



Memories affect mood: Evidence from covert experimental assignment to positive, neutral, and negative memory recall

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Abstract

Memory recall has been proposed as a common and effective mood regulation strategy. Although several studies have presented results suggesting that recalling valenced memories affects subsequent mood, their designs allow for alternative interpretations of the observed effects. Two such alternatives include the reverse effect (mood effects on memory due to non-experimental assignment to memory recall condition) and demand characteristics of the experiment. We used covert experimental assignment to memory condition, asking subjects ($N = 314$; 56% female) to recall memories that were primarily positive, neutral, or negative. Results showed the expected effect on mood ($p < .002$), with reported mood worst in the negative memory condition, better in the neutral condition, and best in the positive condition. These results suggest that valenced memory recall does indeed exert an effect on mood, and may do so even without the individual's awareness.

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1. Introduction

One of the fundamental assumptions about the relation between thought and feeling is that memories and mood affect one another. Generally the effects are assumed to be reciprocal: An individual's mood influences the valence of memories that the person recalls (see Bower, 1981 & Eich & Metcalfe, 1989, for seminal work in this area), and thinking about memories with a certain valence can affect a person's mood. Numerous studies have demonstrated the former effect—that a person's mood can influence the types of memories that the person recalls (e.g., Parrott & Sabini, 1990; Singer & Salovey, 1988).

The question of the reverse effect—that the memories a person chooses to think about can affect his or her subsequent mood—is an important one. Memory recall has been proposed as a common and effective (conscious or unconscious) mood-regulation strategy (e.g., Forgas, 2000; Joormann & Siemer, 2004; Josephson, Singer, & Salovey, 1996; McFarland & Buehler, 1997; Rusting & DeHart, 2000). One of the advantages of using memories to regulate one's mood is that this strategy can be used in virtually any setting, which is not the case with many mood regulation behaviors that individuals commonly report using (e.g., going shopping, eating something, having sex; Thayer, Newman, & McClain, 1994). It is important, therefore, to determine whether a person can influence his or her mood by recalling specifically valenced memories.

The hypothesized effect of memory on mood is intuitively plausible; most everyone has experienced an improvement in mood after recalling a happy memory, or has felt sadness when recalling a memory involving hurt or loss. However, other relationships between memory and mood are possible. One possibility is simply the null hypothesis—that the valence of recalled memories has no effect on subsequent mood. Under this scenario, perceived effects of memories on mood might be nothing more than “hand waving”, with motivated attempts to improve mood being the real driver of the mood improvement, while the happy memories are simply epiphenomenal. Another possibility that is intuitively plausible is that memories actually affect moods in an *incongruent* direction, due to a comparison effect. For example, an individual who remembers the most recent time he or she had the flu might feel relieved that now he or she is well, and would experience an improvement in mood. Similar effects are plausible given the recall of happier times (e.g., the person's wedding day), which might by comparison lead to a decrement in mood, since the person perceives him- or herself to be in a worse situation at present (e.g., experiencing marital conflict).

Distinguishing between these various hypotheses requires demonstrating that valenced memory recall *causally influences* moods, which is not an easy task. Simply ordering the collection of data in a logical way—by asking participants to report a memory and then having them report their mood—is not sufficient. If there is a correlation between memory valence and reported mood, it could be the case that the mood was primary and was responsible for the valence of the reported memory. This problem requires that participants be *randomly assigned* to recall positively- or negatively-valenced memories. In this way, prior mood cannot account for an observed association between the valence of recalled memory and the participant's subsequent mood.

However, random assignment alone is not sufficient. If participants are aware that an experimental manipulation is intended to change their mood, it is impossible to rule out the effect of demand characteristics on reported mood (see, e.g., Buchwald, Strack, & Coyne, 1981; Polivy & Doyle, 1980). If participants are told, for example, to “think of a very happy memory”, it is likely that their subsequently reported mood will be contam-

inated with their perception that the experimenter is expecting them to report a positive mood. Similarly, the use of explicit mood induction procedures in many studies prior to asking participants to recall potentially mood-altering memories (e.g., Erber & Erber, 1994; Joormann & Siemer, 2004; Rusting & DeHart, 2000) can alert the participants that their moods are “supposed” to change in response to the experimental stimuli (see a meta-analysis by Westermann, Kordelia, Stahl, & Hesse, 1996, for a discussion of the influence of demand characteristics on the effectiveness of mood induction procedures). Such demand characteristics could lead to an erroneous rejection of the null hypothesis that recalled memory valence does not affect mood. Therefore, in addition to random assignment to memory condition, participants should not be made aware that the memories they are recalling have a specific, mood-relevant valence.

A large body of research is based on the assumption that recalling positively valenced memories is a strategy for regulating negative moods. For example, Forgas’s (2000) dual-process theory of mood regulation holds that individuals in negative moods are motivated to recall mood-incongruent information in order to maintain affective homeostasis; Boden and Baumeister (1997) suggested that the tendency by some individuals to recall more positive memories after watching an unpleasant film was an effort to regulate their moods; and Parrott and Sabini (1990) interpreted mood-incongruent memory recall as an attempt to regulate mood (see also Forgas & Ciarrochi, 2002; Joormann & Siemer, 2004; McFarland & Buehler, 1997; Parkinson & Totterdell, 1999; Thayer et al., 1994). Although many studies have reported effects of recalled memories on mood (e.g., Josephson et al., 1996; Rusting & DeHart, 2000; Setliff & Marmurek, 2002), their designs do not permit strong conclusions to be drawn about the direction of the effect. These design features represent not an insignificant methodological nuance, but rather a significant gap in the mood and memory literature.

