The effect of regulation goals on emotional event-specific knowledge

Alisha C. Holland , Maya Tamir & Elizabeth A. Kensinger

Ψ Psychology Press
Taylor & Francis Group

The effect of regulation goals on emotional event-specific knowledge

Alisha C. Holland, Maya Tamir, and Elizabeth A. Kensinger
Boston College, Chestnut Hill, MA, USA

The constructivist nature of autobiographical memory leaves its retrieval susceptible to biases based on the current context. The present study addressed the hypothesis that the same memory could be recalled differently depending on a person's current regulation goals. In Experiment 1, a total of 58 participants recalled three events at a baseline session and again 2 weeks later when expecting to meet with an emotional individual. Individuals expecting to meet with a happy individual decreased the negative—and more specifically sad—words they used compared to the baseline session, whereas those expecting to meet with a sad individual showed the reverse effect. These findings were constrained by individual differences in extraversion. Significant effects were confined to events recalled second in order, suggesting the changes in emotional details might be due to controlled, regulatory processes. Using a false memory list-learning paradigm, Experiment 2 ruled out an alternative interpretation of the findings and confirmed that individuals can bias their memory in accord with regulation goals.

Keywords: Autobiographical memory; Regulation.

Autobiographical memory is hypothesised to be organised hierarchically, with broad lifetime themes at the top of the hierarchy, followed by general (e.g., repeated or temporally extended) events at the intermediary level, and event-specific knowledge (e.g., sensory and perceptual details) at the bottom level (e.g., Conway & Pleydell-Pearce, 2000). A popular view of auto-biographical memory posits that event-specific knowledge is not kept permanently in long-term memory, but is instead constructed from auto-biographical knowledge stores based on demands of the current retrieval context (e.g., Conway, 1996; Conway & Pleydell-Pearce, 2000). In support of the constructivist view of autobiographical memory, a range of empirical studies have demonstrated that our retrieval of events, even those that are highly emotional and remembered

with a great deal of confidence, are not consistent across multiple retellings (e.g., Kensinger & Schacter, 2006; McCloskey, Wible, & Cohen, 1988; Schmolck, Buffalo, & Squire, 2000). Although we often feel as though we'll never forget how the important events of our lives made us feel, our memories for even the affective evaluations of life's events can be inaccurate (Barclay & Wellman, 1986; Merckelbach, Wessel, & Horselenberg, 1997).

Retrieval contexts can include goals like mood or emotion regulation, an important function of autobiographical memory (Bluck, Alea, Habermas, & Rubin, 2005; Gross, 1998; Pasupathi, 2003). In particular, it seems that the reconstruction of emotional autobiographical event details can be influenced by emotional goals present at the time of retrieval (for reviews,

see Levine & Pizarro, 2004; Robinson & Clore, 2002). There are at least two potential routes by which emotion regulation goals at the time of retrieval can influence the construction of emotional events.

The first way in which emotional goals at the time of retrieval can bias the reconstruction of events involves the selection of which event to recall. Retrieval processes can be biased in such a way as to make more accessible those memories that are in line with current goals (Sanitioso, Kunda, & Fong, 1990). For example, clinical populations, for whom the avoidance of emotionally disturbing event-specific knowledge is a priority, often have great difficulty retrieving specific autobiographical memories. This overgeneral autobiographical memory phenomenon has been explained in terms of affect regulation (e.g., Raes, Hermans, de Decker, Eelen, & Williams, 2003; Williams, 1996, 2006; but for a discussion of how recalling specific negative emotional details might be better for affect regulation see Phillipot, Baeyens, Douilliez, & Francart, 2004; Phillipot, Schaefer, & Herbette, 2003).

Biased event selection based on the emotional goals at retrieval might also occur in the case of mood-incongruent memory. Mood-*congruent* memory has been demonstrated via faster retrieval times and a greater number of memories recalled for events congruent in valence to the induced mood (e.g., recalling a higher number of negative memories after listening to sad music; see Rusting, 1998, for a review). Other times, however, current mood is associated with mood-*incongruent* memory, reflected in the retrieval of events that are opposite in valence to one's current emotional state (Josephson, Singer, & Salovey, 1996; Parrott & Sabini, 1990). There is some evidence that mood-incongruent memories arise over an extended time course ("first congruency; then incongruency", Sedikides, 1994; but see Parrott & Sabini, 1990, for evidence of mood incongruency in events recalled first in order under natural versus induced mood conditions). This delay in mood incongruency has been used as further evidence that the incongruent memories are being used in a regulatory manner, with the idea being that the selection of mood-incongruent memories is a controlled process that takes time to play out (Isen, 1985; Isen, Shalker, Clark, & Karp, 1978; Josephson et al., 1996). For instance, Josephson et al. (1996) found that memories recalled first in order

following a sad mood induction tended to be mood congruent, whereas those recalled second in order tended to be mood incongruent (in this case, positive). A large proportion of those individuals who recalled a negative first memory followed by a positive second memory cited mood repair as a goal for the recall of their second memory.

Although mood-incongruent memory is often explained in terms of mood repair (e.g., Blaney, 1986; Isen, 1985), it is important to note that event selection for the purposes of regulating our moods and emotions is not always strictly hedonic. Tamir, Mitchell, and Gross (2008) found that when individuals anticipated playing an aggressive video game, they preferred activities like recalling angry events when compared to individuals who anticipated playing a non-confrontational video game. Although these recollections may not have been pleasant in the short term, they allowed for enhanced performance on the video game task.

It is also important to note that individual differences in personality can interact with the retrieval context to determine the extent to which mood-incongruent memories are selected in a regulatory manner. For instance, depression has been associated with a decreased tendency to use positive autobiographical memory recall in a mood-regulatory manner (e.g., Joormann & Siemer, 2004; Josephson et al., 1996), whereas extraversion (Rusting, 1999) and a belief in one's positive emotion regulation self-efficacy (Rusting & DeHart, 2000) have been associated with increased mood-incongruent memory following a negative mood induction.

Most of the research examining the effect of manipulating emotional context on autobiographical memory biases has focused on which memories are selected for retrieval depending on emotional context, rather than on how the details of a specific event might be biased depending on the context. However, there is a second possible route to an emotional context's influence on the reconstruction of autobiographical memories: the biasing of event-specific knowledge so that memory retrieval meets the demands of the retrieval context. It has been suggested that emotional information can be reconstructed in such a way as to emphasise or de-emphasise certain emotional aspects of an event based on our current context and knowledge, but this function of autobiographical memory has received less attention than regulation

through event selection (Pasupathi, 2003). One way that such distortions might occur is by the reconstrual or reappraisal of emotional information (e.g., Baumeister, Stillwell, & Wotman, 1990; Murray & Holmes, 1993). For example, extraverts (for whom the goal of positive affect may be especially salient; Tamir, 2009) have been shown to underestimate the amount of anxiety they experienced before an exam (Levine, Safer, & Lench, 2006). Remembering the past as more positive than it actually was might have helped them maintain their desired levels of positive affect.

Given the constructivist view of the instability of memory recall across multiple retrievals, we hypothesised that the construction of the same memory at different time points would vary depending on the present emotional context. In the present experiments we focused on the second route to reconstruction, examining how specific emotional details of particular events can be reliably biased depending on the emotional goals present at event construction. The aim of the present research was to determine how expecting to meet with a sad, happy, or neutral experimenter might change the types of details participants recalled about emotional events from their past, when compared to a prior baseline recall of the same three events.

We chose to use an impending meeting with a second individual as a way to manipulate individuals' emotional goals because previous research suggests that such anticipated interactions change mood regulation goals. For example, Huntsinger, Lun, Sinclair, and Clore (2009) demonstrated that when participants were anticipating a meeting with a stranger who was in either a happy or sad mood, those participants adopted the mood of that stranger, especially when their desire to have a positive interaction was high. These findings not only support the theory that individuals can be motivated towards anticipatory mood matching, but also suggest that the benefits of smooth interactions with another individual can outweigh short-term hedonic goals (Huntsinger et al., 2009). Gergen and Wishnov (1965) may provide similar evidence for a mood-matching regulation process. When asked to complete self-view ratings prior to a supposed meeting with another participant, individuals who thought they would be meeting with a self-centred partner biased their self-ratings in a positive direction, whereas those who anticipated meeting with a self-derogating

partner biased their ratings in a negative direction when compared to their baseline ratings. These findings from Huntsinger et al. (2009) and Gergen and Wishnov (1965) suggest that the anticipation of meeting with a novel person who is either feeling good or bad (based on information about mood or self-ratings) can induce regulatory processes (see Erber, Wagner, & Theriault, 1996, for similar discussion).

