Perceived Change in the Affect Associated With Dreams: The Fading Affect Bias and Its Moderators

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Eighty-two undergraduate participants kept dream diaries for a month. Five dreams were randomly selected from each diary and were returned to participants. They rated the affect produced by the dream at its occurrence and at its recall, as well as a number of other characteristics of the dream and characteristics of the context in which the dream occurred. Results revealed that, like memories for real autobiographical events, the negative affect associated with dreams generally faded faster than the positive affect associated with dreams (a Fading Affect Bias, or FAB). The data also showed that the FAB did not occur for: (a) dreams that were remembered to contain information that dreamers believed came true at a later date, (b) dreamers who had reportedly taken recreational drugs prior to their dream, (c) dreams remembered as lacking sound, and (d) dreams remembered as very quiet.

Keywords: autobiographical events, dreams, affect intensity, fading affect bias

Dreams sometimes prompt intense emotions, and these emotional experiences have often been the target of research. For example, dream researchers have assessed whether dreams are more often associated with positive emotion or with negative emotion (e.g., Fosse, Stickgold, & Hobson, 2001; Schredl & Doll, 1998). The present article is concerned with an aspect of the dream-affect relation unaddressed by previous research. The focus of the present article is on the emotions that are prompted by dreams recalled at a later date.

Recollection of dreams can provoke emotions for days, months, or even years after a dream initially occurs (Nielsen, Kuiken, & McGregor, 1989; St-Onge, Lortie-Lussier, Mercier, Grenier, & De Koninck, 2005). However, it is probably

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true that, generally speaking, the affect produced by dream recall fades with increases in time lag from the original dream (Koulack & Goodenough, 1976). The research in this article explores variables related to such fading.

Our hypothesis about variables related to the fading of dream-related affect over time can be derived from autobiographical memory research. Results of such research indicate that emotions prompted by recall of positive autobiographical events fade more slowly over time than emotions prompted by recall of negative events (Walker, Skowronski, & Thompson, 2003b; Walker, Vogl, & Thompson, 1997). This differential fading is termed the *Fading Affect Bias* (FAB).

While known for some time (Cason, 1932; Holmes, 1970), the FAB has only recently received systematic empirical attention (Ritchie et al., 2006; Skowronski, Gibbons, Vogl, & Walker, 2004; Walker, Skowronski, Gibbons, Vogl, & Thompson, 2003a; Walker et al., 1997). Results from this research program suggest that the FAB is not due to one of a number of possible methodological artifacts, including: (a) differences in characteristics (e.g., initial intensity) of unpleasant events and pleasant events; (b) better recall of pleasant events than unpleasant events; (c) participants' implicit or explicit theories about affect changes in memory over time; or (d) retrospective biases in recall of initial emotional experiences. Instead, the FAB is thought to result from the action of an individual's social, cognitive, and emotional coping mechanisms, such as social support in the face of negative memories (see Skowronski et al., 2004). It is believed that these mechanisms generally work to retain the positive in an individual's life while minimizing the negative.

THE PRESENT STUDY

The research described in the present manuscript explores whether the FAB similarly characterizes recall of dreams. To conduct the study, the research team adapted self-report methods from studies of affect prompted by recall of autobiographical events (see Ritchie et al., 2006; Skowronski et al., 2004; Walker et al., 1997). In the study described in the present article, participants kept a diary in which they recorded each dream as close in time as possible to experiencing the dream itself. Later, people recalled some of the dreams recorded in their diary and rated how each dream made them feel at the dream's occurrence, and how each dream made them feel when they recalled it. The *change in pleasantness* from dream occurrence to dream recall (typically a reduction, or *fading*, in emotion extremity) is the primary dependent measure in our analyses. Of particular interest is whether the amount of change is related to the valence of the emotion originally produced by the dream. Extrapolation from autobiographical memory studies suggests that more event fading will occur for dreams that originally produced negative emotions than for those that produced positive emotions.

However, autobiographical memory studies show that not all similar-valence memories fade at the same rate (see Ritchie et al., 2006; Skowronski et al., 2004). The research in the present manuscript was also concerned with the extent to which the fading of affect is related to various characteristics of dreams. One set of ideas comes from autobiographical memory research suggesting that *psychological properties* of events, such as memorability, self-relevance, and typicality, are related to

the fading of event-related affect. In the present article, we similarly explored whether these variables were related to the fading of dream-related affect.

