores to illustrate their differences in the table; however, the continuous measure of well-being was used in statistical tests to avoid unecessary loss of explained variance.

pretation of the findings. Each analysis had four repeated measures: mean reaction (either intensity or duration) to the positive events that were recalled, mean reaction to the negative events that were recalled, mean reaction to the positive events that were not recalled, and mean reaction to the negative events that were not recalled. Thus for each analysis there were two within-subject factors: the valence of the event and whether the event was recalled. Subjective well-being was a continuously measured between-subjects variable.

For purposes of illustrating the results in Table 1, the participants were categorized into happy and unhappy groups based on a median split of the continuous measure of subjective well-being. Table 1 shows the mean intensity and duration of happy and unhappy participants' emotional reactions to their positive and negative events. Pooled over all events, the continuous measure of subjective well-being was unrelated to either the duration of reactions ($\beta = -0.22$. $F(1, 153) = 0.92$, *ns*) or their intensity ($\beta = 0.37$, $F(1, 153) = 1.97$, *ns*). Reactions to positive events, however, had longer duration ($F(1, 153) = 35.43$, $p < .001$) and greater intensity ($F(1, 153) = 64.04$, $p < .001$) than reactions to negative events. More importantly, these differences in reactions to positive versus negative events were greater for happy participants than for unhappy participants both in duration ($\beta = -0.26$, $F(1, 153) = 16.85$, $p < .001$) and in intensity ($\beta = -0.62$, $F(1, 153) = 45.20$, $p < .001$). Events that were recalled, compared to those that were not, were associated with more enduring ($F(1, 153) = 23.51$, $p < .001$) and more intense reactions ($F(1, 153) = 59.96$, $p < .001$). These differences in reac-

tions to recalled versus nonrecalled events did not depend on the valence of the events (controlling for participants' subjective well-being, ps $> .1$), nor on the participants' subjective well-being (controlling for the valence of the events, ps $> .1$).

Significantly, however, the intensity of reactions (but not the duration) was greatest for positive events that happy participants' recalled, reflected statistically by a three-way interaction between whether the events were recalled, their valence, and the participants' level of well-being ($\beta = 0.83$, $F(1, 153) = 5.71$, $p < .02$). In other words, the association of the intensity of reactions to positive versus negative events with subjective well-being was mediated by whether the events in question were recalled. With the caveat that the three way interaction predicted only the intensity of reactions and not their duration, of the two hypotheses considered regarding how reactions to events might influence well-being, the possibility that they affected the relative likelihood of recalling positive versus negative events was supported.

Subjective well-being was correlated with participants' mean negativity–positivity ratings of their recalled positive events ($r = .21$, $p < .01$), but nonsignificantly correlated with mean ratings of their recalled negative events ($r = .13$, $p > .10$). These assymetric associations of well-being with ratings of the recalled positive versus negative events are consistent with related findings in previous studies (Blaney, 1986).

Discussion

Recall Findings

The absence of a relation between subjective well-being and the relative numbers of positive and negative life events that were recalled suggests that happy and unhappy participants did not differ in their tendency to selectively retrieve positive versus negative events from memory. Seidlitz and Diener (1993) found that happy and unhappy participants' differed in their recall of these types of events when the numbers of each type that were eligible for recall were uncontrolled. They presented evidence suggesting that the recall differences they obtained reflected differences in the relative numbers of positive and negative events that actually occurred and differences in the interpretation of ambiguous events as favorable or unfavorable. The lack of support for retrieval differences in the present study is consistent with that interpretation.

Nevertheless, caution is warranted in interpreting this null finding. It is possible, for example, that if happy participants had a greater number of positive events stored in memory than unhappy participants, they may have had greater difficulty at the time of recall in identifying the particular positive events that were listed in their diaries. This added difficulty could have coun-

terbalanced a tendency to selectively retrieve positive events, which therefore was not detected. Alternatively, the task of recording both positive and negative events for 6 weeks may have diminished a natural tendency to retrieve one type of event rather than the other. Ruling out retrieval differences must be done cautiously based on an accumulated body of research using a variety of methods. In Phase 2, a different methodology was used to test for differences in retrieval of positive versus negative events.