The present study aimed to determine how the goal of regulating emotions in preparation for a supposed interaction with an emotional individual would influence the way in which individuals would reconstruct the emotional details of emotional events. In Experiment 1 we asked participants to recall three emotional events from the past year at two time points, the first being a baseline recall measure, and the second including the regulation manipulation described above. We hypothesised that the emotional context of the mood of a sad or happy individual would lead to biases in their autobiographical memories. More specifically, we predicted that individuals would bias the details of their memories in a direction consistent with the mood of the person they anticipated meeting, and that this bias would be evident in the emotional language they chose to use when writing about their memories. Individuals who think they will be interacting with someone who is very happy might use either more positive emotion words or fewer negative emotion words when recalling events. On the other hand, individuals who expect to meet with someone who is very sad might use more negative emotion words or fewer positive emotion words when recalling autobiographical events before the meeting. Since we compared how the same events were recalled at two separate sessions, we also included a control group that expected to meet with a neutral experimenter, to control for any effects of the inconsistencies inherent in the retelling of memories. We predicted that those expecting to meet with a neutral individual would show virtually no change in the emotional language they used between a baseline session and the experimental session; we did not hypothesise that the mere passage of time would lead to systematic biases in memory, but rather we expected coherent biases to arise only when individuals' goals differed between the two time points.

Given Josephson et al.'s (1996) finding that events recalled second in order might be

especially important for regulatory processes following a mood induction, we hypothesised that the events recalled second in order following our emotion regulation goal induction would be most prone to reconstructive biases related to emotion regulation goals. This finding would also be in line with theories of delays in invoking regulatory strategies (e.g., Isen, 1985; Isen et al., 1978; Sedikides, 1994). Predictions regarding the event recalled third in order were less clear in light of previous research on memory order effects during mood repair. Josephson et al. (1996) asked participants to recall only two events following a mood induction; Parrott and Sabini (1990, Expts 1, 3, 4, and 5) asked participants to recall three events and found a decrease in mood effects after the first recalled event. Therefore it is possible that the regulatory effects could be specific to the second recalled event or that they could extend to the third event, leaving it prone to reconstructive biases following the goal induction.

Finally, we anticipated that the extent to which individuals in the present study would change their language use when using memories in a regulatory fashion might be related to extraversion, a trait associated with being sociable and enjoying others' company (e.g., McCrae & Costa, 1987) as well as with greater levels of positive emotions (Costa & McCrae, 1980). A series of studies by Tamir (2009) showed that individuals high (vs low) in extraversion were more likely to use regulatory strategies meant to induce happiness (e.g., recalling positive autobiographical memories) in effortful contexts like preparing to give a speech or taking an intelligence test. It is possible, then, that individuals who score high on a scale of extraversion might be particularly motivated to increase their own happiness (Tamir, 2009). In contrast, those who score lower in extraversion, and are not as motivated to increase happiness (Tamir, 2009), might be more prone to mood matching in the face of meeting with a sad individual. Such a pattern of findings might also be in accordance with Rusting's (1999) suggestion that extraverts show stronger mood congruency following a positive (vs negative) mood induction; perhaps extraverts are more sensitive to and therefore more motivated to overcome any threats to their positive moods. Therefore, an important caveat to our predictions was that emotional language use might be related to individual differences in levels of extraversion.

EXPERIMENT 1

Method

Participants

A total of 63 Boston College freshmen (32 female; age 18–19 years) participated in this study. Two participants (one female) were excluded for failure to complete the second session of the study, one male was excluded for correctly suspecting the study purpose, and two males were excluded because of failure to meet study eligibility requirements. Therefore 58 individuals' data (31 female) are included in the present analyses. Participants reported no history of depression, anxiety, neurological or learning disorder, or past or present use of psychiatric medication. Participants either received monetary compensation or course credit.

Procedure

The study included two sessions (described in detail below) separated by approximately 2 weeks. Each session lasted approximately 90 minutes.

Session 1/Baseline Session. At the first session participants were asked to provide a baseline recall of three events from their recent past: high school graduation, a self-nominated event from the spring break before their graduation, and a self-nominated event from the first week of classes at Boston College. High school graduation was always recalled first, but the order of the self-nominated events was counterbalanced across participants, so that half of individuals recalled the event from spring break second, and half recalled the event from the first week of classes second in order.[1]

---

[1] A series of one-way ANOVAs was run to compare the baseline emotional language according to the LIWC categories of interest (overall affect, positive and negative emotion, and sad words) in narratives about graduation vs spring break vs first week of classes. There was only a significant effect of event on the number of positive emotion words used at the baseline session, $F(2, 173) = 4.89$, $p = .009$. Post-hoc tests revealed that participants used more positive emotion words to describe graduation ($M = 3.96$, $SD = 1.45$) than the event from first week of classes ($M = 3.03$, $SD = 1.67$), $p = .007$, but neither was significantly different from the percentage of positive emotion words used in the spring break events ($M = 3.35$, $SD = 1.88$). Given that the emotional language used in each event was roughly equivalent, it does not seem likely that always recalling graduation first would have influenced subsequently recalled events any more than recalling events from spring break or the first week of class first in order would have.

Participants completed a written narrative of each recalled event in a blank Microsoft Word document. They were instructed to spend approximately 10–12 minutes writing down as many details as they could remember and felt comfortable sharing for each event. Participants were advised that they should write down the details as they came to mind, as though they were telling a friend about what happened at each event. Because we did not want participants to spend time editing what they wrote or rearranging the order of details, we turned on the Track Changes option in Word and instructed participants that they should not make any significant changes in their writing. For the self-nominated events participants were told that they could choose any specific event that occurred within the target time frame (i.e., unique events that happened at one time, one place, and lasted for a day or less). Participants were left alone to spend time writing about each event, but an experimenter entered the room after the recall of each event to set up the Word document for the next recalled event and provide reminders about task instructions.

Questionnaires: At the end of the Baseline Session participants first completed a modified version of The Differential Emotions Scale (DES; Izard, Dougherty, Bloxom, & Kotsch, 1974). Participants were given this scale to determine whether their reported emotions experienced during the recall of each event would change between the baseline session and the session including the emotional goal manipulation described below. We asked individuals to rate on a 9-point Likert scale how they felt as they were writing about each event according to groups of emotional adjectives: (a) *interested, concentrated, alert*; (b) *joyful, happy, amused*; (c) *sad, downhearted, blue*; (d) *angry, irritated, mad*; (e) *fearful, scared, afraid*; (f) *anxious, tense, nervous*; (g) *disgusted, turned off, repulsed*; (h) *disdainful, scornful, contemptuous*; (i) *surprised, amazed, astonished*; (j) *loving, affectionate, friendly*; (k) *ashamed, embarrassed*; (l) *guilty, remorseful*; and (m) *moved*. In addition, participants were asked to make an overall emotional intensity rating on a 9-point scale for each event.

Following completion of the DES, participants were asked to complete a packet of individual differences questionnaires. The main questionnaire that the present paper will focus on was Goldberg's (1999) Big-Five IPIP scale (short version), meant to measure individuals' levels of extraversion, neuroticism, agreeableness, openness to experience, and conscientiousness. For the purposes of the analyses presented in this paper we examined only the extraversion subscale.

Session 2/Regulation Goal Induction Session. Approximately 2 weeks following the Baseline Session, participants returned to the laboratory. They were instructed that they would be recalling the same three events that they recalled 2 weeks previously, and that while they were not expected to be able to replicate exactly what they wrote at their first visit, they should write about the same three events. The same instructions given at the first session were repeated, and once again the Track Changes option was turned on. Participants wrote about the three events in the same order that they had written them in at the Baseline Session. They spent approximately 10–12 minutes writing about each and were once again left alone as they wrote about each event.