In addition to these holdover variables, we explored relations between other psychological properties, some of which are unique to dreams, and the fading of pleasantness. One variable was the extent to which dreams were seen as reflecting later reality. Our hypothesis was that dreams that were seen as reflecting later reality (e.g., they "came true") might be more likely to retain their affective properties than those dreams that did not. A second psychological property variable that we examined was the extent to which the dream was perceived to be a lucid dream. Our hypothesis was that lucid dreams might be perceived to be relatively unusual, and autobiographical memory research suggests that unusual events tend to retain affect across time. Hence, we anticipated that lucid dreams would be more likely to retain affect across time than nonlucid dreams. A third new psychological property variable that we explored was whether dreams were perceived as reflecting random information. Autobiographical memory research suggests that meaningfulness is related to retention of event affect across time. Hence, we speculated that dreams interpreted as reflecting random thoughts would be less likely to retain affect over time than dreams that were not. Another new psychological property variable assessed whether a dream contained real-life content. However, predictions for this last variable are unclear; both real-life and the products of imagination can produce intense emotions in dreams, and the retention of such emotions across time may have more to do with other variables (e.g., the dream's vividness) than with the realistic content or imagined content of the dream.

Another set of items explored the extent to which *dream rehearsals* were related to the retention of dream-related affect. Research in autobiographical memory suggests that some rehearsal types tend to promote the retention of positive affect and accelerate the decay of negative affect. These effects tend to occur, for example, when autobiographical events are discussed with others (e.g., Ritchie et al., 2006; Skowronski et al., 2004). Positive events are also sometimes privately rehearsed, and the mental activity involved in such rehearsal is also likely to promote the retention of positive event-related affect (Bryant & Veroff, 2007).

In the present research we similarly explored the extent to which rehearsal was related to the fading of dream-related affect. In addition to rehearsal types culled from the autobiographical memory literature, two rehearsal-related items specific to dreaming were also used. One item assessed the extent to which the dream was perceived to be provoked by an external cue. The second item was a dream recurrence item, assessing the extent to which a given dream recurred.

Yet another set of items explored the extent to which *stimulus properties of dreams* were related to the fading of dream-related affect. Examples of these are the perceived vividness of the dream, whether the dream was in color or was in black and white, whether the dream contained sensory information that went beyond the visual (e.g., sound, smells), the dream's context or setting, and temporal elements of the dream (e.g., whether it seemed to be of a short or long duration). Some general ideas motivated inclusion of these items. For example, the fading of dream-related affect might be minimized in dreams that are vividly recalled, or that are recalled in great sensory detail. Thus, a dream in which many scary details are vividly recalled might also be expected to remain anxiety-producing at recall. The logic seems clear: If inclusion of certain cues in a dream promotes anxiety, and if

many cues that promote anxiety are vividly reexperienced at dream recall, then one might expect a positive relation between the vividness of event recall (or the recall of certain cues) and the amount of anxiety provoked by dream recall.

A final set of items (*other items*) reflects our interest in the extent to which the fading of dream-related affect might be related to elements of the life context in which dreams occurred. One potentially important element of context is when the dream occurred in the sleep cycle: early, middle or late. The ability to recall dreams in detail, and hence, the ability to reexperience dream-related emotions, may be related to the timing of dream emergence (Schredl, 2004). Two items explored this possibility. One of the items asked participants to report when the dream emerged in their sleep cycle; the second asked subjects to report if the dream occurred during their regular sleep cycle or during a nap. A third item in this group tied into the fact that people's dream experiences are sometimes influenced by agents (e.g., drugs) that alter states of consciousness (e.g., see footnote 5 in Porte & Hobson, 1996). We wondered if such altered states were related to the fading of dream-related affect. Accordingly, we included an item assessing whether a participant had ingested alcohol or recreational drugs prior to sleeping and dreaming.

METHOD

Participants

For five weeks, 82 undergraduate participants (68.3% women, median age = 21 years, ranging from 20 to 58) enrolled in an upper-level psychology course at a large Midwestern (United States) university kept handwritten daily diaries of their dreams. As compensation, they received partial credit toward fulfillment of their course requirements.

Procedure

After receiving a participant's diary, members of the research team randomly selected five dreams from the diary (Dream, $N = 410$). A week later, the researchers returned each participant's diary with tags indicating the five dreams of interest. This was accompanied by a dream event rating booklet. Instructions to participants indicated that they were to reread each dream description, and then complete a series of ratings. Participants were given five days to reread their dreams, rate the events, and return their research materials to their course instructor.

General Characteristics of the Dreams Sampled

About 48% of the dreams sampled occurred in the first two weeks of the study, and about 52% occurred in the final two weeks of the study. About 73% of the dreams were recorded soon after awakening, with times ranging from 6:00 a.m. to 10:00 a.m. The remaining dreams were recorded at some other time of day. Dreams

sampled occurred across all days of the week but Tuesday dreams were sampled least often (10.6%) and Saturday dreams were sampled most often (16.5%).

Dream Affect Ratings and Affect Change Score

Dream affect intensity scores came from responses to two bipolar items: (1) "About how positive or negative did the dream make you feel, either during the dream itself or immediately after you woke up?" and (2) "About how positive or negative does the dream make you feel as you remember it now?" Responses were made on a 6-point scale (1 = *very negative*, 2 = *negative*, 3 = *slightly negative*, 4 = *slightly positive*, 5 = *positive*, 6 = *very positive*).