Differences in Reactions to Valenced Life Events

Happy participants reacted more intensely and for longer duration to positive versus negative life events than unhappy participants. These two aspects of participants' reactions were conceptualized as related measures of the attention paid to the events in question, and not as independent dimensions. Indeed, some evidence suggests that people have difficulty distinguishing these two dimensions in retrospective reports of their emotions (Thomas & Diener, 1990). Greater attention paid to events, as indexed by the greater intensity and longer duration of participants' reactions, increased the likelihood that the events were subsequently recalled. These findings are consistent with those of Skowronski, Betz, Thompson, and Shannon (1991) who found that events rated high in either pleasantness or unpleasantness were more likely to be recalled than neutral events.

The association of the intensity (but not the duration) of reactions to positive versus negative events with subjective well-being was contingent on whether the events in question were subsequently recalled. Therefore, to the extent that the intensity of these reactions are a determinant of well-being and not simply a correlate of it, their effect on well-being was mediated by their effect on the relative availability of positive versus negative events in memory. In other words, the impact of intense reactions to valenced life events on subjective well-being was enhanced by the memory of the events giving rise to these reactions. The fact that the relation of duration of reactions to events with well-being was not mediated by recall suggests that other processes may also mediate the effects of reactions to life events on happiness. Future research is necessary to clarify the differing effects of recall in mediating the effects of intensity versus duration of reactions to life events with subjective well-being.

PHASE 2

Phase 1 supported the conclusion that subjective well-being is associated with the reactions to valenced life events, and the effect of these reactions on the relative availability of positive versus negative events in memory. Controlling for the numbers of events available in memory, however, subjective well-being was not found to be related to differences in selective retrieval of these events from memory. Phase 2 further examined the possible

association of subjective well-being with differences in retrieval using a methodology potentially more sensitive to retrieval differences than the recall measures used in Phase 1. In addition, it examined the cognitive organization of positive and negative events in memory, and whether chronically happy and unhappy participants differed in the ways their events were organized in memory. The cognitive organization of positive and negative events, in turn, could have implications for the stability of subjective well-being.

The possibility that information in memory might be partly organized according to its valence is suggested by associative network-based models of affect and memory (Bower, 1981). If life events are organized in memory according to their favorableness, this type of organization could contribute to the maintenance of well-being. For example, suppose the events of a given type (positive or negative) are interconnected. Recalling an event of one type would increase the accessibility of other events of the same type, relative to the accessibility of events of the other type. This type of organization might lead happy participants to think about their positive experiences relatively more frequently than their negative ones, and thereby maintain their positive mood and outlook. Correspondingly, such an organization might contribute to a tendency for unhappy participants to ruminate about their negative experiences. For example, suppose that when a positive event is encountered and encoded into memory, it activates other positive events with which it is organized, and these other events become more accessible to recall. If happy people tend to encounter positively valenced events more frequently than unhappy people (Seidlitz & Diener, 1993), positive events stored in memory would be activated more frequently in the former individuals than in the latter. Similarly, if happy people are more likely than unhappy people to interpret their life events positively, this tendency would further contribute to the more frequent activation of positive events in memory in happy people than in unhappy people. The reverse might occur for unhappy people. Thus, if positive life events tend to be organized separately from negative life events in memory, this organization might predispose participants to focus on one type of event or the other. These tendencies could contribute to the stability of subjective well-being.

It is also possible that happy and unhappy people differ in the way that they organize their life events in memory. Happy people might be more likely to organize their experiences in memory according to their favorableness, which may assist them in focussing on positive memories and avoiding negative ones. Unhappy people may not organize their positive and negative events in this way, and therefore be less insulated from memories of their negative experiences.

