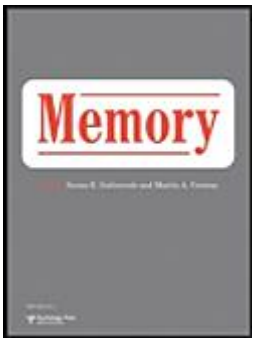

The Fading Affect Bias in the Context of Emotion Activation Level, Mood, and Personal Theories of Emotion Change

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Abstract

The intensity of emotions associated with pleasant memories generally fades slower across time than the intensity of emotions associated with unpleasant memories, a phenomenon known as the *fading affect bias* (*FAB*). Four studies examined variables that might account for, or might moderate, the bias. These included the activation level of the emotions, individual differences in dispositional mood, and participant expectations of emotion change across time. Results showed that dispositional mood moderated the FAB, but could not fully account for it. Similarly, although participants' predictions of emotion change across time were somewhat veridical, the FAB emerged even when these predictions were statistically accounted for. Finally, although emotion activation level was related to overall fading of affect, emotion activation levels were unrelated to the FAB. Methodological and theoretical implications of these results are discussed.

Key words: autobiographical memory, emotion, arousal, valence, fading affect bias

The Fading Affect Bias in the Context of Emotion Activation Level, Mood, and Personal Theories of Emotion Change

When people remember, they also feel. The reinstatement of positive emotions consequent to autobiographical event recall may be quite functional (Mather, 2006). For example, research suggests that the experience of positive emotions can have a number of benefits, such as providing a buffer against stress (Folkman, 2008). Conversely, reactivating emotions associated with negative autobiographical events may not always be desirable or functional. Deleterious effects of the production of negative event-related emotions can be seen in those with severe depression (Raes, Hermans, Williams, Beyers, Brunfaut, & Eelen, 2006) and those with chronic stress (Berntsen & Rubin, 2006; 2002; Wenzel, Pinna, & Rubin, 2004).

Despite the apparent practical importance of understanding emotions prompted by memories, relatively little is known about the variables and psychological mechanisms related to such memory-induced emotions and to how these emotions change over time. Much of what is known comes from research exploring the *fading affect bias* (*FAB*; Cason, 1932; Holmes, 1970; Walker, Vogl, & Thompson, 1997): Negative affect associated with autobiographical memories generally fades faster across time than positive affect associated with such memories.

Research conducted so far suggests that the FAB is a reliable and valid characteristic of autobiographical event recall, and cannot be accounted for by variables such as differences in the initial extremity of unpleasant events and pleasant events or better recall of pleasant events than unpleasant events (Ritchie & Skowronski, 2008; Ritchie, Skowronski, Wood, Walker, Vogl, & Gibbons, 2006; Skowronski, Gibbons, Vogl, & Walker, 2004; Walker, Skowronski, & Thompson, 2003a; Walker, Skowronski, Gibbons, Vogl, & Thompson, 2003b; Walker et al., 1997). However, research has also identified variables that moderate the FAB. For example,

Ritchie et al. found that the magnitude of the FAB was especially small when autobiographical events were self-important, psychologically open (Beike & Wirth-Beaumont, 2005) or self-caused. The FAB was especially large when events were considered to be atypical of a person's life, when they were frequently rehearsed, and when they were rehearsed by means of discussing the events with others. Individual differences also moderate the FAB. Walker et al. (2003b) found that dysphoric individuals evinced a smaller FAB than non-dysphoric individuals. Moreover, Ritchie and Skowronski (2008) found that the FAB did not occur for individuals who reported being under the influence of a recreational drug when they recorded an event.

To gain a better understanding of the experience of emotions prompted by memories, FAB researchers continue to seek other theoretically-relevant variables that might moderate, and ultimately might help to explain, the FAB. Moreover, a continuing concern among FAB researchers is the elimination of methodological artifact explanations for the FAB. These goals are reflected in the research described in the present article. This research explores the extent to which the *activation level* of the emotion originally prompted by event occurrence, the *pre-existing affect* present at the time emotion judgments are made, and *personal theories* about temporal changes in event–prompted emotions are related to the FAB.

Possible Moderators of the FAB: When and Why

The Activation Level of Emotions and the FAB

Some emotion theorists view emotions as multi-dimensional. Two dimensions commonly discussed are valence and activation level (Barrett 2005, Barrett & Russell, 1998; Russell, 1980, 1989): Emotions can be positive or negative, but they can also be active or passive. The extant FAB research has focused only on the valence component of emotions; the activation level component has not yet come under direct scrutiny.

Such inattention may be problematic. For example, it can be argued that inattention to emotion activation level, combined with event selection biases (Levine, Safer, & Lench, 2006), may cause an illusory FAB. The argument is as follows. In FAB research, regardless of whether participants enter events into a diary or recall them retrospectively, participants typically select the events that are used in the experiment. It is possible that the events selected for inclusion in experiments could be biased, and that such biases could contribute to an illusory FAB. Such an argument can take two forms.

First, when people select positive events for a study, they may be especially likely to select events associated with *highly active emotions*, such as elation (e.g., Talarico, LaBar, & Rubin, 2004). One might argue that the higher initial activation levels of such emotions might be especially likely to lead to retention of the emotions across time (Mather, 2007). In comparison, people may be particularly likely to report events associated with *low activation level* negative emotions, such as sadness (Davis, 1987). One could argue that the low activation level of such emotions might dispose them to be particularly susceptible to fading across time. Given these tendencies, analyses emotion change across time that ignored activation level effects could yield results apparently showing that affect fades more rapidly for negative emotions than for positive emotions. However, this apparent effect would only be illusory, a product of the over-sampling of active/positive and passive/negative autobiographical events in participant memory reports.

A second explanation also relies on the consequences of event selection bias, but the details are opposite to the explanation presented above. The logic is driven by the idea that higher activation level emotions will be subject to greater fading across time (as in “the bigger they are the farther they fall”). This explanation also assumes that people will be especially likely to report *highly active* negative events (e.g., see Wenzel et al., 2003). Because they begin at an

elevated intensity level, the emotional experience associated with such negative events might be especially likely to fade across time. In comparison, people may be especially likely to report *low activation level* positive events. Because they begin at a lower initial activation level, such emotions may be especially unlikely to fade across time. Given these hypothetical biased event selection tendencies, and given the possibility that fading is related to emotion activation level, analyses that ignored the activation level of emotions could yield an illusory FAB.