These ratings were used to create two new variables. One of these was *dream valence*. A dream was designated as either pleasant or unpleasant using affect-at-dream-occurrence rating: A rating of 1, 2, or 3 suggested that the dream was unpleasant; a rating of 4, 5, or 6 suggested that it was pleasant. The second new variable was a *change-in-pleasantness score*: The dream affect-at-recall rating was subtracted from the affect-at-occurrence rating.[1] A negative score indicates that affect was more intense at dream recall than when the dream occurred. A score of zero indicates that affect intensity at dream occurrence and at dream recall were equal. Finally, a positive score shows that affect intensity decreased from dream occurrence to dream recall (*fading affect*). Over 26% of dreams exhibited fading, about 63% evinced no change, and fewer than 4% (16 events) were rated as provoking affect more strongly at recall than at occurrence (*affect amplification*)

Two other affect-related judgments of the dreams were obtained. To make one of these, participants were first given the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (APA, 1994) definition of a nightmare and asked: "About how much would you consider this dream to be a nightmare?" (1 = *not a nightmare, according to the definition*; 4 = *according to the definition, this dream was a nightmare*). A second item asked: "About how much would you consider this dream to be a bad dream, but not a nightmare?" (1 = *this was not a bad dream*; 4 = *this was a very bad dream*).

Dream Psychological Properties

These items were intended to assess some of the overall psychological properties of each dream. Inclusion of many of these items was guided by their utility in predicting the fading of event-related affect in autobiographical mem-

[1] Discerning readers will note that manual subtraction of the means for emotions at dream occurrence and emotions at dream recall do not equal the means reported for the change score. The reason is that extremity scores were calculated by taking the absolute value of the difference from the scale midpoint (3.5); the change score was derived from the absolute value of the difference between the affect-at-occurrence rating and the affect-at-recall rating. The difference between the absolute value of the extremity score will not equal the change score when a dream changed valence from occurrence to recall. For example, a dream that was a assigned a rating of 1 at occurrence and a rating of 4 at recall would have a change score of 3, the initial extremity score would be 2.5, and the recall extremity score would be 0.5.

ory research. An *ease of recall* item was responded to on a seven-point scale: "As you reread your dream, how much effort have you exerted to recall this dream you had?" (1 = *very much effort*, 4 = *moderate effort*, 7 = *hardly any effort at all*). Two other items, *perceived detail at occurrence* and *perceived detail at recall*, assessed the perceived amount of detail that was in the dream: (a) "When you recalled and wrote about this dream right after it occurred, how rich and detailed was it in your memory then?" (1 = *almost no detail*, 4 = *moderately rich and detailed*, 7 = *very rich and detailed*); and (b) "When you think about this dream, how rich and detailed is it in your memory now?" (same scale as the item above); and, (c) ". . .Did you experience lucid dreaming in this dream?" (1 = *it seemed to happen all by itself the whole time*, 4 = *I was in complete control*).

Other items measured the extent to which dreams were *related to the self*, *meaningful*, or *related to reality*: (a) "How important is this dream to how you think about or define yourself?" (1 = *very unimportant*, 4 = *moderately important*, 7 = *very important*); (b) "Is this the kind of dream that is very typical in your life, or is this very atypical or unusual?" (1 = *very unusual*, 2 = *moderately unusual*, 3 = *slightly unusual*, 4 = *slightly typical*, 5 = *moderately typical*, 6 = *very typical*); (c) "In your opinion, how psychologically meaningful to you was this dream?" (1 = *no special meaning at all*, 4 = *extremely meaningful*); (d) "About how much would you say this dream was the result of random, meaningless information, purely a result of the brain's activity while asleep?" (1 = *not random at all*, 4 = *very random*); (e) "Did this dream contain any real information from your past, such as people, places, events, and so forth?" (*no*/*yes*); and, (f) "Did anything you dreamt about in this dream actually come true in your waking life?" (*no*/*yes*).

Dream Rehearsals

Another set of items assessed whether dream rehearsal was related to dream affect fading. One of these was an *overall dream rehearsal frequency* item responded to on a 7-point scale: "Relative to other dreams how often do you think about, rehearse or review this dream?" (1 = *never*, 4 = *sometimes*, 7 = *almost always*). Using the same scale, additional ratings assessed how frequently individuals rehearsed a dream in different ways: (a) "The dream just pops into my head for no apparent reason," (b) "I activate the memory of the dream so that I can describe the event to others," (c) "It pops into my head because I am reminded of it by a person or event in my environment," (d) "I try to reflect on the dream so that I can try to understand it or learn from it," and, (e) "I rehearse the dream so that I will make sure to remember it better or not to forget it". Finally, a *dream recurrence item* was responded to on a 4-point scale: "Since you turned in your dream diary booklet, has this dream recurred, that is, how often have you dreamt the same or very similar dream as this one?" (1 = *I have not dreamt a similar or the same dream as this one since then*, 4 = *I have very often dreamt a similar or the same dream as this one since then*).