The organization of related information in memory has been inferred in previous studies by the effect that activating one type of information has on the time it takes to recall another type of information. If the two types of

information are related in memory, then it is assumed that activating one of the types through the presentation of a stimulus (the ''prime'') will decrease the time it takes to recall the second type relative to the effect of a neutral unrelated stimulus. Whereas this paradigm has been used most frequently to infer the organization of semantic memory (e.g., Collins & Loftus, 1975; Wyer & Carlston, 1979; Wyer & Srull, 1989), it has also been used to investigate the organization of autobiographical information in memory (Conway & Bekerian, 1987; Klein & Loftus, 1993; Reiser, Black, & Abelson, 1985).

Consistent with logic of this paradigm, we hypothesized that if life events are organized in memory according to their valence, recalling one event should decrease the time required to recall a subsequent event of the same valence relative to the time required to recall a subsequent event of the opposite valence. It seemed intuitively likely, however, that these effects would occur only if the events involved were in the same life domain. Participants who have an experience in a particular domain may not typically think about it in relation to their experiences in other life domains. Thus, for example, events involving one's parents might be organized together but separately from events that concern one's work or education. Thus, the events might be organized with respect to valence only within a domain.

The present investigation examined whether episodic memories are organized with reference to not only the valence of the events but also the domain of life experiences in which the events occur. To evaluate the extent to which these organizational criteria were applied, we determined the effect of recalling a given life event on the time it takes to recall another event that was (a) of either the same or the opposite valence and (b) in either the same or a different domain. If two events of a particular type are associated in memory, recalling one of these events should ''prime'' the other and therefore, should decrease the time it takes to recall this event. If, however, these associations do not exist, the facilitating effect of recalling an event on the recall of similar ones should not occur. Thus, by comparing the time to recall an event of a given valence and domain as a function of the valence and domain of the recalled event that immediately preceded it, inferences could be drawn concerning the memorial organization of life events with respect to these factors.

Method

There were 171 participants (76 women and 95 men) drawn from the same group of participants used in Phase 1. The higher number of subjects in the second phase reflects the higher rate of completion of the measures that were used in this phase. Subjective well-being was assessed in the same manner as described in Phase 1.

Participants were seated in front of computer terminals. They were informed that they would be asked to recall positive and negative life events in two domains: events related to parents and events related to school. They were instructed that when the type of event to be recalled appeared on the computer screen, they were to recall an event of the type indicated as quickly as possible, press the space bar, and then type their description of the event into the computer.

They were instructed that if they recalled an event they preferred not to reveal, they could either provide a very general description or could substitute the description with a series of five exs.

On each of 33 trials, the computer prompted the participants to recall one of four types of events: (a) positive events related to parents, (b) negative events related to parents, (c) positive events related to school, or (d) negative events related to school. The prompts included only the two key words *positive* or *negative* and *parents* or *school*. Underneath, an instruction read ''press space bar when ready.'' When participants pressed the space bar, the screen was cleared, and another instruction was presented: ''type description.'' The program recorded two response latencies: (a) between the presentation of the stimulus and the space bar press and (b) between the space bar press and the first letter typed. Observations of participants performing the task suggested that they sometimes pressed the space bar, marking the end of the first latency, before having an event clearly in mind. Therefore, the sum of the latencies described above was used as the index of the events' accessibility. Whereas this sum might include an error component associated with time taken to mentally formulate an event description after an event had been recalled, it appeared to be the most accurate reflection of the time participants required to recall the events.

The time to recall each type of event was analyzed as a function of the type of event that was recalled in response to the prompt on the preceding trial. The order of prompts was varied in such a way that each possible type of successive event pair (e.g., ''positive–parents'' followed by ''positive–school'') occurred from seven to nine times. This latter variation was necessary to distribute the four prompts evenly across the sequence of trials while at the same time keeping within a limited number of trials. Each participant received one of eight different sequences of prompts. A standard sequence was first constructed in which the mean serial positions of the positive and negative events were approximately the same, as were the mean serial positions of school-related events and parent-related events. Three additional sequences were permutations of the first in which the positions occupied by each of the four prompts varied in a latin square design. The four remaining sequences were the reverse of the first four.