Once the task instructions were given at the beginning of the second session, participants were told that, after they were finished writing about the events, they would be meeting with a second experimenter to complete some paper and pencil tasks similar to the questionnaires they had completed at the end of the Baseline Session. One-third of participants were further told that the second experimenter was very sad that day and heard one of two cover stories to explain why (e.g., "Just so you know, she's in a really sad mood today because she just found out one of her relatives that she's close to was diagnosed with a serious illness, so if she seems sad, that's why."). Another third of participants were further told that the second experimenter was very happy that day and heard one of two cover stories to explain why (e.g., "Just so you know, she's in a really good mood today because it's her birthday and she's going out to celebrate with her friends tonight, so if she seems happy, that's why."). The remaining third of participants were not told any further information about the second experimenter and therefore made up the control group for the study.

As in the Baseline Session, an experimenter entered the testing room after the recall of each event to set up the Word document for the next event to be recalled. During this time the experimenter repeated task instructions and provided a reminder about the second experimenter (e.g., "Now I'll have you write about the event you selected from your first week of classes, then

you'll write about the event from spring break, and then I'll get you set up with the second experimenter.") to ensure that participants did not forget about the upcoming meeting.

Questionnaires: Following the recall of all three events, participants completed the same version of the DES that they had completed at the Baseline Session.

Debriefing. Once the event recall and questionnaires were completed, participants were told that there would be no meeting with a second experimenter. They were asked to fill out a short debriefing questionnaire asking how negative or positive they felt on a single 7-point Likert scale (1 = very sad, 4 = neutral, 7 = very happy) when they heard that they would be meeting with the second experimenter, how much they thought of the second experimenter as they were writing about each event, and whether they tried to use any of their memories to try to make themselves feel a certain way to get ready for meeting with her. Only one participant reported suspecting that there was no second experimenter, and that participant's data were excluded from analyses presented here.

Following debriefing, participants were also asked to complete a short questionnaire that asked about the frequency with which they had spoken and thought about each event since it had occurred, as well as how often they had viewed pictures and videotapes of each event. Finally, they were asked to rate their confidence in the accuracy of each memory.

Linguistic inquiry and word count

The primary approach to analysing the narratives to determine whether an emotion regulation manipulation might influence the details recalled about autobiographical events was a quantitative word count. Each narrative was run through the Linguistic Inquiry and Word Count (LIWC 2007) program, a system designed by Pennebaker and colleagues (Pennebaker, Booth, & Francis, 2007) to calculate the percentage of words in a text belonging to various pre-determined categories. LIWC classifies words according to numerous categories (e.g., cognitive functions, pronouns, work-related concerns, etc.), but the present analyses focused only on those categories related to emotion and emotion processes. Those categories were as follows: (a) Affective Processes, which includes 915 affect words regardless of valence (e.g., great, terrific, terrified); (b) Positive

Emotion (406 words like laugh, romantic, wonderful); and (c) Negative Emotion (499 words like appalled, tears, suffer). The Negative Emotion category is further subdivided into an anxiety category (94 words like scared, neurotic), an anger category (184 words like destroy, confront), and a sadness category (101 words like melancholy, sob); the present analyses focused specifically on the sadness subcategory, since we hypothesised that sad word usage might be modulated by the expectation of meeting with a sad experimenter.

Results

LIWC

To determine whether the emotional language individuals used to describe each event might change depending on whether they were expecting to meet with a happy, sad, or neutral experimenter, we conducted a series of linear regressions for each LIWC category in each event. As noted above, the LIWC categories of interest were the overall affect, positive and negative emotion, and sadness words. We first used the LIWC program to calculate the proportion of words in each narrative belonging to these categories. For each recalled event, difference scores were calculated for each category by subtracting the proportion of their Time 1 (baseline) use from the proportion of their Time 2 (following the regulation manipulation) use. The difference score for each category was included as the predicted variable in the regressions. Each regression included group (happy emotion regulation, sad emotion regulation, or control) and extraversion as predictors. Group membership was dummy coded in the following manner: happy emotion regulation group = 1, control group = 0, sad emotion regulation group = −1. The mean difference scores and standard deviations for each group and LIWC category are summarised in Table 1. In keeping with previous research (e.g., Josephson et al., 1996; Parrott & Sabini, 1990; Setliff & Marmurek, 2002), and based on our prediction that there may be something special about memories recalled second in order following a mood induction for regulatory processes, the three recalled events were analysed according to the order in which they were recalled.

Event 1. Consistent with our prediction that the second event would be most prone to regulation-related biases in memory construction, linear

TABLE 1
LIWC Descriptive statistics

	Control group M(SD)	Happy Emotion group M(SD)	Sad Emotion group M(SD)
Event 1			
Affective Processes	−.69(1.85)	−.49(1.29)	−.60(1.52)
Positive Emotion	−.44(1.49)	−.27(1.05)	−.47(1.38)
Negative Emotion	−.26(.85)	−.17(.56)	−.10(.69)
Sad	−.13(.44)	−.10(.29)	−.02(.35)
Event 2			
Affective Processes	.04(1.44)	.07(.33)	.55(1.47)
Positive Emotion	.17(1.33)	.38(1.50)	.32(1.51)
Negative Emotion	−.14(.91)	−.33(1.22)	.25(.58)
Sad	−.05(.40)	−.12(.71)	.21(.45)
Event 3			
Affective Processes	.08(1.83)	−.5(2.11)	.04(1.27)
Positive Emotion	.22(1.45)	−.32(1.91)	.13(1.27)
Negative Emotion	−.14(1.22)	−.09(.63)	−.13(1.00)
Sad	−.11(.55)	.03(.30)	−.10(.37)

Mean differences (Time 2 – Time 1) and standard deviations.

regressions for each LIWC category of interest in the first recalled event revealed that experimental group and extraversion were not significant predictors for differences in word use between Time 1 and Time 2, all $ps > .05$.

Event 2. Linear regressions for each LIWC category in the second recalled event revealed group to be a significant predictor for the difference in negative emotion and sad word use between Times 1 and 2 (Table 2). More specifically, the regression for the negative emotion word category revealed that group membership predicted the change in negative emotion word use from Time 1 to Time 2 when extraversion was held constant, $R^2 = .099, t(57) = -2.01, p = .05, ß = -.26$ (Figure 1). When looking specifically at sad emotion word use, group membership showed a nearly significant trend to predict changes in sad emotion word use when extraversion was held constant, $R^2 = .065, t(57) = -1.93, p = .059, ß = -.25$

(Figure 1). For both the negative and sad emotion word categories there was a tendency for those in the happy and control groups to decrease their negatively valenced language use, but for those in the sad group to increase their negatively valenced word use. The fact that the effect of group was significant for the second event but not for the first is consistent with our predictions that there may be a delay in regulatory strategies following a regulation induction.

When group membership was partialled out, extraversion was a significant predictor for the change in the proportion of overall affect word use, $R^2 = .138, t(57) = -2.67, p = .01, ß = -.34$, and positive emotion word use, $R^2 = .078, t(57) = -2.15, p = .04, ß = -.28$. Higher levels of extraversion across the three groups were associated with lower increases in overall affect and positive emotion word use in the second recalled event prior to a meeting with a second experimenter, regardless of experimental group.

TABLE 2
Regression results in the second recalled event

		Group			Extraversion		
Dependent variable	R^2	B	SE B	β	B	SE B	β
Affect	.14*	−.32	.24	−.17	−.72	.27	−.34*
Positive Emotion	.08*	.02	.22	.01	−.54	.25	−.28*
Negative Emotion	.10*	−.29	.15	−.26*	−.24	.17	−.19
Sadness	.07+	−.17	.09	−.25+	−.04	.10	−.05

Regression results for affect, positive emotion, negative emotion, and sadness word differences (Time 2 – Time 1) in the second recalled event, using group membership and extraversion as simultaneous predictors. +p < .06, *p < .05.
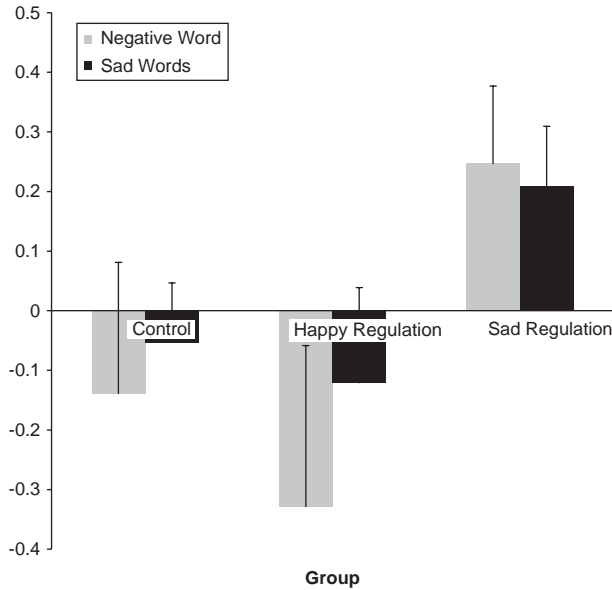
Figure 1. Differences in the proportion of negative affect word use and sad word use (Time 2 – Time 1) as a function of group (happy regulation, sad regulation, or control) in the second recalled event.