Dream Stimulus Characteristics

Some items assessed the stimulus characteristics of the dreams: (a) "In your dream were you alone or with others, or both?" (b) "In your dream were you indoors, outdoors, or both?" (c) "Did your dream occur in black and white or color?" (*black and white*; *gray or dull tones*; *colorful*; *a mixture of colors black/white*) (d) "Did your dream contain sounds, such as voices, music, nature, and so forth?" (*no/yes*) (e) "If you remember your dream to have contained sound, how loudly could you hear in your dreams?" (1 = *very soft and quiet sounds*, 4 = *very loud, audible sounds*) (f) "About how much motion and movement do you remember occurring in your dream?" (1 = *I do not remember there being movement*, 4 = *I remember a lot of movements occurring in my dream*), and (g) "About how much do you remember any particular smells and odors occurring in this dream?" (1 = *I do not remember any smells or odors*, 4 = *I remember there being a lot of smells and odors in my dream*).

Other questions assessed the temporal characteristics of the dreams. These items included: (a) "About how long did this dream seem to take?" (1 = *it seemed to last briefly*, 4 = *it seemed to last very long*) and (b) ". . .when you think back about this dream, do you remember it containing a series of minidreams?" (1 = *it was one continuous dream*, 4 = *the dream was a series of dreams*).

Other Items

One item assessed whether each subject had ingested alcohol or recreational drugs prior to sleeping and dreaming (*no/yes*). A second item assessed whether the dream occurred during the day's longest sleeping period or during a nap (*nap/longest sleeping period of the day*). A third item assessed a person's perception of the time during the sleep cycle when the person experienced the dream (*falling asleep/during sleep/waking up*). One additional item assessed the extent to which the dream was provoked by a cue: "Did anything in your environment most likely trigger this dream, for example, your alarm clock, your pet, your roommate or something else?" (*no/yes*).

RESULTS

Analyses: Considerations and Choices

Analyses were conducted using a pooled within-subjects regression analysis with SAS, version 9.1.3 for Windows, using General Linear Model procedures (i.e., PROC GLM). Because each participant gave ratings for five of their diary-kept dreams, each model that we conducted included dummy-coded regression terms designed to extract between-subjects effects. By accounting for between-subjects variance in each regression model, tests of effects associated with dream characteristics were uncontaminated by subject-to-subject differences (for a more thorough description of this procedure, see J. Cohen & P. Cohen, 1983).

Analyses primarily explored predictors of *change-in-pleasantness* scores. Our analyses of these change scores were primarily concerned with whether affect generally faded from dream occurrence to dream recall, the extent to which each dream characteristic (especially valence) may have been related to such fading, and whether a given dream characteristic moderated the relationship between dream valence and the change score.

Main effect tests of a variable's relation to *change-in-pleasantness* were run in two versions. In simple versions, only variables necessary to extract between-subjects variance and the predictor of interest were included in regression models. In simultaneous versions, the dream valence variable was added to the previously described model. However, results for only one rating ("How much would you consider this dream to be a nightmare?") were substantially affected by the addition of valence to the regression model. More specifically, the predictive relation between the nightmare rating and the fading of affect was eliminated by the addition of the valence variable to the model, initial $F(3, 324) = 5.16$, $p < .002$, with valence in model, $F(3, 323) = 1.65$, $p < .18$. The explanation for this elimination is straightforward—the nightmare rating was significantly correlated ($r = -0.35$, $p < .0001$) with the dream valence classification, so both variables largely predicted the same variance in the change measure. Otherwise, the variance predicted by the dream valence variable and the other variables used to predict affect change did not substantially overlap. Accordingly, results reported reflect regressions in which the relation between predictors and the change variable control for dream valence. Hence, significant effects for each variable are independent of dream valence (and vice versa—and in these models, valence always reliably predicted affect change). Moreover, null effects for a predictor cannot be accounted for by referring to shared variance with the valence variable.

Moderation analyses were conducted by exploring whether a given variable interacted with the valence variable to predict the change-in-pleasantness score. These interaction tests always controlled for the main effects of each variable in the interaction, as well as for general between-subjects effects. It also should be noted that, when appropriate, two sets of analyses were run on each of the predictor sets. In one set, predictors were treated as categorical variables. In the second (when appropriate), predictors were treated as continuous measures. The two analysis sets allowed us to describe data in terms of both means (the former) and slopes (the latter). The former analyses easily allow the capture of nonlinear relations between a predictor and the change score; the latter analyses focus on linear relations. The former analyses also have the advantage of bypassing debates about whether the response scale has true interval or ratio properties, a theoretical necessity for the latter analyses. Obviously, inferential convergence between the two analysis types weakens criticisms that our results were due to method of analysis. Indeed, results from the two analysis types almost always converged. Hence, to avoid redundancy, we report only the analyses treating predictor variables as categorical.