Prompted by such reasoning, Studies 1 and 2 attempted to disentangle the relations between the fading of event-related affect and the valence and activation level of those feelings. To do so, the studies explored the fading of affect within four broad classes of emotion formed by crossing valence with activation level: positive/active (e.g., ecstatic), positive/passive (e.g., calm), negative/active (e.g., angry), and negative/passive (e.g., sad). One question addressed in these studies is whether the activation level of an emotion is at all related to the extent to which the intensity of that emotion fades from event occurrence to event recall. However, the more important question is whether emotion activation levels moderate, or can even fully account for, the differential fading of emotion that has been attributed to event valence (e.g., the FAB).

Pre-existing Affect, Misattribution, and the FAB

An unaddressed issue in FAB research is the extent to which the FAB may be a function of an individual's affective state prior to the recall of memories. Affect and recall have already been connected in a number of ways. For example, Seidlitz and Diener (1993) found that mood was related to the content of recalled events: Happy respondents recalled more positive life events than did unhappy participants. Walker et al. (2003b) extended this affect-memory relation to the FAB. They demonstrated that memories of individuals with symptoms of depression (i.e., dysphoria) did not show the FAB: Negative and positive emotions faded with equal rapidity.

Extrapolating from these results, one might argue that it is possible that the FAB might occur because of the tendency to misattribute to a recalled event the affect (mood) that a person feels immediately prior to event recall. For example, imagine that a person is feeling good and is asked to recall a life event. If the recalled event was pleasant and prompts positive affect, the person may subjectively feel even better about it because of their pre-existing positive emotional state. If the life event was unpleasant and prompts negative affect, the person may subjectively not feel especially bad about it because the pre-existing positive mood dampens the bad feelings prompted by the recalled event.

This idea is consistent with the notion that people sometimes rely on their present feelings in a heuristic fashion to make complex judgments, especially when the experienced feelings are subjectively relevant to the object of judgment (Clore, 1992; Schwarz, 1990; Schwarz & Clore, 1983). For example, when asked to rate overall life satisfaction, participants typically do not calculate estimates on a number of life dimensions; they simply ask themselves, "How am I feeling?" Thus, participants in a positive mood provide higher ratings of life satisfaction than participants in a negative mood. Importantly, if participants attribute their feelings to a source that is irrelevant to the judgment at hand (e.g., the current weather), the feelings are no longer considered informative, and exert little or no influence on judgment (Keltner, Locke, & Audrain, 1993; Schwarz, 1990; Schwarz & Clore, 1983).

Two additional lines of evidence are relevant to a misattribution explanation of the FAB. First, research suggests that people are generally satisfied with life and are in a good mood (Diener, Suh, Lucas, & Smith, 1999; Myers & Diener, 1995). Thus, from a base rate perspective, peoples' affective state prior to event recall is more likely to be positive than negative. Second, misattribution of emotion phenomena have often been demonstrated in research (Barrett, Gross,

Conner Christensen, & Benvenuto, 2001; Schwarz & Clore, 1983). Such demonstrations include assessments of emotions prompted by real-life episodic memories. In summary, then, it seems possible that a high positive affect base rate (people are generally in a positive mood), combined with the tendency to engage in misattribution, could contribute to an apparent FAB.

In fact, this misattribution of affect mechanism could be related to the FAB in one of two ways. In the first, mood and affect misattribution would simply modulate the FAB. This idea suggests that the FAB will typically emerge, but it will be especially large for those individuals who rate the emotional impact of recalled events while in a positive mood. However, a more theoretically serious possibility is that the misattribution of existing affect might fully account for the FAB. If people usually rate events while in a positive mood, and if that positive mood is misattributed to emotion prompted by event recall, then the may FAB disappear when individual differences in mood are accounted for. This idea is specifically examined in Study 3.

Personal Theories about Affect Change and the FAB

People hold beliefs, form attitudes and invent common-sense and intuitive theories about emotions and memory and about how both change over time (Ross, 1989). The theories that individuals possess about emotion changes across time may shape the process of event reconstruction and affect reappraisal, regardless of whether such theories are activated explicitly or implicitly (Levine et al., 2006). Accordingly, one might offer the argument that the FAB may be illusory, resulting from personal theories of emotion change. For instance, the belief that negative emotions tend to fade faster than positive emotions could influence judgments of event-related affect made at both event occurrence and at event recall (which may be especially likely when people make those ratings in relative proximity to each other). If the FAB occurs only in

those with such beliefs, then it is possible that the FAB is a product of those beliefs and not a product of real changes in the emotions across time prompted by event recall.

Dwyer, Gibbons, and Walker (2004) reported preliminary evidence suggesting that the FAB effect was not a consequence of such beliefs. Their results suggest that the FAB is similar among individuals who believe that the negative feelings associated with autobiographical events fade faster than positive feelings, those who believe that positive feelings fades faster than negative, and those who believe that both types of events and feelings fade with equal rapidity. However, while Dwyer et al.'s results represent an important contribution to FAB research, it would be desirable to conceptually replicate and extend their results. Accordingly, the fourth study described in the present article utilized a diary methodology in which participants made ratings of event-related affect at event occurrence, totally eliminating the possibility of retrospective bias (from sources such as personal theories) in the perceived affect prompted by event recall. Moreover, at the time of event occurrence participants predicted the affect they would experience at event recall (instead of simply providing a general report, as in Dwyer et al.). Such predictions can be used to examine participants' expectations about the fading of affect for specific events and the extent to which those expectations were well-calibrated to the actual fading of affect for each event. Such predictions can also be used to assess the extent to which the FAB occurs, even when those predictions are statistically accounted for. If the FAB occurs only when people predict that it will, then it is possible that peoples' theories of affect change might be responsible for the FAB. This theoretical mechanism is discounted if the FAB emerges, even when predictions are statistically accounted for.

STUDY 1: THE ACTIVATION LEVEL OF EMOTIONS AND THE FAB

Study 1 sought to address the question of whether the FAB can be accounted for by differences in the activation levels of the emotions prompted by the elicited positive events and negative events. It did so by asking people to report events that each elicited emotions in one of four categories of emotions. The categories were defined by the combination of valence and activation level (positive/active, negative/active, positive/passive, and negative/passive). The emotions selected as exemplars of each category were specifically selected to be relatively equivalent in mean activation levels across valence and were derived from Barrett and Russell (1998). This approach eliminates the possibility that any FAB effect that emerges might be a consequence of valence-related selection biases in the activation levels of the emotions that are elicited when participants report autobiographical events.