Event 3. As with the first recalled event, group and extraversion were not significant predictors for differences in word use between Times 1 and 2 for any of the LIWC categories, all $ps > .05$.

Debriefing questionnaire

Not surprisingly, participants' ratings of how they felt when they heard about their meeting with the second experimenter showed a significant effect of group when subjected to a one-way analysis of variance (ANOVA), $F(2, 57) = 79.99$, $p < .001$ (partial $\eta^2 = .74$). Bonferroni post hoc analyses indicated that individuals who heard they would be meeting with a second happy experimenter reported feeling more happy ($M = 6.9$, $SD = 0.22$) than both the control group ($M = 4.83$, $SD = 0.15$) and those who heard they would be meeting with a second sad experimenter ($M = 3.25$, $SD = 0.24$), both $ps < .001$. The difference in ratings between the control group and the sad regulation group was also significant, so that those who heard the sad story about the experimenter reported feeling more sad than the control group, $p < .001$. Although these ratings may have been influenced by demand characteristics, it is important to note that individuals in the control group reported feeling neutral (rather than happy or sad) about meeting with a second experimenter in comparison to either of the experimental groups.

As Table 3 shows, there were no significant group differences in individuals' self-report of how frequently they thought of the second experimenter while recalling each event nor in how much participants reported attempting to use each memory to change the way they were feeling prior to their meeting, all $ps > .05$.

A series of one-way ANOVAs was used to analyse whether the three events differed from each other in terms of how often individuals had remembered them since they had occurred. There were also no significant differences in the reported frequency of speaking (graduation $M = 2.49$, $SD = .81$; spring break $M = 2.47$, $SD = 1.09$; classes $M = 2.2$, $SD = .99$) or thinking about each event (graduation $M = 2.42$, $SD = .79$; spring break $M = 2.65$, $SD = .97$; classes $M = 2.29$, $SD = .89$), both $ps > .05$. Participants did report viewing more photographs of graduation than the other two events (graduation $M = 3.02$, $SD = 1.08$; spring break $M = 1.98$, $SD = 1.15$; classes $M = 1.42$, $SD = .99$), $F(2, 164) = 31.32$, $p < .001$. The same was true for videos of graduation (although the mean frequency for each was quite low across all three events: graduation $M = 1.33$, $SD = .64$; spring break $M = 1.2$, $SD = .56$; classes $M = 1.07$, $SD = .42$), $F(2, 164) = 2.97$, $p = .054$. Participants also reported feeling more confident in the accuracy of their memories for graduation than for spring break or the first week of classes (although confidence was high across all three events: graduation $M = 4.36$, $SD = .56$; spring break $M = 4.02$, $SD = .83$; classes $M = 3.96$, $SD = .94$), $F(2, 164) = 4.13$, $p = .02$.

Emotion questionnaires

A 3 (Group: control, sad, or happy regulation group) × 2 (Session: baseline or emotion regulation) repeated-measures ANOVA was conducted for each of the ratings made on the DES as well as for the overall emotional intensity rating that participants made. Extraversion was used as a covariate in these analyses. The only dimension that revealed an interaction between group and session was that of emotional intensity in the first recalled event. Individuals in the control group reported feeling more emotionally intense at the second session compared to the first session, whereas those expecting to meet with a happy or sad experimenter reported feeling less emotionally intense at the second session (Session 1: control group $M = 5.47$, $SD = 2.2$; happy regulation group $M = 6.17$, $SD = 1.6$; sad regulation group $M = 5.72$,

TABLE 3
Debriefing questionnaire: Means and standard deviations

	Control group M(SD)	Happy Emotion group M(SD)	Sad Emotion group M(SD)
How often did you think about the second experimenter as you were writing about each event?			
Event 1	1.56(1.04)	1.90(1.74)	2.40(1.73)
Event 2	2.56(2.09)	1.75(1.37)	2.60(1.82)
Event 3	2.50(2.09)	2.35(2.32)	2.40(1.93)
How much did you try to use your memory of each event to prepare for meeting with the second experimenter?			
Event 1	1.61(1.46)	1.75(1.62)	1.65(1.35)
Event 2	1.61(1.46)	1.40(1.35)	1.65(1.79)
Event 3	2.06(2.10)	2.10(1.86)	1.70(1.75)

$SD = 1.5$; Session 2: control group $M = 5.82$, $SD = 1.55$; happy regulation group $M = 5.44$, $SD = 2.06$; sad regulation group $M = 5.56$, $SD = 1.7$), $F(2, 49) = 4.378$, $p = .018$ (partial $\eta^2 = .152$).

Discussion

The present results support our prediction that manipulating the emotional context under which individuals retrieve events influences the emotional language they use to describe the same events that they had reported 2 weeks earlier. These changes in emotion word choice were confined to an overall negative emotion word category as well as a more specific sadness word category, and occurred in the second recalled event following our attempt to change regulation goals. Interestingly, participants reported no awareness of trying to use their memories to regulate their emotions in preparation for meeting with the second experimenter, and few reported even thinking about the second experimenter while completing the memory tasks. These findings are in line with Gross's (1998) suggestion that emotion regulation can be either a conscious or an unconscious effort, and the results suggest that participants' use of autobiographical retrieval for the purpose of emotion regulation might have proceeded as an unconscious strategy.

It is possible that the effects present in Experiment 1 were due to a mood-congruency effect (i.e., hearing about a sad individual made participants feel sad, which in turn made negative emotional details more accessible to them). It is difficult to tease apart the effects of mood congruency and mood regulation in this experiment, given that (a) both phenomena would make similar predictions about the shifts in emotional language and (b) in this case, mood regulation (in the form of

anticipatory mood matching) may involve achieving mood congruency. However, there are a few reasons why we believe that a regulatory process would better explain the current results. The present study is different from studies that use music or video clips to induce mood, in that those mood inductions are external stimuli meant to directly manipulate mood in a measurable way. In this study we have no direct evidence that we manipulated mood; if participants changed their mood in response to the stories about the experimenter it would be because of some internal factor such as a tendency to empathise with another person. Furthermore, based on pilot data collected in our lab[2] showing that individuals did not experience an immediate change in mood after hearing the same cover stories about a supposed

[2] A total of 30 Boston College freshmen were randomly assigned to hear either the same happy, sad, or neutral stories about a second experimenter as in Experiments 1 and 2. An additional 10 participants were not told about any meeting with a second experimenter. Immediately before and after hearing the stories, participants rated the extent to which they were currently experiencing several negative (e.g., sad, depressed, down, in a bad mood) and positive (e.g., happy, elated, pleased, enthusiastic) emotions. The mean negative and positive emotion ratings from before and after the second experimenter stories were compared using two 4 (Group: happy, sad, neutral, or no story) ×2 (Time: before and after hearing the story) within-participants ANOVAs. Extraversion was used as a covariate in the ANOVAs to maintain consistency with Experiments 1 and 2. There was no significant Group ×Time interaction for positive emotions (happy story $M_1=2.98$, $SD_1=.68$, $M_2=2.93$, $SD_2=.64$; sad story $M_1=2.68$, $SD_1=.68$, $M_2=2.7$, $SD_2=.48$; neutral story $M_1=3.06$, $SD_1=.52$, $M_2=2.52$, $SD_2=.4$; no story $M_1=2.82$, $SD_1=.72$, $M_2=2.47$, $SD_2=.45$), $F(1, 35) =1.72$, $p=.18$, partial $\eta^2=.13$. There was also no significant Group ×Time interaction for negative emotions, (happy story $M_1=1.14$, $SD_1=.28$, $M_2=1.64$, $SD_2=.42$; sad story $M_1=1.2$, $SD_1=.37$, $M_2=1.93$, $SD_2=.39$; neutral story $M_1=1.23$, $SD_1=.28$, $M_2=2$, $SD_2=.49$; no story $M_1=1.23$, $SD_1=.28$, $M_2=1.88$, $SD_2=.56$), $F(1, 35) =0.59$, $p=.62$, partial $\eta^2=.05$.