Categorical treatment of predictors allows us to describe results in terms of means. However, means reported are not raw means, but Least Squares Means (i.e., LS Means, *M*). These reflect adjustments made to the relation between a predictor and the change score measure for all the terms included in each simultaneous regression model. When simultaneous predictors in a regression are correlated, such adjustments can often be large. Hence, the use of such adjusted means

for descriptive purposes is preferable to the use of raw means, for they often correspond more closely to the implications of the inferential results than do the raw means.

Finally, although our analyses focused on change scores, we acknowledge that change scores are sometimes difficult to interpret and can mask the true locus of effects. For example, a change score of 0.5 for one set of dreams and a change score of zero for a second group of dreams could reflect the fact that pleasantness ratings were more extreme for the former group than the latter at dream occurrence, but that they provoked equal affect at dream recall. On the other hand, that same change score could reflect equally extreme emotions at dream occurrence, but a significant difference between groups in responses to dream recall.

For our purposes, the cleanest interpretation of significant change score differences occurs if initial extremity ratings of emotions do not differ across levels of a variable, with differences emerging only in emotions prompted by dream recall. If this is the case, then results for the change score variable can only be interpreted as reflecting true changes in the intensity of emotions provoked at dream occurrence and at dream recall. Accordingly, we *always* performed follow-up tests examining the locus of change score effects. For brevity, we do not report the results of all such tests. Instead, we simply report the fact that, except for one variable (reported in the Results section) it was *never* the case that a significant relation between a predictor and a change score variable could be explained by relations between that same variable and the rated intensity of the emotion prompted by the original dream. Hence, the data that we report reflect meaningful changes in pleasantness intensity.

Replication of the FAB

Dreams are Characterized by a FAB

One set of analyses looked for evidence of the FAB in the change-in-pleasantness scores. The analyses used the change scores as the criterion variable and dream valence as the predictor. The valence effect was first tested in a model in which it was the sole predictor of interest (other terms merely served to extract between-subjects variance, and are included in all models); valence was a highly reliable predictor of change-in-pleasantness, $F(1, 327) = 30.17$, $p < .0001$, $\Delta R^2 = .06$. A second model included both dream valence and dream age (i.e., dreams from "last month" were older; dreams from "this month" were newer). The valence effect was again highly reliable, $F(1, 322) = 28.84$, $p < .0001$, $\Delta R^2 = .06$, and the LS Means reflect a FAB: Emotions prompted by unpleasant dreams showed substantial change from dream occurrence to dream recall ($M = 0.50$); emotions prompted by pleasant dreams did not ($M = 0.08$). These data resemble results obtained for autobiographical memories, and suggest that dream memories may have affect-provoking characteristics similar to memories for such events (Walker et al., 2003b).

Variables Moderating the FAB

Our primary interest in the next set of analyses was to determine whether dream-related variables moderated the FAB in a manner similar to the moderation that has been observed in the autobiographical memory literature.

Dream Psychological Properties

Within this group, only the perceived extent to which a dream *seemed to predict reality* moderated the relation between valence and the fading of dream-related affect, $F(1, 325) = 3.51$, $p = .06$, $\Delta R^2 = .007$. The means suggest that a FAB occurred for ordinary dreams ($M_{negative} = 0.55$, $M_{positive} = 0.07$), $F(1, 325) = 35.53$, $p < .0001$, but did not occur for reality-predicting dreams.

Dream Stimulus Characteristics

The analyses yielded an interaction between valence and dream sound presence, $F(1, 325) = 4.24$, $p < .05$, $\Delta R^2 = .009$. The FAB was substantial for dreams recalled as having sound ($M_{negative} = 0.60$, $M_{positive} = 0.08$), $F(1, 325) = 35.12$, $p < .0001$, but did not occur for dreams without sound.

Similar data emerged for dreams judged to contain varying degrees of loudness. When a dream did contain sound, the judged loudness of a dream's sound also moderated the FAB, $F(3, 246) = 4.26$, $p < .01$, $\Delta R^2 = .027$. The results of follow-up tests suggested that the FAB occurred at each level of recalled dream volume except for the lowest level, $M_{negative1} = 0.56$, $M_{positive1} = 0.17$, *ns*; $M_{negative2} = 0.56$, $M_{positive2} = 0.00$, $F(1, 246) = 11.19$, $p = .001$; $M_{negative3} = 0.44$; $M_{positive3} = 0.14$, $F(1, 246) = 6.32$, $p = .01$; and, $M_{negative4} = 0.79$, $M_{positive4} = -0.22$, $F(1, 246) = 35.17$, $p < .0001$. However, because of relatively few observations in the low volume level condition, the lack of a significant effect in that condition may simply be a reflection of low statistical power. Instead, the primary driving force to the interaction comes from the high volume responses, which clearly reflect a FAB that exceeds those observed at the other three volume levels.