In Study 1, we also attempted to control for the time at which events occurred. Such control is desirable given that negative events described by participants could be older than positive events, which could account for the greater apparent fading of emotions accompanying negative events. This possibility that event age contributes to the FAB has been discounted by the results of prior research (Ritchie et al., 2006; Walker et al., 2003). However, the case for null effects is often best made by demonstrating those effects at repeated times and in repeated ways. Accordingly, participants retrospectively reported event ages. While placement of events in time is not perfect, such placements are often reasonably accurate (see Thompson, Skowronski, Betz, & Larsen, 1996). Subsequent analyses examined the ages of positive events and negative events and whether valence-related age differences could account for the FAB.

Methods

Participants

Participants were one hundred and nine undergraduates (57.3% females) enrolled in introductory psychology at a large Midwest university (USA). They received class credit as compensation for their participation.

Materials and Procedure

On arrival at the laboratory, participants were ushered to a computer. *MediaLab* (Jarvis, 2006) software controlled the experiment. Instructions provided by the computer told participants to recall events that prompted a specific emotion at the event's occurrence. Events that each prompted one of eight specific emotions were solicited. These emotions can be conceptualized as four pairs, with each pair corresponding to one cell of a Valence X Activation Level matrix: (a) *unpleasant low activation* (e.g., sad, bored); (b) *unpleasant high activation* (e.g., tense, stressed); (c) *pleasant low activation* (e.g., serene, relaxed); (d) *pleasant high activation* (e.g., excited, elated).

In response to a program prompt (e.g., *Think of an event that happened within the last two years that made you sad*), participants typed in a short event description. After completing this description, participants rated the intensity with which each emotion was felt at the time the event occurred using a 6-point scale (*not very intense* to *extremely intense*). An additional rating reflected how each recalled event made participants feel at event recall (same response scale). Participants also provided an estimate of each event's age (in months). Emotion presentation order was randomized within each of two four-emotion blocks; each block presented one emotion from each of the four cells of the Valence x Activation Level matrix. After all eight events had been entered and all ratings made, participants were debriefed and dismissed.

Results and Discussion

Calculating Affect Intensity Change Scores

The mean intensity rating provided for the emotion experienced at event recall was subtracted from the mean rating provided for the emotion experienced at event occurrence: This difference is the *affect intensity change score* (for discussions of this change score measure, including validity information, see Ritchie et al., 2006; Skowronski et al., 2004). For example, if the emotion provoked at event occurrence was given a 3 rating and the emotion provoked at recall of that same event was given a 1 rating, the affect intensity change score for the event would be 2. Similarly, if the emotion provoked at event occurrence was given a -3 rating and the emotion provoked at event recall was given a -1 rating, the affect intensity change score for the event would again be 2. Given the rating scale used in Study 1, each change score can exhibit one of three patterns: affect can decrease in intensity from occurrence to recall (*fading affect*); affect can be stable from occurrence to recall (*fixed affect*); or affect can intensify from occurrence to recall (*flourishing affect*).

Change Score Analyses

Valence differences emerge in how often affect intensity fades. Examination of frequency data shows that the emotions prompted by positive events faded from event occurrence to event recall only a minority of the time (*n*'s as follows: fading affect = 134; flourishing affect = 42; fixed affect = 264). Such fading is more usual for negative events (*n*'s as follows: fading affect = 209; flourishing affect = 46; fixed affect = 185), $\chi^2(2, N = 880) = 30.48$, $p < .0001$, $\phi = .19$. Such results are consistent with a FAB in the emotions accompanying event recall.

Valence differences emerge in the amount of fading that occurs. Frequency analyses minimize the FAB by ignoring the amount of change that occurs in the emotions that are

produced at event occurrence and at event recall. Accordingly, the change scores were entered into a hierarchical within-subject regression analysis. This analysis parsed out within-subject variance before evaluating the relation between the affect change scores and the predictors of emotion valence, emotion activation level, and the interaction between the two (see J. Cohen & P. Cohen, 1983). The analysis was done in two steps. The first simultaneously evaluated relations between the main effects of the predictors and the affect change scores. The second evaluated the relation between the interaction of the two predictors and the affect change score, controlling for the main effects. Observed effect size for each effect is denoted as the improvement in a model's R-squared value (ΔR^2) that results from the addition of the effect to the regression model. To simplify presentation, for these analyses events were grouped into three age categories: recent (8 months or less); middling (9 to 16 months) and older (over 17 months).

Results from the regression analyses show that there was more fading of affect for negative events (M = 1.01) than for positive events (M = 0.48), $F(1, 762) = 37.59$, $p < .0001$, $\Delta R^2 = .012$. Recent events (M = 0.53) also showed less fading than middling (M = 0.83) or older (M = 0.87) events, $F(2, 762) = 4.28$, $p = .02$, $\Delta R^2 = .008$. The effect for the Valence x Event Age interaction term approached significance, $F(2, 757) = 2.64$, $p = .08$, $\Delta R^2 = .003$. The means for this interaction show a typical pattern: The FAB was especially small for recent events (recent event M's: positive = 0.35, negative = 0.72; middling event M's: positive = 0.42, negative = 1.24; older event M's: positive = 0.43, negative = 1.22).

Importantly, these effects emerged despite the fact that the activation level of each emotion, as well as interactions between the activation level variable with all other predictors, were appropriately accounted for in the analysis. In fact, no effects involving the activation level variable approached significance. Thus, in Study 1 the FAB emerged, occurred across event ages

(but was smallest for recent events), and was not accounted for or influenced by the activation level of the emotion prompted by the event.

Emotion Ratings at Event Occurrence

The cleanest interpretation of the change scores described above depends, in part, on the patterns of data observed in the initial extremity ratings. Accordingly, a pooled within-subjects regression analysis was conducted examining the extent to which valence, arousal, event age, and all interactions among them predicted initial extremity ratings. Positive events were given more extreme initial emotion extremity ratings (M = 5.94) than negative events (M = 5.08), $F(1, 762) = 64.22$, $p < .0001$, $\Delta R^2 = .055$. Moreover, events producing high activation level emotions were given more extreme initial intensity ratings (M = 5.75) than events producing low activation levels (M = 5.28), $F(1, 762) = 18.85$, $p < .0001$, $\Delta R^2 = .017$. These results differ substantially from results observed in the change scores. Accordingly, the data suggest that the patterns observed in the change scores were driven largely by the event ratings provided at event recall, not by the event ratings provided at initial event occurrence.