Results

A repeated measures regression was computed in which time to recall each event was analyzed as a function of the valence of the event, the valence of the preceding event, whether the event was in the same or a different domain than the preceding event, the participant's level of subjective well-being and all interactions. If happy and unhappy participants differed in their tendency to retrieve positive versus negative events, they should differ in the time they took to recall these types of events. They did not. In fact, no main effects or interactions involving the subjective well-being measure were significant, ps $> .10$. These results support those of Phase 1 and Seidlitz and Diener (1993) in showing that neither the selective retrieval of events nor their organization in memory contributed to differences in the relative accessibility of positive or negative events.

Although the organization of events in memory did not differ as a function of well-being, the question of how they were organized remains. If life events are organized according to valence, the time to recall an event of the same valence as the previous one should be faster than the time to recall an event of a different valence. This was not the case, however. Although positive

TABLE 2
Mean (SD) Recall Times of Positive and Negative Target Events as a Function of Prime's Valence and Domain Similarity (in Seconds)

	Recalled event			
	Same valence		Different valence	
Preceding event	Same domain	Different domain	Same domain	Different domain
Positive	9.92 (5.27)	10.54 (5.64)	11.03 (5.86)	12.19 (6.11)
Negative	11.98 (6.68)	11.79 (6.17)	10.00 (5.03)	10.52 (5.83)

events were responded to faster ($M = 10.25$ s) than negative ones ($M = 11.75$ s), $F(1, 169) = 26.63$, $p < .001$, the time to recall events did not depend on whether the valence of the preceding event was the same ($M = 11.06$ s) or different ($M = 10.94$ s), $F(1, 169), = 0.32$, *ns.* Moreover, this was true regardless of whether the preceding event was in the same domain ($M = 10.95$ s vs $M = 10.52$ s) or a different one (11.17 s vs. 11.36 s), $F(1, 169) = 2.17$, *ns.* Thus, life events appear not to be organized in memory according to valence, either across domains or within a given domain.

If events are organized by the domain of life in which they occurred, the recall of an event in one domain should facilitate recall of other events in this domain. Data bearing on this hypothesis are shown in Table 2. An event was recalled faster if the previous event was in the same domain ($M = 10.74$ s) than if it was in a different domain ($M = 11.27$ s), $F(1, 169) = 4.65$, $p < .05$. Unexpectedly however, this effect was only evident when the preceding event was positive (10.48 vs 11.37). When the preceding event was negative, the difference was negligible (10.99 vs 11.15). This effect is confirmed statistically by an interaction of the prime's valence and whether or not the prime and the target were in the same domain, $F(1, 169) = 3.37$ $p < .07$. A possible interpretation of this contingency is provided presently. Thus, the data suggest that the episodic memories of both happy and unhappy participants were organized by the life domains in which the events occurred but not by the valence of the events.

Discussion

The evidence that events are not organized according to their valence has implications for a body of research on the relation of mood and memory (e.g., Bower, 1981; Blaney, 1986). Much of this research is based on an associative network formulation in which emotions act as key nodes in memory linking other representations having associations with these emotions. This conceptualization implies that happy life events would tend to be more strongly associated in memory with each other than with unhappy events.

Whereas the findings of this study suggested that events are organized according to the life domain in which they occur, no evidence was found that they are organized according to their positive or negative valence.

The finding of a lack of organization of events in memory according to valence contrasts with Showers' (1992) finding that trait-like information about the self was organized according to valence. Showers (1992) also found that the tendency to organize self-information by valence either had a positive main effect on self-esteem and lower depression (Studies 1 and 2) or had a positive effect only when the information was considered important (Study 3). Showers' theoretical model would suggest that whether an individual tends to compartmentalize or combine positive and negative life events in memory depends both on the person's proneness to depression and on the relative importance that he or she attributes to the events, a factor that was not assessed in the present study. In addition to perceived importance of the information, the results of the present study may have differed from those of Showers (1992) due to differences in the domains of self-relevant information that were assessed (life events versus self-traits) and in the methodologies that were used to measure the organization of memory (timed-recall task versus a card-sorting task).

The results in Phase 2 further support the conclusion of Phase 1 that differences between happy and unhappy participants in the recall of valenced events (Seidlitz & Diener, 1993) are not due to differences in the retrieval of these events, but rather are due to factors associated with the encoding of the events into memory. The use of recall time as a measure of retrieval in Phase 2 supports the generalizability of this conclusion.