Other Items

Whether a person had taken alcohol or recreational drugs prior to the dream moderated the relation between dream valence and affect change, $F(1, 324) = 4.89$, $p < .05$, $\Delta R^2 = .010$. The means show that the FAB was substantial for dreams experienced while not under the influence of drugs ($M_{negative} = 0.52$, $M_{positive} = 0.08$), $F(1, 324) = 31.76$, $p < .0001$, but did not occur when a person ingested drugs prior to dreaming. However, only a substantial minority of dreams were experienced under the influence of drugs ($n = 23$ vs. $n = 386$ in the nondrug condition). Hence, absence of a significant FAB in the drug-dream condition should be viewed with skepticism, in that it may simply reflect low statistical power. Nonetheless, the data clearly show that negative dream affect

did not readily dissipate across time when the dreamer was in a drug-induced state at the time the dream occurred.

Variables Predicting Affect Fading: Main Effects

The data were also examined for evidence that some of the predictor variables were related to affect fading, but for which the amount of fading was equivalent for negative and positive dreams.

Dream Psychological Properties

Within this item group, only participants' perceptions of the extent to which a *dream predicted reality* were related to affective fading in dreams, $F(1, 326) = 6.26$, $p = .01$, $\Delta R^2 = .013$. More fading occurred for remembered dreams that were perceived to not have come true in waking life ($M = 0.32$) than for remembered dreams that came true ($M = 0.01$). However, note that the Dream Valence × Dream Reality interaction reported in the FAB moderation section above qualifies the meaning of this main effect. The means for the interaction suggested that the presaging of reality was related to the change-in-pleasantness scores for negative dreams, but not positive dreams.

Dream Stimulus Characteristics

A couple of dream stimulus characteristics were related to the extent to which the affect associated with dreams faded over time. For example, *recalled dream continuity* predicted change-in-pleasantness, $F(3, 324) = 5.29$, $p < .002$, $\Delta R^2 = .032$. Means for this effects showed that dreams remembered more like one continuous dream (responses on the lower half of the scale; $M_1 = 0.30$, $M_2 = 0.01$) evinced less affect fading than dreams remembered more like a series of minidreams (responses on the higher half of the scale; $M_3 = 0.56$, $M_4 = 0.41$).

The *recalled presence or absence of sound* in dreams also predicted the change-in-pleasantness scores, $F(1, 326) = 9.31$, $p < .005$, $\Delta R^2 = .019$. The affect associated with dreams remembered to have sound faded more ($M = 0.35$) than the affect associated with dreams remembered to not have sound ($M = 0.09$). However, subsidiary analyses showed that dreams lacking sound were rated as less extreme at the dream's occurrence (0.92), than dreams containing sound (1.12), $F(3, 322) = 3.73$, $p < .06$. Hence, the differential fading effect for the different sound content of dreams seems to simply be a consequence of initial dream emotion extremity, and hence, may not have much psychological meaning. Moreover, note that the Dream Valence × Sound Presence interaction reported in the FAB moderation section above qualifies the meaning of this main effect. The means for the interaction suggested that sound presence was related to high affective fading for negative dreams, but not for positive dreams.

Other Items

Within this group, only responses to the when dream occurred item predicted the fading of dream-related affect, $F(2, 320) = 3.39$, $p < .05$, $\Delta R^2 = .022$. The means suggest that the greatest amount of affect fading emerged for dreams remembered to occur as the dreamer was falling asleep ($M = 0.55$), that a middling amount of fading emerged for dreams that occurred while sleeping ($M = 0.37$), and the least fading emerged for dreams remembered to occur while the dreamer was waking up ($M = 0.19$).

DISCUSSION

When people reflect on the past, the memories produced by such recollection tend to provoke affect (e.g., Ritchie et al., 2006). Event valence tends to moderate the extremity of these affective responses: Participants' self-reports suggest that, all other things being equal, greater affect intensity is experienced in response to recollection of positive events than to recollection of negative events. When viewed in relation to the affect experienced at event occurrence, there is less fading of event-related affect for positive events then for negative events (i.e., a *FAB*). The results of the present study extended this finding to the domain of dreams.

Results from autobiographical memory research suggests that the extent to which event-related affect fades is related to a number of variables. These variables either moderate the relation between valence and fading or directly impact fading independently of valence. Among such variables are characteristics of the event. We adopted a similar perspective with regard to dreams, and explored how various dream characteristics were related to the fading of dream-related affect and whether such characteristics moderated the relation between valence and the fading of affect. Some interesting results emerged.

Our data suggest that dreams seen as reflecting later reality (e.g., they "came true") were more likely to retain their affect than dreams that were not perceived to have "come true." However, such retention was especially likely for negative events. More specifically, positive dreams seemed to retain affect, *regardless* of whether or not the dream events were perceived to predict reality. In comparison, negative dreams seemed to lose their affective punch over time *unless* the dream seemed to presage reality. One might speculate about psychological variables that underlie this effect. One possibility is that the correspondence between the dream and reality might cause the event to remain psychologically open, and autobiographical memory research suggests that events lacking closure are particularly likely to retain their affective qualities (Ritchie et al., 2006). Unfortunately, we did not include an openness rating in the ratings booklet, so assessment of this idea remains to future research.