Summary

The results from Study 1 suggest that the FAB is not a consequence of any of several variables. For instance, some might claim that negative events tend to be more extreme, and so have more room to decrease over time. Moreover, some might claim that the events reported confound emotion valence and activation level, and that it is the emotion activation level that is really responsible for the FAB. Furthermore, some may claim that negative events might be older than positive events, on average, causing greater apparent fading in negative events. None of these possibilities were supported by the results obtained in Study 1. Instead, the results point to the FAB as being a consequence of the valence of the emotion prompted by an event.

STUDY 2: THE ACTIVATION LEVEL OF EMOTIONS AND THE FAB, REVISITED

Study 2 sought to build on Study 1's results, but with additional methodological controls. It can be argued that obtaining both emotion-at-occurrence and emotion-at-recall ratings on the same occasion could feasibly introduce response biases into the emotion ratings. For example, when both sets of ratings are obtained at once, as in Study 1, it could be especially likely that participants' ratings are influenced by their current mood and their theories of how emotions *should* change across time. Current mood and personal theories could induce people to report more consistency in the ratings of positive emotions (e.g., less change) than in ratings of negative emotions (i.e., more change). While some evidence exists suggesting that personal theories about event-related emotional change cannot explain the FAB (Dwyer et al., 2004), it nonetheless seems desirable to bring additional evidence to bear on this issue. Temporal separation of emotion-at-occurrence and emotion-at-recall ratings should reduce the possibility that personal theories of emotional change are responsible for the FAB, although it admittedly does not eliminate it.

Accordingly, in Study 2, the affect-at-occurrence and affect-at-recall intensity ratings were made at different times. In previous FAB research, only diary studies (e.g., Walker et al., 1997) employed temporal separation of these ratings. To our knowledge, this has not been done in retrospective recall studies.

A second methodological control employed in Study 2 reflects an attempt to more systematically control the ages of reported events. In Study 1, we recorded event ages and used them in analyses, but there was an imbalance in the event ages reported--there were a greater number of younger events than older events. In Study 2 we systematically added event age to the research design by systematically asking people to report events that were one of two

approximate ages (six months or one year). Accordingly, all participants were instructed to provide two events in each cell of an Event Age (six months, one year) x Event Valence (positive, negative) X Emotion Activation Level (low, high) matrix.

Method

Participants

Participants included eighteen undergraduate students (13 females, 5 males; M_{age} = 23 years, *SD* = 6.64) who were enrolled in an upper-level psychology class at a large Midwestern university. They received class credit as compensation for their participation.

Procedure

Except for three details, the methods in Study 2 duplicated those used in Study 1. The first detail is that the participants took part in Study 2 using materials that were administered via email. Participants were sent instructions that prompted them to not only recall events that produced specific emotions, but also prompted recall of specific event ages (e.g., "Please describe an event that is about six months old that made you sad"). Half of the events requested were a year old, the other half were six months old. These requests were balanced evenly across event valence and emotion activation level.

The second detail is that the event emotion solicitation order was fixed. The order in which respondents recalled and rated their events was: (a) sad, one year ago; (b) calm, six month ago; (c) angry, one year ago; (d) happy, six months ago; (e) sad, six months ago; (f) calm, one year ago; (g) angry, six months ago; and, (h) happy, one year ago.

The third detail is that participants made two independent affect ratings. At Time 1, they reported events and rated the intensity of emotions prompted at event occurrence. At Time 2, approximately one month later, participants re-read each event and rated their affect-at-recall for

each. In the course of this Time 2 task, each participant's own event descriptions were returned to them, but not their initial intensity ratings. Participants were asked to read each event and to rate the intensity of the emotion that they felt now, when they recalled the event.

Results and Discussion

Valence Differences Emerge in How Often Affect Intensity Fades

Affect intensity change scores were calculated as describe in Study 1. For one set of analyses, the affect intensity change scores were classified as indicative of fading affect (affect intensity decreases across time), fixed affect (affect intensity is stable across time), or flourishing affect (affect intensity increases across time). Examination of frequency data for these classifications shows that the emotions prompted by positive events showed some evidence of fading from event occurrence to event recall (*n*'s as follows: fading affect = 35; flourishing affect = 11; fixed affect = 26). However, such fading was even more typical for negative events (*n*'s as follows: fading affect = 50; flourishing affect = 3; fixed affect = 19). This alteration of the pattern of change score classifications across valence was significant, $\chi^2(2, N = 144) = 8.31$, $p = .015$, $\phi = .24$. This frequency pattern is indicative of the FAB.

Valence Differences Emerge in the Amount of Fading that Occurs

Classification analyses minimize the FAB by ignoring the amount of change that occurs in the emotions that are produced at event occurrence and at event recall. Accordingly, the change scores were subjected to a within-participants ANOVA. This ANOVA is conceptually equivalent to the pooled within-participants regression analyses employed in Study 1, but was employed in Study 2 because the data were balanced across cells. The variables in the ANOVA were event valence, emotion activation level, and event age.

The analysis yielded a reliable valence effect, $F(1, 119) = 6.69$, $p = .01$, $\eta^2 = .04$. The means reflect the FAB: unpleasant affect faded more ($M = 1.43$) than pleasant affect ($M = 0.76$). No other main effects or interactions were statistically reliable.

Emotion Ratings at Event Occurrence

As noted earlier in this article, interpretation of change scores depends on the patterns of data observed in the initial extremity ratings. Accordingly, a within-subjects ANOVA was conducted examining the extent to which valence, arousal, event age and the various interactions among these variables, predicted initial extremity ratings. For negative emotions, the intensity of experienced emotion did not vary by emotion activation level (high $M = 5.25$; low $M = 5.27$), but for positive emotions, the intensity of experienced emotion did vary by emotion activation level (high $M = 5.58$; low $M = 4.58$), $F(1, 119) = 11.54$, $p = .001$, $\eta^2 = .06$. The analysis also yielded an inconsequential emotion activation level effect, $F(1, 119) = 10.32$, $p = .002$, $\eta^2 = .05$. Overall, these results differ substantially from those observed in the change scores. Accordingly, the data suggest that the valence effect observed in the change scores was driven largely by the ratings provided at event recall, not by the ratings provided at initial event occurrence.