meeting with a second individual, we are more inclined to believe that the changes we observed were due to regulatory processes. The confinement of negative and sad emotional language differences to the second recalled event further suggests that the observed effects were not due to mood congruency, as we would expect a mood-congruency effect to be present in the first recalled event. The time course for the changes in emotional language in the present study is similar to the time course for mood regulation present in Josephson et al.'s (1996) experiment, as they found an event recalled second in order following a negative mood induction was key for participants' mood regulation (in that case, making themselves feel better). It is important to note that regardless of whether our findings are due to mood regulation or mood congruency, these results are novel in showing that the emotional details of particular events can be changed in reliable ways based on the context present at retrieval.

We did not find any group-based emotional language differences in the events recalled either first or third in order following an emotion regulation goal induction. It is possible that the lack of differences in the first event reflects a delay in invoking regulatory strategies, similar to the delays found by Sedikides (1994) and Josephson et al. (1996). Perhaps the time spent writing about the first event was also being used to process the information given about the second experimenter. Support for this idea may be found in participants' ratings for how they felt as they were writing about each event: The significant group by session interaction in emotional intensity ratings reported on the DES might suggest that individuals who were preparing to meet with an emotional experimenter were less emotionally engaged in the task of recalling the first event, perhaps because they were simultaneously processing the emotional information they had just learned about the second experimenter. One possible explanation for the lack of differences in the third recalled event that could be addressed in future research is that the language differences visible in the second recalled event were indicative of successful emotion regulation, so that biasing recall of the third event in the direction of the second experimenter's mood was not necessary. Conway (2005) proposed that a main function of the self is to reconcile goals of accuracy with goals of the current retrieval context. If this is the case it is possible that, if participants were able to match the mood of the second experimenter by biasing their recall of

details in the second recalled event, then accuracy might have been the higher priority in the third recalled event.

Although it might seem counterintuitive that individuals belonging to the sad regulation induction group in the present study would want to make themselves feel more sad in preparation for their supposed meeting, this result resonates with Gergen and Wishnov's (1965) finding that individuals expecting to meet with a self-derogating partner rated themselves less positively than those expecting to meet with a self-centred partner. Our findings may also support the anticipatory mood-matching hypothesis set forth by Huntsinger et al. (2009), who found evidence that individuals aligned their own moods with that of a happy or sad individual with whom they were told they would interact. The present study also adds to the growing body of evidence for instrumentally driven (rather than just hedonically driven) emotion regulation goals (e.g., Tamir, 2009; Tamir et al., 2008). Although it might be unpleasant in the short-term to put ourselves into a more negative mood in the face of meeting with a sad individual, one can also imagine the long-term social pitfalls of acting in an inappropriately positive manner when a situation calls for more sombre behaviour. In other words, we do not always use our emotion regulation goals in a hedonic fashion; sometimes we can feel motivated to feel unpleasant emotions if those emotions are useful in achieving a goal, such as preparing to interact with an emotional individual in the present study.

Importantly, the emotion language differences seen in the second recalled event by the sad regulation group were constrained by individual differences in levels of extraversion. Given that extraversion has recently been shown to be associated with regulatory strategies meant to increase happiness (Tamir, 2009), it seems logical that extraverts in the sad regulation group may have either attempted to overcome any threats to their positive moods or perhaps adopted a strategy of trying to make a sad other "feel better". Introverts may have been less motivated to stop threats to a positive mood, or perhaps adopted a more empathetic strategy of dealing with a sad individual. This finding extends previous research suggesting that individual differences like extraversion and neuroticism might influence regulation strategies following negative and positive mood inductions (e.g., Rusting, 1999; Rusting & DeHart, 2000). Extraversion also had a more general effect on

memory bias: Regardless of group, extraverted individuals expecting to meet with a second experimenter demonstrated smaller increases in their overall affect and positive emotion word use compared to baseline recall, but only for the second recalled event. One possible reason for this effect is that the increased social ease that is characteristic of extraverts may lead them to be less motivated to bias the emotional details of their memories in preparation for a meeting with another individual. This finding suggests that extraversion can have specific effects on the regulatory strategies adopted following sad regulatory goal induction as well as broader effects on socially relevant regulation goals. These findings speak to the importance of accounting for individual differences when studying the interplay between emotion regulation and memory.

Alternative explanations

We noted above that one potential alternative explanation for our findings may be that we manipulated participants' moods rather than emotion regulation goals, and that our findings simply represent a mood-congruency effect. In a similar vein, it is possible that hearing the emotional details about a second experimenter semantically primed concepts of happiness or sadness in participants, making happy or sad details about past events more accessible and more likely to be reported. It seems unlikely that semantic priming could account for our findings, given additional pilot data demonstrating that hearing about a happy or sad individual did not prime individuals to respond any faster to happy or sad emotion words on a lexical decision task.[3]

---

[3] A total of 17 participants heard the same happy (*n* = 8) or sad (*n* = 9) stories about a second experimenter as in Experiments 1 and 2. Critically, they were not told that they would have to interact with the second experimenter, so as to remove any possibility that they might try to regulate their emotions in advance of the meeting. After hearing the stories, individuals performed a lexical decision task meant to measure semantic priming to emotional concepts (adapted from Innes-Ker & Niedenthal, 2002). The lexical decision task included 16 happiness-related words, 16 sadness-related words, 32 neutral words, and 64 pseudowords. A 2 (Group: happy story, sad story) ×2 (Emotion word type: happy, sad) within-participants ANOVA revealed no significant difference in reaction times to the happy and sad words on the lexical decision task depending on whether individuals heard a happy or sad story (happy story: positive word *M* = .79, *SD* = .15, negative word *M* = .81, *SD* = .12; sad story: positive word *M* = .77, *SD* = .16, negative word *M* = .84, *SD* = .25), $F(1, 15) = 0.54$, $p = .48$, partial $\eta^2 = .04$.

In addition, both of these alternative explanations have difficulty accounting for the delayed time course in increased use of negatively valenced language in the sad condition and decreased use of such language in the happy condition. If either were true, we would have predicted those language differences to be apparent in the first recalled event following the story about the second experimenter, for example, as in other studies using mood inductions (e.g., Josephson et al., 1996; Sedikides, 1994).

There remain two competing explanations for our results in Experiment 1. One possibility is that individuals were distorting the emotional content of their event-specific knowledge about the event recalled second in order. Another explanation is that we simply modulated individuals' attention to different (but still accurate) aspects of each event. For example, perhaps someone's first day of college classes involved a pleasant first class but was followed by an embarrassing incident at lunchtime, such as not being able to find anyone to sit with. When recalling that first day of class while preparing to meet with a sad experimenter, the student might choose to elaborate on the embarrassing incident rather than the pleasant experience, thereby increasing the negative language they used to describe the event without biasing or distorting their memory. Based on our instructions to participants to write about the same events at both time points, and a check of the narratives to ensure that they focused on the same information at both sessions, we do not think that this alternative explanation is true; however, we sought to investigate the explanatory power of this alternative hypothesis in Experiment 2.