Alternatively, one wonders if the retention of negative affect for negative, reality-correspondent dreams might be particularly strong in those who are highly superstitious or who have a strong belief in the paranormal. Such individuals may be especially likely to ascribe special meaning to dreams that appear to have precognitive properties, and such "meaningful" dreams might be especially likely to hold on to their affective properties. Indeed, if this were the case, then one might

argue that this outcome is related to the finding that the FAB is especially small for autobiographical events that are high in self-importance or meaningfulness (Ritchie et al., 2006). However, subsidiary analyses exploring the extent to which the truth value effect could be explained by these psychological properties were not supported: Inclusion of the meaningfulness and self-importance variables in regression analyses failed to weaken the relation between dream truth value and fading.

Parallels to the autobiographical memory literature may be further weakened by the fact that many results that emerged in the memory literature did not emerge in the present data set. Both the psychological characteristics of dreams, such as self-importance, and the frequency of various ways in which dreams are rehearsed failed to predict the affective fading of dreams; such variables consistently predict the fading of autobiographical events, and predict the FAB as well.

The reasons for this dissociation are unclear. One possibility is that the effects observed in the autobiographical memory literature are small. The current research design may have been underpowered, not including enough dreams to detect such effects. This argument is supported by the fact that the nature of many of the relations that would have been predicted from the results of the autobiographical memory literature emerged in the data reported in the present manuscript, but these relations simply failed to surpass the .05 *alpha* criterion that we employed. For example, an examination of the means for the Self-Importance $\times$ Dream Valence interaction showed that for negative events, as event self-importance increased, the fading of affect also increased; however, the reverse was true for positive events. A similar pattern of means emerged for the Psychological Meaningfulness $\times$ Dream Valence interaction. The mapping of such patterns onto the data from the autobiographical memory studies implies that moderation of the FAB by various dream characteristics may have been present, but our dream sample was not powerful enough to detect such effects. This logic obviously suggests that in future research such effects be examined with a larger sample of dreams.

We think that it is also important to note that it is not the case that such effects failed to emerge because the variables that we measured were not meaningful to our participants. Clearly, they were. For example, psychological self-importance substantially predicted the initial extremity of affect associated with dream occurrences, with low meaningful dreams engendering low amounts of initial affect ($M = 0.92$) and psychologically meaningful dreams engendering the highest amount of affect ($M = 1.57$), $F(3, 324) = 9.25$, $p < .0001$. However, for this variable the differences in the ratings of affect at recall tended to mirror those present in the initial affect ratings (low meaningful dreams $M = 0.71$; high meaningful dreams $M = 1.32$, $F(3, 324) = 10.11$, $p < .0001$). Hence, while strongly predicting dream pleasantness, dream self-importance did not predict *change-in-pleasantness*. Many other variables evinced similar characteristics. These included recall effort (low effort was associated with high emotionality), the perceived amount of detail in memories (more detail was associated with higher emotion ratings), dream self-importance (higher self importance was associated with higher emotion ratings), and the extent to which dreams were rehearsed (for specific rehearsal reasons and for the overall rehearsal rating, more rehearsal was associated with higher emotion ratings).

Nonetheless, other variables in the study, ones that were unique to the sleep domain, were related to affective fading. For example, there was substantial affect fading for dreams remembered to occur as the dreamer was falling asleep, a middling amount of fading for dreams remembered to occur while asleep, and minimal fading occurred for dreams remembered while the dreamer was waking. It remains to future research to identify reasons underlying this relation.

One might be tempted to argue that this relation might be related to a person's ability to remember the dream details, but the ratings provided by our participants were not consistent with the idea that greater recall of detail was related to greater affect retention. Instead, one might speculate that this effect is related to dream content. For example, adopting a constructivist view of dreaming, one might speculate that dream content might reflect the heightening activation level of the body as it begins to emerge from its nightly sleep cycle (e.g., Occhionero, 2004). Accordingly, the dreams that are produced during this period of sleep may tend to include greater levels of arousing material than dreams remembered to recall at earlier times of the sleep cycle.

An interesting dream-related outcome not observed in the autobiographical memory literature was that the FAB was related to predream drug or alcohol use. Because psychotropic substances have been documented to disrupt sleep and dreaming (e.g., as noted by Porte & Hobson, 1996), we thought that it was possible that the FAB would be disrupted in those who had consumed alcohol or recreational drugs prior to falling asleep. Indeed, the data showed that the FAB did not occur when a person claimed to have ingested drugs prior to dreaming. It was particularly noteworthy that negative dreams experienced under the influence of alcohol or drugs evinced little fading of affect over time, distinctly different from the usual pattern of fading for negative events. Explanations for this effect need to be pursued.

One possibility is that dreams experienced while under the influence of drugs might differ substantively in content from other dreams, and it is these content-based differences that account for the persistence of negative affect when such dreams are recalled. However, subsidiary analyses of our data show that such effects cannot be attributed to heightened negative emotions for dreams under inebriated or drugged conditions. If anything, it was the positive dreams that tended to produce more extreme emotions at the dream's occurrence when an individual was under the influence of drugs or alcohol than when they were not. Alternatively, perhaps those who are drug or alcohol users have different personality characteristics than those who are not, and it is these personality characteristics that are responsible for the lack of fading for negative dreams in drug users. Similar effects have been observed in the autobiographical memory domain for subclinically depressed individuals (Walker et al., 2003a).