STUDY 3: DISPOSITIONAL MOOD AND THE FAB

Study 3 explored whether mood was related to the FAB. Specifically, the present study explored the extent to which the FAB may be related to dispositional affectivity: the extent to which a participant generally feels affectively positive or affectively negative.

As noted in the introduction to this article, one possibility is that the FAB is especially likely in those with an emotionally positive disposition. This would be consistent with a misattribution mechanism in which this dispositional positivity infuses feelings experienced at event recall. Such effects would make it appear as if positive events maintained affective

intensity across time, while negative events lost their affective intensity. Such effects could occur either in strong form or in weak form. Strong moderation would be indicated by the elimination of the FAB for individuals with a negative disposition. Weak moderation would be indicated by a pattern of results suggesting that the FAB emerged even for those who reported being in a chronic negative mood, with a smaller FAB occurring in those chronically negative individuals than in those who report being in a chronic positive mood.

Method

Participants

Participants (113 females and 43 males) from upper-level classes in psychology at a Midwestern university received credit toward completion of a course requirement in return for their participation. The average participant age was 21.77 years (*minimum* = 19, *maximum* = 53).

Procedure

Autobiographical event recall. Participants reported autobiographical events in a booklet provided by participants' course instructors at the beginning of an academic semester. Participants took their booklet home and completed it at their convenience. Booklets were returned prior to the end of the semester.

Instructions asked participants to provide a variety of events and cautioned against inclusion of items too sensitive for public consumption. Each booklet page specified a time-period and a solicited brief written account of a positive or negative autobiographical event occurring in the period. Five pleasant and five unpleasant events were requested from each of the following epochs: (a) one week old or less, (b) about one month old, (c) about four months old, (d) about one year old, and (e) from the time between the person's 13th and 16th birthdays. Participants provided multiple ratings of each event.

Affect ratings and change scores. Of primary interest are reports of the affect: (a) produced by each event when it occurred and (b) produced by each event when it was recalled (e.g., Walker et al., 1997). These ratings were made on a bipolar scale (1 = *very negative*, 2 = *negative*, 3 = *slightly negative*, 4 = *slightly positive*, 5 = *positive*, 6 = *very positive*). As in Study 1, *affect intensity change* was calculated for each event as the difference between affect at occurrence and affect at recall.

Dispositional affect. The final page of each booklet presented items from the PANAS (Watson, Clark, & Tellegen, 1988). The PANAS includes ten positive emotion terms and ten negative emotion terms. Each is rated on a 5-point scale (1 = *very slightly or not at all*, 3 = *moderately*, 5 = *extremely*). Instructions prompted respondents to report how much or little they feel, on average, the emotion reflected in each word.

In accord with recent theorizing (e.g., see Barrett, 2004), and with the practice of some researchers (e.g., Sanna, Parks, & Chang, 2003), responses were treated as a single unipolar pleasantness scale rather than as separate positive affect and negative affect scales. Support for this approach comes from the Cronbach's alpha calculated from these ratings. The scale reliability was good (.85), suggesting that it is appropriate to combine items into a single scale. Accordingly, after reverse-scoring negative items, participants' ratings were summed. A quartile split of these sums was used to assign participants to one of four *dispositional affect conditions* (i.e., low; medium-low; medium-high; high). This dispositional affect variable was used as a predictor of affect change in subsequent regression analyses. [1]

Results and Discussion

Analytic Technique

These analyses were conducted in hierarchical fashion, with all analyses controlling for event age. An initial analysis examined whether event valence predicted affect change. A second analysis examined whether the Event Valence X Dispositional Affect Condition interaction predicted affect change, controlling for event valence. Additionally, we report Least Squares Means. The LS Means reflect the adjustments made to the data because of the other terms entered simultaneously into the regression models.

The Fading Affect Bias Emerged

The affect prompted by recalled events should increasingly fade with increasing event age (Walker et al. 1997), and it did (one week old $M = 0.32$; one month old $M = 0.36$; four months old $M = 0.45$, one year old $M = 0.51$, and between 13^{th} and 16^{th} birthdays $M = 0.79$, $F(4,1399) = 7.82$, $p < .0001$, $R^2 = .37$). Even more importantly, controlling for event age, as expected, negative events evinced more affective fading ($M = 0.63$) than positive events ($M = 0.34$), $F(1,1399) = 119.72$, $p < .0001$, $R^2 = .41$.

Moderation of the Fading Affect Bias

An Event Valence X Dispositional Affect Intensity Category interaction also occurred in our analyses, $F(3, 1395) = 4.01$, $p < .007$, $R^2 = .42$. The means (see Figure 1) for this effect show that the FAB was present for all participants, but was smallest for those in the lowest dispositional affect quartile than for others. However, even for those in the lowest dispositional affect quartile, event-related negative affect faded more than positive affect, $F(1, 327) = 5.82$, $p < .05$. This result suggests that, while the FAB can be influenced by pre-existing affect, it is not entirely caused by pre-existing affect.

However, there are at least two good reasons to be cautious about this conclusion. First, we used a version of the PANAS that assessed trait affect. While trait affect undoubtedly predicts state affect, it is also the case that peoples' immediate affective states can differ from their affective traits. Second, the PANAS was the last page to appear in the take-home booklet, and thus, may not have assessed affect experienced immediately prior to event recall. Accordingly, despite evidence that suggested possible mood misattribution, in Study 3 the dispositional version of the PANAS may not have reliably captured a psychometric image of the affective state that an individual was in just prior to event recall.

Nonetheless, these cautions would seem to be especially applicable if dispositional mood were not related to the FAB. The fact that responses to the PANAS measure did moderate the FAB in the predicted manner suggests that responses to the PANAS reflected mood, and that mood was incorporated into the emotional experience produced by event recall.

Analyses of Initial Affect Ratings

As noted earlier in this article, the interpretation of change scores depends, in part, on the patterns of data observed in the initial affect ratings. Accordingly, regression analyses examined the extent to which initial ratings were related to the valence of emotions prompted by events. No valence effect was observed these ratings, $F(1, 1557) = 2.10$, $p > .10$. Thus, the affect change scores indeed reflect how the intensity of affect prompted by autobiographical events changed from event occurrence to event recall.