EXPERIMENT 2

One potential way to determine whether regulation goals actually result in biased memory retrieval is to present information that is encoded in the laboratory and then retrieved under the guise of a future meeting with an emotional experimenter. In Experiment 2 we utilised emotional and neutral word associate lists (described below), commonly referred to as the Deese/Roediger-McDermott (DRM) paradigm (Deese, 1965; Roediger & McDermott, 1995). During a subsequent recognition test participants were presented with previously learned words, critical lure words semantically associated with the lists,

and novel foils that were semantically unrelated to the studied lists. We reasoned that if individuals actually bias their memory retrieval to include information congruent with their regulation goals, then they would show higher false alarm rates in response to those critical lures congruent in valence to their goals. On the other hand, if individuals are more prone to selectively retrieve (rather than bias) information congruent with their goals, then they should show increased accuracy (hit rates) for such congruent information but no difference in false alarm rates. Although we could not make the same predictions as in Experiment 1 about how extraversion would relate to non-autobiographical memory or about the potential temporal delay in regulatory strategies, the benefit of using the DRM paradigm was the more precise assessment of memory accuracy and biases.

Method

Participants

Participants were 51 Boston College undergraduate students (15 male; mean age = 20.0 years; mean years of education = 14.0). All participants met the same exclusion and inclusion criteria as for Experiment 1, except that participants were not required to be freshmen and they could not have enrolled in Experiment 1. Participants were randomly assigned to one of the three regulation conditions, as described in Experiment 1.

Materials

The stimuli were a subset of the associate lists published by Stadler, Roediger, and McDermott (1999) and Budson et al. (2006). Two lists were associated with *sadness* (the "alone" and the "cry" lists from Budson et al., 2006), two were associated with *happiness* (the "celebration" and the "happy" lists), and two were neutral (the "high" and the "rough" lists from Roediger & McDermott, 1995). For shorthand, the combination of these lists will hereafter be referred to as the *sadness*, *happiness*, or *neutral* lists. Beyond emotion considerations, these particular lists were selected because the words within the lists had comparable word lengths, word frequencies, and word concreteness. Additional negative, positive, and neutral words pulled from other lists were used as novel foils on the recognition task.

Procedure

Participants first completed a packet of surveys assessing individual differences; here we focus on scores on Goldberg's (1999) Big-Five IPIP scale (short version). After completion of these surveys, participants were presented with a list of 84 words, 28 associated with *sadness* related concepts, 28 associated with *happiness* related concepts, and 28 associated with *neutral* concepts, as described above. Each word was presented on a computer screen for 2 seconds, and during that time participants were asked to indicate whether each word was abstract or concrete. Words associated with a particular list were blocked, but the order of list presentation was randomised across participants.

After completion of this computerised task participants were given the information about the second experimenter with whom they would later be interacting; this information was presented in an identical fashion to Experiment 1. After completion of a brief filler task (Sudoku puzzles), participants were then shown another series of words on the computer screen. They were presented with 60 of the words that they had previously studied (20 associated with the *sadness* lists, 20 associated with the *happiness* lists, and 20 associated with the *neutral* lists). These studied words were intermixed with 12 critical lure words and with 39 novel foils. The critical lure words were associated with some of the studied items but had not themselves been presented. Four critical lures were associated with the *sadness* lists, four with the *happiness* lists, and four with the *neutral* lists. The novel foils were consistent in valence with studied words but were not otherwise semantically related to the studied items. Following the recognition task, participants were debriefed; individuals in the happy and sad regulation groups completed the same debriefing questionnaire used in Experiment 1. Due to experimenter error, the debriefing questionnaire was not presented to individuals in the control group.

Data analysis

The recognition task was scored to determine the proportion of studied items that participants correctly endorsed ("hits") and the proportion of critical lure items that participants incorrectly endorsed ("critical lure false alarms"). These tallies were computed separately for items from (or associated with) each type of list: sadness,

happiness, or neutral. To control for differences in participants' bias to endorse items with different valences, the proportion of novel foils that participants incorrectly endorsed ("baseline false alarms") were also computed. These proportions were computed separately for participants from each of the three emotion regulation groups (happy regulation, sad regulation, and control).

Results

Debriefing questionnaire

In accordance with Experiment 1, participants' ratings of how they felt when they heard about their meeting with the second experimenter differed according to group. Those who heard about meeting with a happy experimenter reported feeling more happy upon hearing about that meeting ($M = 6.83$, $SD = 1.04$) than those who heard about a meeting with a sad experimenter ($M = 3.83$, $SD = 1.25$), $t(34) = 7.82$, $p < .001$. Those in the happy regulation group did not report thinking about the experimenter ($M = 4.22$, $SD = 2.02$) any more or less than those in the sad regulation group ($M = 3.56$, $SD = 1.95$) during the task, $t(34) = 1.01$, $p = .32$.

Recognition data

We conducted a series of linear regressions using the proportion of negative, positive, or neutral items that were correctly (hits) or incorrectly (false alarms) endorsed as our predicted variables. Each regression included group (happy emotion regulation, sad emotion regulation, or control) and extraversion as simultaneous predictors. Although we did not have the same

expectations as in Experiment 1 about how extraversion might influence a non-autobiographical memory task, we included it in our regressions to be consistent with our Experiment 1 analyses. Group membership was once again dummy coded in the following manner: happy regulation group = 1, control group = 0, and sad regulation group = −1. The means and standard deviations for the endorsement of each type of item (positive, negative, neutral) by group are presented in Table 4.

Hits

Group and extraversion did not account for a significant amount of the variance in hits (correct recognition) for positive, negative, or neutral words, all $ps > .05$.

Baseline false alarms

Group and extraversion were also not significant predictors of the number false alarms made to positive or neutral novel items that were unrelated to the study lists, all $ps > .05$. However, extraversion accounted for a significant amount of the variance ($R^2 = .11$) in the proportion of negative baseline false alarms, $t(48) = 2.41$, $p = .02$, ß = .33, when group membership was held constant.

Critical lure false alarms

As predicted, and in line with our findings from Experiment 1, group accounted for a significant amount of the variance ($R^2 = .095$) in the proportion of negative critical lure false alarms, $t(48) = –2.23$, $p = .031$, ß = −.31, when extraversion was held constant (Figure 2). The

TABLE 4
Means and standard deviations of hits, baseline false alarms, and critical lure false alarms for each group

|	Positive Regulation group	Negative Regulation group	Neutral group
Hits			
Positive words	.69(.18)	.77(.14)	.74(.17)
Negative words	.67(.20)	.75(.15)	.77(.13)
Neutral words	.64(.19)	.66(.17)	.73(.14)
Baseline false alarms			
Positive words	.09(.09)	.12(.09)	.13(.13)
Negative words	.11(.09)	.12(.14)	.14(.16)
Neutral words	.06(.08)	.06(.05)	.11(.11)
Lure false alarms			
Positive words	.63(.23)	.68(.19)	.62(.25)
Negative words	.60(.30)	.78(.19)	.52(.22)
Neutral words	.44(.35)	.36(.21)	.73(.26)
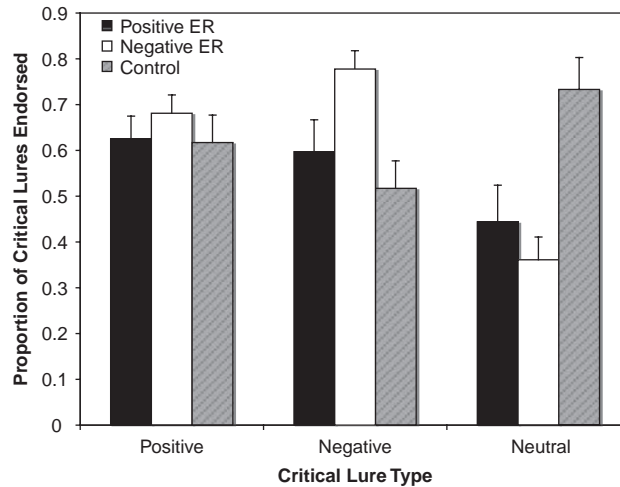
Figure 2. Proportion of positive, negative, and neutral critical lures incorrectly endorsed by each group.

mean number of negative critical lure false alarms for each group shows that those anticipating a meeting with a sad experimenter were most likely to incorrectly endorse negative critical lures (see Table 5).

Group and extraversion did not account for a significant proportion of either positive or neutral critical lure false alarms, all $ps > .05$.