Another moderation outcome seemingly unique to dreams was the finding that negative dreams without sound were particularly likely to retain affect across time. One might speculate that negative dreams that occur without sound might be perceived as particularly ominous or scary. While not necessarily producing greater extremity at dream occurrence (in comparison to emotions produced by other negative dreams), it may be the case that this sense of portent keeps soundless negative dreams scary at dream recall. The situation is similar for ratings of dreams that contain sound. In comparison to other negative dreams, it was the negative

dreams perceived to contain soft sounds that were most likely to keep their affective sting across time. Negative dreams perceived to contain loud sounds exhibited substantial affective fading.

Interesting to note, though, in comparison to other positive dreams, loud positive dreams actually gained affective punch when recalled. These differing patterns suggest different mechanisms across dream valence. In negative dreams, high perceived loudness may have suggested dream noise that produced a startle response when dreaming, an arousal response that was obviously muted at recall. Subsidiary analyses support this idea, suggesting that loud negative dreams were associated with particularly extreme ratings for emotions experienced at dream occurrence (loud $M = 1.41$; quiet $M = 0.98$), a difference that was not present in emotion ratings at recall (loud $M = 0.84$; quiet $M = 0.75$). In comparison, loud noise in positive dreams may reflect more expected, less startling kinds of positive noises (e.g., a loud cheer in response to success), the response to which may not readily dissipate across time. This suggestion is also supported by the results of subsidiary analyses suggesting that the relation between dream loudness and rated emotion extremity for positive events actually reverses from occurrence (loud $M = 0.93$; soft $M = 1.23$) to recall (loud $M = 1.10$; quiet $M = 0.71$).

Limitations

The methods used by any study have characteristics that limit the generalizability of results using those methods. One limitation comes from the fact that we relied exclusively on diary-cued self-report ratings. Self-reports are only one among several measures of dream content and affect intensity (e.g., see Domhoff, 2003, pp. 58–61). While self-reports are often convenient and useful, alternative evidence of the FAB in dreams might emerge from alternative measures (e.g., physiological measures, such as magnetic resonance imaging). Such evidence would lead to better understanding of relations between phenomenal characteristics of dreams and their underlying neural substrates and systems.

A second limitation is that participants were allowed to choose the dreams entered into their diaries. People certainly do not recall all the dreams that they experience during sleep. Such procedures allow for selectivity in the dreams that are entered. Our attempt at randomly sampling from the pool of memories generated does not entirely counter the possibility that the initial pool of dreams generated does not reflect the entire pool of dreams. The use of experience sampling techniques might be used to overcome this objection. Such methods might involve setting an alarm to wake people at random intervals during their sleep cycles and have them record and rate a dream they may have been having when awakened.

A third potential limitation, one noted previously, is possible low statistical power. Many of the variables that predict affective fading in the autobiographical memory literature do so only weakly. Accordingly, many of those studies use substantially larger event sample sizes than the sample size of dreams that we employed. Our comparatively low power may have caused us to miss some effects that may otherwise have been present.

Coda

Recall of dreams sometimes produces affect. Our data show that, all other things being equal, affect associated with negative dreams fades faster than affect associated with positive dreams. However, things are not always equal: Several event characteristics moderate this FAB effect. Greater fading for negative dreams did not occur when dreams were thought to presage reality, for dreamers who had reportedly taken recreational drugs prior to dreaming, for dreams remembered as lacking sound, and for dreams remembered as very quiet. Moreover, dream-associated affect, whether positive or negative, faded more when dreams were long in duration and when dreams were perceived to exhibit continuity. In the latter case, this heightened fading may simply be the consequence of the heightened emotional impact of these dreams at dream occurrence. Finally, dreams that were thought to have occurred while falling asleep exhibited more fading than dreams that were thought to have occurred while waking.

However, we note that our findings are largely descriptive, providing an initial insight into the fading of dream-related affect. Even descriptively, we have only scratched the surface. In the present study we treated all positive affects as alike and all negative affects as alike. There are obviously differences among the various affects, such as activation level, that may further play into the fading of affect. Will a sad dream's affect fade at the same rate as a frightening dream's affect? We cannot answer that right now. Similarly, dream affect might fade more easily for some than for others. For example, might those who often fantasize about their dreams be more likely to retain their dream-related affect over time? What physiological processes might be related to the fading of affect or to the retention of affect across time? We cannot answer those questions right now. The data in the present manuscript have only raised the question of affective fading among dreams and provided preliminary data on such fading. It remains to future research to grapple with some of the questions that we have raised above. We can only hope that the present manuscript provides a stimulus to some researchers to commence such grappling.

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