STUDY 4: ELIMINATION OF RETROSPECTIVE BIAS AND THE FAB

Retrospective recall studies (as in Studies 1 through 3) are sometimes seen as problematic in the study of autobiographical memory. One oft-cited problem is that ratings provided in such studies may reflect retrospective bias. For example, reports of how people felt at the time they

experienced events might be altered by current feelings, goals, and ideas about the self (Conway & Pleydell-Pearce, 2000; Levine et al., 2006). One possibility is that such alterations might contribute to, or even fully account for, the FAB. This might occur, for example, if a person rates negative emotions as worse than they actually were at event occurrence. Such distortions would produce the illusion that the intensity of negative memory-prompted emotions changes more across time than the intensity of positive memory-prompted emotions.

Such problems are eliminated by using a diary methodology in which feeling-at-occurrence ratings are obtained near to the time at which the event occurred and feeling-at-recall ratings are obtained when recall is prompted. Such a methodology has previously been used in FAB research (Walker et al., 1997), but not often. Accordingly, in Study 4 we used a diary methodology to explore the FAB.

The diary methodology totally eliminates the possibility that retrospective bias in recall of emotional experience drives the change scores that reflect the FAB. Nonetheless, we thought that a particularly compelling demonstration would be to produce data that would show evidence of both a FAB and retrospective bias. Accordingly, in Study 4, we assessed the extent to which retrospective bias occurred by asking participants, at event recall, to report the intensity of the emotion that they experienced at event occurrence. A *retrospective bias* measure was obtained by calculating the disparity between the initial affect rating (given temporally near when the event occurred, at time 1) and the retrospective report of the emotional experience provided at event recall (given two weeks later, at time 2). We explored whether the discrepancies that emerged were related to event valence.

Study 4 also explored peoples' predictions of the extent to which the intensity of the emotions associated with event memories change across time. In contrast to the general approach

to prediction used by Dwyer et al. (2004), these predictions in Study 4 were assessed on an event-by-event basis. This was done by asking people to predict, for each event, the expected intensity of emotion prompted two weeks in the future when the event was to be recalled. The disparity between actual final affect reported at recall and predicted final affect can reflect peoples' theories of how affect might change for each event. Analyses explored whether the discrepancies that emerged were related to event valence and the extent to which these predictions could account for the FAB.

Method

Participants

Fifty-six participants (41 females) with a mean age of 22 years (*minimum* = 19, *maximum* = 41) from upper-level classes in psychology at a Midwestern university received credit toward completion of their course requirement.

Materials and Procedure

Individuals who volunteered to participate in the present study gave their informed consent in writing. Their course instructor posted the research materials on a website used for their class. Participants downloaded two files: the instructions and the diary template (a spreadsheet). Each day for two weeks participants typed into their diary file both "something pleasant that happened today" and "something unpleasant that happened today". For each pair of events they entered the date and then rated each event according to "How pleasant [unpleasant] did you feel *when this event occurred earlier today*?" and "How pleasant [unpleasant] do you think this event will make you feel in *two weeks from today*?", each rated along an 11-point bipolar scale (-5 = *extremely unpleasant* to 0 = *neutral* to 5 = *extremely pleasant*). After two weeks of keeping the electronic diary, participants sent their files to the first author via email.

After an additional two weeks passed, participants were emailed their events, but not their initial ratings. They were instructed to read and re-rate each event using the following two items, rated along the same 11-point scale described above: "How pleasant or unpleasant does thinking about this event make you feel *now*?" and "How pleasant or unpleasant did this event make you feel *two weeks ago*?" After turning in their event data file again, participants were sent a debriefing statement via email.

Results and Discussion

The results reported below focus on the valence of the emotion prompted by an event or by event recall. In these analyses, the effect of valence was always evaluated controlling for individual differences among participants, the extremity of the affect felt at an event's occurrence, and the event's age.

The FAB Emerges Yet Again

Most importantly, the data reflect a robust FAB valence effect, $F(1, 1441) = 40.95$, $p < .0001$, $\Delta R^2 = .018$. Examination of the difference scores shows that fading for unpleasant events was greater (Adjusted $M = 1.89$) than fading for pleasant events (Adjusted $M = 1.34$). Importantly, in Study 4, retrospective bias cannot account for the FAB. That is, in Study 4 the FAB occurred even when ratings were collected using a diary methodology in which it is impossible for retrospective bias to affect the emergence of the FAB (i.e., driven by current concerns, goals, or personal theories of change).

There is Retrospective Bias in Recall

Nonetheless, it is possible that retrospective biases can occur. This possibility was examined by calculating the difference between the actual affect reported at occurrence to the retrospective report of the affect felt at occurrence (i.e., looking back in attempt to remember

how one felt more than two weeks earlier). The results suggest that people were good at recalling the extremity of the positive emotions that happened at an event's occurrence (Adjusted M = 0.05), but underestimated the extremity of negative emotions when recalling them (Adjusted M = 0.35), $F(1, 1441) = 21.84$, $p < .0001$, $\Delta R^2 = .074$. Thus, these data show that, consistent with the results of other research (Levine et al., 2006; Ross, 1989), retrospective bias in recall of emotions associated with memory can, indeed, occur. However, it is important to reiterate that the diary design of Study 4 makes it impossible for such bias to influence the FAB.

Peoples' Theories of Change or Their Expectations of Change Do Not Fully Predict the FAB

A third set of analyses examined participants' predictions of affect to be experienced at event recall and assessed whether these predictions could account for the FAB. The first set of analyses examined the differences between participants' predictions of the emotions to be experienced when events were to be recalled two weeks and the actual reports of affect intensity that were provided at recall. The data suggest that, on average, peoples' projections of the extent to which affect fades was about equally good for negative events (Adjusted M = -0.06) and for positive events (Adjusted M = -0.03), $F(1, 1441) = 0.08$, $p > .70$, $\Delta R^2 = .00$. This result suggests that people do have some insight into their future emotional experiences, and also leaves open the possibility that peoples' theories of change or expectations of change may be related to the FAB.

This idea was directly examined in a second analysis. The analysis examined whether a FAB emerged, even when peoples' predicted emotional reactions to each event were added to the regression model predicting affect change. As one might expect, the predicted emotion for each event (with each of the 11 rating levels treated as a separate category) did predict actual affect change, $F(10, 1431) = 18.62$, $p < .0001$, $\Delta R^2 = .07$. However, despite the inclusion of this

term in the regression model, the analysis revealed a significant valence effect, $F(1, 1431) = 4.27$, $p = .04$, $\Delta R^2 = .05$, with means reflecting the FAB (Adjusted negative $M = 1.32$, Adjusted positive $M = 1.04$). In short, less fading was experienced for positive emotions accompanying recalled events than for negative emotions, even accounting for the predicted changes in emotions that people made when events occurred. If the FAB were caused by peoples' theories of change or by their expectations of change, such a result should not have occurred.