Discussion

The results of Experiment 2 support and extend our findings from Experiment 1 by demonstrating that memories can be biased during retrieval when the demands of the emotional context of retrieval are manipulated. In particular, when individuals were expecting to meet with a sad experimenter they were most likely to incorrectly endorse negative critical lure words on the DRM task when compared to those individuals who thought they would be meeting with a happy or neutral second experimenter. These results are in

line with our predictions that memory distortions can occur as the result of the emotional goals at the time of retrieval, and further support our conclusions from Experiment 1. It is of key importance that our significant finding in this experiment was specific to the proportion of negative critical lures incorrectly endorsed by the sad emotion regulation group. The fact that group membership did not predict the proportion of correct hits made to previously learned information suggests that individuals were not selectively paying more attention to information congruent in valence with emotional goals at the time of retrieval.

As in Experiment 1 it is difficult to tease apart whether the findings in Experiment 2 were due to mood congruency, mood regulation, or both. Our findings were partially consistent with a recent study that demonstrated that a negative mood induction led to an increase in negative false memories on a DRM task (Ruci, Tomes, & Zelenski, 2008). However, that study also found that a positive mood induction led to an increase

TABLE 5
Regression results for critical lure false alarms using group membership and extraversion as simultaneous predictors

		Group			Extraversion		
Dependent variable	R^2	B	SE B	β	B	SE B	β
Lure FA							
Positive items	.01	−.03	.04	−.10	.02	.07	.05
Negative items	.10*	−.10	.04	−.31*	−.06	.08	−.10
Neutral items	.02	.05	.05	.13	.06	.11	.08

*$p < .05$.

in positive false memories and in positive hit rates; another study suggested that positive—but not negative—mood is associated with increased false memory (Storbeck & Clore, 2005). Given that our results are not completely consistent with these mood induction studies, and given our pilot data that indicate no immediate change in mood after the emotional goal manipulation, it seems more likely that our findings were due to a change in emotional goals.

GENERAL DISCUSSION

It has been suggested that autobiographical memory retrieval can be used in such a way as to change how individuals are feeling (e.g., Pasupathi, 2003); its reconstructive nature (Conway, 1996; Conway & Pleydell-Pearce, 2000) may make autobiographical memory particularly open to inconsistencies based on current emotional goals. Taken together, the results of Experiments 1 and 2 demonstrate that individuals may bias the construction of their memories as a way to regulate their emotions in the face of an impending social interaction with an emotional individual. We showed that individuals who heard that they would be meeting with an emotional experimenter demonstrated subtle language changes in written narratives of past events or increased false memory on a DRM task. Hearing about a meeting with a sad second experimenter, in particular, predicted both increased negative and sad word use on an autobiographical recall task (in Experiment 1) and increased endorsement of negative critical lure words (in Experiment 2). The effect of emotional context on autobiographical memory recall was related to individual differences in extraversion in Experiment 1, a finding that aligns itself with research examining extraversion and instrumental emotion regulation goals (Tamir, 2009).

The results of Experiment 1 suggested that individuals might reliably bias their memory recall depending on the valence of their emotional goals. The fact that differences in emotional language use were only evident in the events recalled second in order, rather than just in the first recalled event or throughout all three events, implied that the memory biases existed because of regulatory strategies. Experiment 2 further ruled out an alternative explanation for our findings, namely that the language changes we saw in Experiment 1 might be due to selective attention to information congruent in valence with the mood of the second experimenter. This alternative hypothesis would predict more accurate memory for information congruent in valence to the mood of the second experimenter. However, we found no such memory benefit for previously presented words congruent in valence to the experimenter's mood, as measured by the proportion of "hits" in the DRM paradigm. The language changes evident in Experiment 1 and increased false memory in Experiment 2 point to memory biasing as a mechanism for regulatory processes.

One limitation of the present experiments that should be addressed in future research is that we did not measure how successful individuals were at regulating their emotions through the recall of specific autobiographical memories (in Experiment 1) or greater responding to negative critical lures before a purported meeting with a sad experimenter (in Experiment 2). Therefore we do not know whether the memory biases led to successful emotion regulation or whether they were robust even if the attempt at regulation was unsuccessful. It may be of interest for future studies to determine how well individuals can change their emotions by recalling specific memories, and whether this ability is associated with individual differences such as extraversion scores. Another potential limitation that we have noted throughout the paper is the difficulty in determining whether the memory biasing effects were due to mood-congruency or regulation processes. Although there may always be overlap between these two processes (i.e., with regulation processes leading to mood changes), future study designs might be able to distinguish the two more clearly, for example, by directly asking individuals to use particular memories to make themselves feel certain emotions. As we noted previously, the results of these study—whether due to regulatory processes or mood congruency—are interesting in that they reveal that emotional event-specific knowledge can be altered when the demands of the retrieval context are manipulated.

The present studies point to several other exciting lines of possible inquiry. First, it is notable that in both experiments memory biases were demonstrated only in relation to negative details. It was not the case that individuals anticipating a meeting with a happy experimenter

increased the positive emotional language they used when recalling autobiographical events or incorrectly recalled a greater proportion of positive critical lures. One possibility is that preparing to meet with a sad experimenter provided greater motivation to up-regulate negative emotions, whereas preparing to meet with a happy experimenter was not as powerful of a motivator to up-regulate positive emotions. Another possibility is that negative details are generally more prone to biased recall than are positive details; however, this option seems less likely given research suggesting that negative experiences can be recalled in a more consistent fashion than positive memories (e.g., Bohn & Berntsen, 2007; Kensinger & Schacter, 2006; Levine & Bluck, 2004).

The findings of the present studies are constrained by the relative recency of all of the events that participants recalled (all memories were less than a year old). It remains to be seen whether the types of emotional language differences and detail biases present in this study will extend to memories for older events. It has been shown that recall of more remote memories contains more general, schema-based information (e.g., Anderson, Cohen, & Taylor, 2000), and so it is possible that the increased stability of older memories might make them less susceptible to biases resulting from regulatory processes. In addition, it would be interesting to see how using our memories in a regulatory fashion at one time point might influence subsequent recall of that same memory. In other words, when we bias a memory to achieve an emotion regulation goal, do we then recall that memory in the future in a way that is more similar to the biased memory, or can we also recall the event in the same manner as a "baseline" recall?

As we noted in the Introduction, Experiment 1 focused on one of the routes to using memory construction in a regulatory manner (i.e., biasing the emotional details to be in line with the retrieval context). It remains to be seen how the reconstruction of emotional details might vary based on different emotional contexts and retrieval goals when individuals are not constrained as to which memories they should recall. It would also be interesting to see how event selection (e.g., in terms of specificity) might vary based on anticipated social interaction.

On a more general level, the results of the present studies speak to the reconstructive nature of memory first proposed by Bartlett (1932) and elaborated on by Conway and colleagues (e.g., Conway, 1996; Conway & Pleydell-Pearce, 2000). Even those emotional memories that seem indelible, such as meeting college roommates for the first time, or taking spring break trips with high school friends and family for the last time, are not immune to biases and distortions. Previous research has shown that inaccuracies and inconsistencies in memory are evident across multiple retellings, even for events that are remembered with great vividness and feelings of confidence (e.g., McCloskey et al., 1988; Schmolck et al., 2000). Our findings suggest that invoking an emotional context—possibly in the form of emotion regulation goals—at the time of retrieval may make the memories that we recall particularly malleable. Not only do our current goals influence and bias which memories are most accessible and likely to be recalled at any given time (as suggested by Sanitioso et al., 1990), but they may also affect and bias the details that are recalled, even over relatively short delays.

Conclusion

In sum, Experiment 1 is the first that we know of to show that, even when the specific memory to be recalled is constrained (i.e., individuals are instructed to recall particular events from their past), individuals can construct their recall of autobiographical events in either a positive or negative direction depending on the present emotional context. In particular, individuals may bias the details they reconstruct about past events in such a way as to regulate their emotions, as evidenced by shifts in their emotional language when compared to a baseline recall of the same events. Experiment 2 replicates the finding that emotion regulation goals can modulate memory retrieval and further suggests that the effects in Experiment 1 were in fact due to memory biases rather than to selective retrieval of factual information. Emotion regulation is likely a pervasive function of autobiographical memory recall (Pasupathi, 2003); the present research demonstrates that our goals can influence not only what events we recall, but what we recall about those events as well.

REFERENCES

Anderson, S. J., Cohen, G., & Taylor, S. (2000). Rewriting the past: Some factors affecting the variability of personal memories. *Applied Cognitive Psychology, 14*, 435–454.