The most provocative finding of Phase 2 surrounds the asymmetric effects of priming positive and negative events. Specifically, positive primes facilitated the recall of other events within the same domain regardless of the valence of these events, whereas negative primes did not have these facilitating effects. In other words, both positive and negative events became more accessible as a result of recalling a positive event in the same domain, but their accessibility was unaffected by recalling a negative one. One interpretation of this finding is that participants who recalled a positive event perseverated in thinking about events in the domain in which it occurred, thus increasing the accessibility of other events within this domain relative to others. When participants recalled a negative event, however, they were disinclined to continue thinking about this or other events in the same domain, and so they shifted their attention elsewhere. As a result, this facilitating effect on the recall of other events in the domain did not occur. Although this interpretation is speculative, it suggests that there are differences in the processing of positive versus negative episodic memories despite the fact that these memories were organized according to domain and not according to favorableness.

GENERAL DISCUSSION

The present study extended the findings obtained by Seidlitz and Diener (1993) concerning differences in the processing of valenced life events that are associated with subjective well-being. The previous study found that the tendency to interpret events more positively, as well as a higher incidence of positive versus negative life events, was associated with higher well-being. The present study showed that relatively more intense and enduring reactions to positive versus negative events were associated with greater happiness. In turn, more intense and enduring reactions to events were associated with better recall of the events. Finally, the association of more intense reactions to positive than negative events with higher subjective well-being was greater for events that were subsequently recalled than those that were not, suggesting that these differing reactions to events contributed to happiness by improving the recall of the positive events relative to the recall of the negative events.

No evidence was found that subjective well-being is related to the tendency to selective retrieve positive versus negative life events from memory, controlling for differences in their relative availability. In addition, because no priming effects for valence were obtained in Phase 2, no evidence was obtained for the maintenance of subjective well-being due to the organization of life events according to their positive or negative valence. In contrast, evidence was found that life events are organized according to the life domain in which these events occur.

Preliminary evidence was obtained that recalling a positive event, relative to a negative one, increased the accessibility of other events in memory that had occurred in the same life domain. To the extent that happy participants have more positive events stored in their memories and therefore are more likely to recall them than unhappy participants, this effect could contribute to a greater tendency for happy people to continue thinking about their positive experiences.

Based on these results and their implications as discussed earlier, a somewhat more formal description of the processes underlying the development and maintenance of subjective well-being is suggested:

1. Some people in the course of their life tend to encounter more positive events, and fewer negative ones, than other people. The former individuals also are more likely than the latter to interpret their life events positively. Both of these factors contribute to a greater relative availability of positive versus negative life events in the memories of the former individuals than in the latter.

2. These differences in the incidence and interpretation of valenced life events are complimented by differences in the perceived intensity and duration of the individuals' emotional reactions to their life events. Individuals

who encounter more positive events and who tend interpret their events more positively than their counterparts also tend to react more intensely and for longer duration to positive events, and less intensely and for shorter duration to negative events. These factors also contribute to a greater relative availability of positive versus negative life events in the memories of the former individuals than in the latter.

3. Recalling a positive event stimulates memories of other events that have occurred in the same life domain. People who have a greater relative availability of positive versus negative events in memory are more likely to be stimulated to recall their experiences.

4. People's subjective well-being is based in part on their memory of positive and negative life events, along with the positively or negatively valenced emotional reactions they experienced in relation to these events. Individuals who have encountered more positive events and fewer negative ones, who have tended to interpret their events positively, and who have reacted with greater intensity and duration to their positive events than negative ones are more likely than their counterparts to recall positive life experiences and to feel and report greater happiness.

The above conceptualization does not provide a complete picture of the phenomena identified in the present research. In particular, the reasons for the asymmetric reactions to positive versus negative life experiences, and the sources of systematic individual differences in these reactions, must await further research and theorizing. However, the present research and the conceptualization it suggests provide a general framework within which further research can be interpreted and suggest other directions that this research might take.

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