In this regard we note that our analysis is very conservative. Some participants may have insight into their future emotions, but may not have used them to generate the ratings of emotion that they experienced at event recall. In our analysis, such participants are not parsed out from those who may have used their predictions to generate their emotion ratings. Hence, if anything, the results of the analysis likely overestimate the extent to which emotion predictions might have affected the FAB.

The FAB Weakly Emerges From Retrospective Ratings

One final set of analyses compared recalled emotions felt at event occurrence to ratings of emotions actually experienced at event recall. The difference score is interesting because it corresponds to the affect change variable calculated in retrospective recall studies. Duplicating the results from those studies, results of the analysis suggest that the affect associated with negative events faded more (Adjusted $M = 1.31$) than the affect associated with positive events (Adjusted $M = 1.21$). However, the effect only approached significance in the regression analysis, $F(1, 1441) = 1.86$, $p = .17$, $\Delta R^2 = .04$.

Interestingly, these data suggest that the retrospective methodology has been criticized for the wrong reasons. That is, such methods have been criticized because they leave open the possibility that various forms of bias are responsible for the appearance of the FAB. Instead,

these results suggest that retrospective recall methods will detect the FAB, but the power of the method to detect such effects may be lower than the power of data gathered via diary methods. This implies that researchers can detect the FAB using either retrospective recall or diary methods, but must weigh the greater ease and convenience of retrospective recall studies against the greater power seemingly provided by diary studies.

General Discussion

Remembering events can rekindle emotions experienced at event occurrence. However, this rekindling is not equal across emotion valence. The rekindling of emotion seems to be stronger when emotions are positive than when they are negative. This effect is often due to the differential fading of emotions: Negative emotions prompted by event recall seem to fade faster across time than positive emotions prompted by recall (i.e., the *fading affect bias*, or *FAB*). Data from the four studies described in the present article showed that this FAB manifests in at least two ways: negative emotion is *more likely* to fade from event occurrence to event recall than positive emotion and (b) the *amount of fading* from event occurrence to event recall is greater for negative emotion than for positive emotion.

The data from the present studies also show that the FAB emerges: (a) when event ages are controlled for, (b) when there is temporal separation between ratings of emotion experienced when events are recalled and ratings of emotions experienced at event occurrence, and (c) regardless of whether emotion ratings come from event-contemporaneous ratings or retrospective ratings. Hence, the data from our studies add to the results of existing studies that show that the FAB is a reliable phenomenon, that it is driven by emotion valence, and that it is not caused by any of a number of methodological artifacts.

This conclusion is emphasized by results from Studies 1 and 2, which explored the possibility that the FAB is an illusion caused by a methodology that masks the effect of the activation level of the emotions prompted by event recall. These studies also explored whether emotion activation level is at all related to the fading of event-related emotions, regardless of whether such emotions are positive or negative. The results from these studies suggest that even though emotion activation level is sometimes related to the fading of memory-related affect, emotion activation level plays no role in the FAB.

While the activation level variable does not account for the FAB, emotion activation level may, nonetheless, be important to autobiographical memory. Particularly interesting was the finding that people more often reported high activation positive events than they reported either low activation positive events or unpleasant events of any activation level (but see Talarico et al., 2004). Such a pattern may be consistent with the idea that, in normally functioning people, autobiographical event recall may play a role in self-enhancement. Recalling positive events enhances mood (Baker & Guterfreund, 1993) and may also enhance self-perceptions.

Additional results from our studies rule out other alternative explanations for the FAB. For example, Study 3 explored the possibility that the FAB is an illusion caused by the misattribution of pre-existing affect to the affect associated with recalled autobiographical events (Schwarz & Clore, 2003, 1983). Such misattribution could have either moderated the FAB (weak view) or totally accounted for FAB (strong view). Our data are consistent with the weak view. Individual difference measures showed that pre-existing affect, measured as a disposition, moderated the FAB. However, the FAB emerged, regardless of participant disposition.

Interestingly, the pattern of moderation that we observed is similar to that observed by Walker et al. (2003b). They observed that moderation occurred rather abruptly, emerging

primarily when an individual's responses warranted a "mildly depressed" or dysphoric classification on the Beck Depression Inventory. Our data evinced similar non-linearity, showing evidence of moderation only when pre-existing affect was especially low.

However, there are also important differences in the data reported by Walker et al. (2003b) and the data from our studies. Walker et al.'s data suggested that being in a mild depressive state fully moderated the FAB. Our results suggest only partial moderation. It is possible that this difference could have occurred because the depressives in the Walker et al. study were in a very negative state, but in our view, this is unlikely. Most depressives in the Walker et al. study scored just beyond the BDI's cutoff for classification of an individual as depressed. It seems more likely to us that the differences between the results of our studies and results reported by Walker et al. are a consequence of differences in the personality construct assessed. The experience of depression goes beyond mood, and additional characteristics of depressives might account for the moderation power of the depression measure. For example, depressives interact with fewer people and get less social support than non-depressives get. Given that social discourse frequency moderates the FAB (e.g., Skowronski et al., 2004), the absence of such communicative opportunities, and not pre-recall affect, may explain the dissipation of the FAB in depressives.

However, the weakness of the moderation effects may have also been caused by our retrospective methodology. It is possible that ratings of the pre-existing affect experienced at event occurrence and at event recall may both have been affected by a person's pre-existing mood. A stronger mood effect may be evidenced if one used a diary methodology in which ratings of affect at event occurrence are made at the time the event occurred, so that those ratings are uncontaminated by current mood. However, while this may be a more effective strategy for

detecting mood misattribution effects, it would be inconsistent with the idea that the FAB can be totally explained by misattribution of a person's pre-existing mood to event-related affect. The inconsistency exists because the FAB has been obtained in both retrospective and diary paradigms. For mood to account for the FAB effect it would have to work in both paradigms. Instead, our data suggest that misattribution of pre-existing mood does not totally account for the FAB in retrospective recall paradigms.

Study 4 also has high theoretical relevance. It explored the possibility that the FAB is an illusion caused by people's biases during retrospection and their theories about how emotions change over time. One line of argument suggests that participants experience retrospective bias in recall of their initial emotion ratings, and that it is this retrospective bias that is responsible for the FAB. Certainly, it is clear that, in response to a host of motivational and cognitive factors, retrospective bias can easily occur in retrospective emotion ratings (Levine et al., 2006; Safer, Levine, & Drapalski, 2002). Indeed, evidence for such a bias emerged in Study 4.