Barclay, C. R., & Wellman, H. M. (1986). Accuracies and inaccuracies in autobiographical memories. *Journal of Memory and Language, 25*, 93–103.

Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. London: Cambridge University Press.

Baumeister, R. F., Stillwell, A., & Wotman, S. R. (1990). Victim and perpetrator accounts of interpersonal conflict: Autobiographical narratives about anger. *Journal of Personality and Social Psychology, 59*, 994–1005.

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

Bluck, S., Alea, N., Habermas, T., & Rubin, D. C. (2005). A tale of three functions: The self-reported uses of autobiographical memory. *Social Cognition, 23*, 91–117.

Bohn, A., & Berntsen, D. (2007). Pleasantness bias in flashbulb memories: Positive and negative flashbulb memories of the fall of the Berlin Wall among East and West Germans. *Memory and Cognition, 35*, 565–577.

Budson, A. E., Todman, R. W., Chong, H., Adams, E. H., Kensinger, E. A., Krandl, T. S., et al. (2006). False recognition of emotional word lists in aging and Alzheimer's disease. *Cognitive and Behavioral Neurology, 19*, 71–78.

Conway, M. (1996). Autobiographical knowledge and autobiographical memories. In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 67–93). Cambridge, UK: Cambridge University Press.

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language, 53*, 594–628.

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. Psychological Review, *107*, 261–288.

Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology, 38*, 668–678.

Deese, J. (1965). *The structure of associations in language and thought*. Baltimore, MD: The Johns Hopkins Press.

Erber, R., Wegner, D. M., & Therriault, N. (1996). On being cool and collected: Mood regulation in anticipation of social interaction. *Journal of Personality and Social Psychology, 70*, 757–766.

Gergen, K. J., & Wishnov, B. (1965). Others' self-evaluations and interaction anticipation as determinants of self-presentation. *Journal of Personality and Social Psychology, 2*, 348–358.

Goldberg, L. R. (1999). A broad-bandwith, public domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe, Vol. 7* (pp. 7–28). Tilburg, The Netherlands: Tilburg University Press.

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

Huntsinger, J. R., Lun, J., Sinclair, S., & Clore, G. L. (2009). Contagion without contact: Anticipatory mood matching in response to affiliative motivation. *Personality and Social Psychology Bulletin, 35*, 910–923.

Innes-Ker, A., & Niedenthal, P. M. (2002). Emotion concepts and emotional states in social judgment and categorization. *Journal of Personality and Social Psychology, 83*, 804–816.

Isen, A. M. (1985). Asymmetry of happiness and sadness in effects on memory in normal college students: Comment on Hasher, Rose, Zacks, Sanft, and Doren. *Journal of Experimental Psychology: General, 114*, 388–391.

Isen, A. M., Shalker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology, 36*, 1–12.

Izard, C. E., Dougherty, F. E., Bloxom, B. M., & Kotsch, W. E. (1974). *The differential emotions scale: A method of measuring the subjective experience of discrete emotions*. Nashville, TN: Vanderbilt University.

Joormann, J., & Siemer, M. (2004). Memory accessibility, mood regulation, and dysphoria: Difficulties in repairing sad mood with happy memories? *Journal of Abnormal Psychology, 113*, 179–188.

Josephson, B. R., Singer, J. A., & Salovey, P. (1996). Mood regulation and memory: Repairing sad moods with happy memories. *Cognition and Emotion, 10*, 437–444.

Kensinger, E. A., & Schacter, D. L. (2006). When the Red Sox shocked the Yankees: Comparing negative and positive memories. *Psychonomic Bulletin and Review, 13*, 757–763.

Levine, L. J., & Bluck, S. (2004). Painting with broad strokes: Happiness and the malleability of event memory. *Cognition and Emotion, 18*, 559–574.

Levine, L. J., & Pizarro, D. A. (2004). Emotion and memory research: A grumpy overview. *Social Cognition, 22*, 530–554.

Levine, L. J., Safer, M. A., & Lench, H. C. (2006). Remembering and misremembering emotions. In L. J. Sanna & E. C. Chang (Eds.), *Judgments over time: The interplay of thoughts, feelings, and behaviors* (pp. 271–290). New York: Oxford University Press.

McCloskey, M., Wible, C. G., & Cohen, N. J. (1988). Is there a special flashbulb memory mechanism? *Journal of Experimental Psychology: General, 117*, 171–181.

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52*, 81–90.

Merckelbach, H., Wessel, I., & Horselenberg, R. (1997). The accuracy of autobiographical memory: A replication of Barclay & Wellman (1986). *Behavioural and Cognitive Psychotherapy, 25*, 103–111.

Murray, S. L., & Holmes, J. G. (1993). Seeing virtues in faults: Negativity and the transformation of interpersonal narratives in close relationships. *Journal of Personality and Social Psychology, 65*, 707–722.

Parrott, W. G., & Sabini, J. (1990). Mood and memory under natural conditions: Evidence for mood incongruent recall. *Journal of Personality and Social Psychology, 59*, 321–336.

Pasupathi, M. (2003). Emotion regulation during social remembering: Differences between emotions elicited during an event and emotions elicited when talking about it. *Memory, 11*, 151–163.

Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). *Linguistic Inquiry and Word Count: LIWC 2007*. Austin, TX: LIWC (www.liwc.net).

Philippot, P., Baeyens, C., Douilliez, C., & Francart, B. (2004). Cognitive regulation of emotion: Application to clinical disorders. In P. Philippot & R. S. Feldman (Eds.), *The regulation of emotion* (pp. 71–98). Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Philippot, P., Schaefer, A., & Herbette, G. (2003). Schematic versus propositional processing of emotional information: Impact of generic versus specific autobiographical memory priming on emotion elicitation. *Emotion, 3*, 270–283.

Raes, F., Hermans, D., de Decker, A., Eelen, P., & Williams, J. M. G. (2003). Autobiographical memory specificity and affect regulation: An experimental approach. *Emotion, 3*, 201–206.

Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin, 128*, 934–960.

Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 803–814.

Ruci, L., Tomes, J. L., & Zelenski, J. M. (2008). Mood-congruent false memories in the DRM paradigm. *Cognition & Emotion, 23*, 1153–1165.

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

Rusting, C. L. (1999). Interactive effects of personality and mood on emotion-congruent memory and judgment. *Journal of Personality and Social Psychology, 77*, 1073–1086.

Rusting, C. L., & DeHart, T. (2000). Retrieving positive memories to regulate negative mood: Consequences for mood-congruent memory. *Journal of Personality and Social Psychology, 78*, 737–752.

Sanitioso, R., Kunda, Z., & Fong, G. T. (1990). Motivated recruitment of autobiographical memories. *Journal of Personality and Social Psychology, 59*, 229–241.

Schmolck, H., Buffalo, E. A., & Squire, L. R. (2000). Memory distortions develop over time: Recollections of the O. J. Simpson trial verdict after 15 and 32 months. *Psychological Science, 11*, 39–45.

Sedikides, C. (1994). Incongruent effects of sad mood on self-conception valence: It's a matter of time. *European Journal of Social Psychology, 24*, 161–172.

Setliff, A. E., & Marmurek, H. H. C. (2002). The mood regulatory function of autobiographical recall is moderated by self-esteem. *Personality and Individual Differences, 32*, 761–771.

Stadler, M. A., Roediger, H. L. III, & McDermott, K. B. (1999). Norms for word lists that create false memories. *Memory & Cognition, 27*, 494–500.

Storbeck, J., & Clore, G. L. (2005). With sadness comes accuracy; with happiness, false memory: Mood and the false memory effect. *Psychological Science, 16*, 785–791.

Tamir, M. (2009). Differential preferences for happiness: Extraversion and trait-consistent emotion regulation. *Journal of Personality.*

Tamir, M., Mitchell, C., & Gross, J. J. (2008). Hedonic and instrumental motives in anger regulation. *Psychological Science, 19*, 324–328.

Williams, J. M. G. (1996). Depression and the specificity of autobiographical memory. In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 244–267). Cambridge, UK: Cambridge University Press.

Williams, J. M. G. (2006). Capture and rumination, functional avoidance, and executive control (CaRFAX): Three processes that underlie overgeneral memory. *Cognition and Emotion, 20*, 548–568.