However, the issue is not whether such bias occurs: The issue is whether such bias can account for the FAB. The answer seems quite clear: it cannot easily do so. Prior studies consistently show that the FAB is caused almost entirely by the emotion ratings that assess how a person feels *at the time that they remember the event* – it is not related to the ratings of the emotions occurring at event occurrence. Despite repeated demonstrations of this fact, however, some commentators have repeatedly cited retrospective bias as a possible contributor to the FAB. The diary methodology used in Study 4 makes it impossible for retrospective bias to be responsible for the FAB. The fact that the FAB emerged in Study 4 eliminates the possibility that the FAB is caused by retrospective bias in memory for emotion.

Study 4 also addressed a second line of argument: the FAB is a consequence of peoples' theories about how affect associated with autobiographical events changes over time. One implementation of the argument seemingly necessitates that participants thoughtfully focus on the emotion ratings and purposefully consider how they change across time. This does not map on to the rapidity with which participants often complete their ratings. Because of the numerous ratings collected, participants often seem to be more concerned with getting done as rapidly as possible than with puzzling over how they think ratings for one particular item type (emotion ratings) out of a large rating set should change across time.

Theory-driven bias seems especially unlikely in diary studies. For that bias to operate in those studies, people must first remember their initial judgments and then modify their current judgments to accommodate their theory. Direct assessment and report of emotion prompted by event recall would require much less effort, and hence, seems more plausible as an account for how people produce judgments of the emotion experienced at recall. In fact, that direct assessment and report occurs is supported by the finding that mood affects emotion ratings (Study 3).

Other results from Study 4 cause even more problems for a theory-based view of the FAB. In Study 4, peoples' predictions about the emotion that they would experience later, at event recall, were assessed. Despite exhibiting reasonable accuracy, such predictions failed to entirely account for the emergence of the FAB.

The theory-driven account of the FAB is further weakened by the results from data collected by Dwyer et al. (2004). Those data show that participants hypothesized that negative emotions will persist across time to a greater extent than positive emotions (Dwyer et al., 2004). This is *exactly the opposite* of the pattern observed in the FAB. Thus, when considered *in toto*,

an account of the FAB that is derived from peoples' theories of how emotions change across time is not a good fit with the empirical data.

Methodological Limitations and Their Implications

However, as noted earlier, one of the forces driving our program of research has been, and will continue to be, assessment of alternative explanations for the FAB. In this regard, we note that some work remains to be done. For example, the FAB studies that have been conducted so far have allowed participants wide latitude over the events to be included in the study. This allows the opportunity for selection biases to operate, threatening the validity of the outcomes that we report. In at least one study (e.g., Ritchie & Skowronski, 2008) participants generated a large corpus of events, a subset of which were randomly selected for further investigation by the experimenters. However, even this procedure does not provide total protection against bias in event selection. Accordingly, in future studies we will attempt to incorporate experience sampling methods for autobiographical event collection.

A second issue concerns generalization of our findings across emotions. The first two studies described in the present manuscript explored the FAB in only a small subset of emotions. Obviously, there are more emotions that can be sampled. Accordingly, future studies will solicit autobiographical events that, collectively, elicit a broad range of emotions.

A third issue concerns conceptualization of the properties of those emotions. One approach to emotions views them as a circumplex, in which valence and activation-level are seen as separate dimensions (Barrett & Russell, 1998). However, such models are not the only way to conceive of emotions. For example, in their study of the properties of memory, Talarico et al. (2004) adopted a vector approach to emotions. This vector approach sees emotions as reflecting two activation level vectors, one for positive emotions (e.g., calm to excited) and one for

negative emotions (sad to angry). The vector approach sometimes seems a better fit to empirical data showing that it is not easy to find negative stimuli that are very low in activation level (see Bradley, Greenwald, Petry, & Lang, 1992, Figure 1).

One implication of the vector conceptualization is that it may not be correct to view valence and activation levels as separate and independent dimensions of arousal, implying that an ANOVA conducted on event-related affect change score data might not be appropriate (given the factorial ANOVA assumption of independence between factors). However, this critique does not apply to Studies 1 or 2 of the present manuscript, given that both used regression as a means of analyzing the emotion change scores. Such analyses do not require the assumption of independence, and hence, are compatible with the vector conceptualization of emotion.

A final methodological critique is that FAB studies rely too much on self-report. This critique is correct. While self-reports are useful, self-report data also have limitations. Accordingly, additional research should attempt to assess the emotions associated with autobiographical events using other measures. Such research may employ various physiological measures (as used in Bradley et al., 1992) as well as brain imaging technology, such as magnetic resonance imaging. We would encourage additional research that uses such measures.

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Authors' Notes

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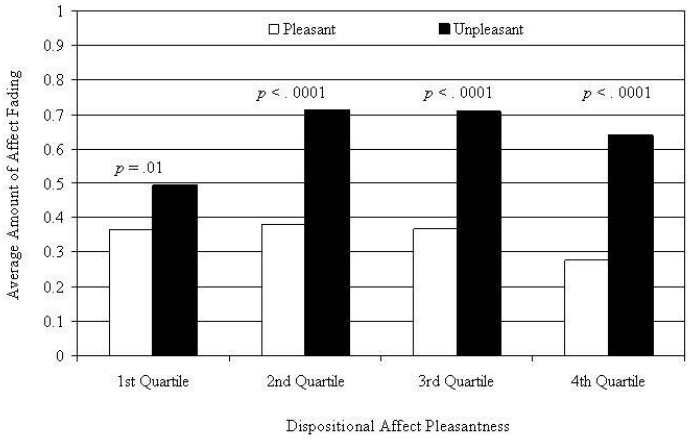
Footnotes

[1] Procedures that change metric variables to categorical variables (e.g., median splits) are sometimes criticized because such procedures can lower analytic power or produce misleading results. Accordingly, the analyses described in this article were also performed treating affect measures as a continuous, metric variable. Given that inferential results were substantially similar across analyses, ease of description led us to report the quartile-split results.

Figure 1

Mean Affect Fading as a Function Dispositional Affect Pleasantness Quartiles in Study 3



Mean Affect Fading as a Function Dispositional Affect Pleasantness Quartiles in Study 3
254x190mm (96 x 96 DPI)