The present study provides a more definitive answer to the question of whether recalling memories can influence individuals’ moods because to our knowledge it is the first study to satisfy both of the conditions outlined above: random assignment to memory valence, with participants blind to their assignment. These conditions were accomplished by asking participants to report memories that, unbeknownst to the participants, were either primarily negative, neutral, or positive, depending on which version of the questionnaire the participant received, followed by mood ratings that were supposedly unrelated to the memory questions. As such, this study addresses the unresolved issue of whether memories influence mood or whether apparent memory effects on mood are actually mood effects on memory, or result from demand characteristics of the experiments.

2. Method

2.1. Participants and design overview

Participants were adults waiting for trains at the main train station in a large city in the eastern United States. Experimenters approached every individual who appeared to be over 18 years of age and who was not obviously busy (e.g., talking on a cell phone, tending to small children). The experimenters explained that they were conducting a research study and asked whether the individual would be willing to take “3 or 4 min to fill out an anonymous questionnaire for the study”. If the potential participants asked what the study was about (as many did), the experimenter explained that the questionnaire asked about the person’s memories

about different experiences from the person's life. This explanation satisfied the majority of potential participants; indeed, data collected on a subset of potential participants indicated that 74 of 101 (73%) individuals asked to complete the questionnaire agreed to do so.

The full sample comprised 326 individuals (56% female). Of the individuals who reported their ethnicity, 75% were White; the majority of the non-White respondents were Black (18%) or Asian (5%). The mean age was 39.6 years ($SD = 16.0$; range = 18–83).

There were three versions of the questionnaires; each individual completed one version, yielding a between-subjects design. One version included all neutral questions, one approximately half neutral and half positive, and one half neutral and half negative; these three versions corresponded with neutral, positive, and negative conditions, respectively. Participants were not aware that there were versions of the questionnaire that differed from the one that they completed such that they would have no basis for judging the affective valence of their recalled memories as happy or sad relative to the other forms of the questionnaire. Experimenters were blind to condition. Upon completion of the questionnaire participants were thanked for their time and given a slip of paper with a brief description of the purpose of the study and an e-mail address whereby they could ask questions about the purpose and/or outcome of the study.

2.2. Measures

2.2.1. Memory questionnaires

Each version of the memory questionnaire comprised 19 questions about memories from the person's life—mostly episodic memories, although each version included some personal semantic memory questions (e.g., “Do you know how to make an omelet”?) for the neutral version; see the [Appendix](#) for the complete questionnaires). The neutral version included only questions that were intended to evoke neutral memories or associations (e.g., “What time did you wake up yesterday”?). In order to disguise the purpose of the study we interspersed neutral questions with positive (e.g., “What is the best present you ever received”?) or negative (e.g., “When was the last time you had the stomach flu”?) ones on the positive and negative versions, respectively. As is evident from an inspection of the questionnaires, the vast majority of questions pulled for experiences that most everyone would have experienced; this feature of the design was meant to minimize individual differences in the valence of recalled memories within conditions.

In a pilot study with a sample of psychology graduate students ($N = 18$, 67% female) we asked participants to rate the valence of their reported memories on a Likert-type scale from 1 (negative) to 7 (positive) in response to all of the memory items (presented in random order). Results indicated that the questions were indeed associated with memories having the intended valence, as can be seen in [Table 1](#); mean differences were statistically significant between all groups ($p < .0001$).

Table 1
Emotional valence ratings of memories recalled in response to negative, neutral, and positive questions

Question type	Mean (SD)	Range
Negative	3.2 (1.2)	2.6–4.2
Neutral	4.5 (1.2)	3.7–5.9
Positive	5.3 (1.3)	4.4–6.1

Note. Higher numbers indicate more positive emotional valence.

2.2.2. Mood measure

One question was used to assess participants' mood; this question was placed at the top of the second page immediately following the last memory question, in order to minimize the chance that participants would look ahead and figure out that the memory questions were intended to affect their mood. Participants were instructed to make a single vertical mark on a 100 mm horizontal line "to indicate your mood right now". The line was anchored with "Worse than average" on one end, "Better than average" on the other, and "Average" in the middle. By asking participants to rate their mood relative to how they usually feel rather than asking them to judge their mood relative to objective markers (e.g., negative, neutral, positive) we controlled as much as possible for individual differences in average mood. We used only one mood rating question (rather than having participants rate their mood based on a list of adjectives) to minimize the chance that participants would "catch on" that we were really interested in their mood, and infer that the preceding questions were intended to affect their mood in a particular direction. In order to validate the mood measure we administered among a new sample ($N = 76$) of adult participants from the same train station a modified version of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), a widely used and well-validated measure of positive and negative affect. Our version comprised the original 20 adjectives from the PANAS and an additional 18 adjectives from the expanded version of the PANAS (Watson & Clark, 1994); the adjectives (e.g., happy, angry) are rated on a scale from 1 to 5. Our single item mood rating captured approximately 42% of the variance in participants' ratings of both positive and negative affect; as expected, the mood question was positively associated with ratings of positive adjectives, $r = .65$, $p < .0001$, and negatively associated with ratings of negative adjectives, $r = -.66$, $p < .0001$. These analyses demonstrate the convergent validity of our mood measure.

We hypothesized that there would be an effect of memory questionnaire on mood and that post hoc analyses would show that participants in the positive condition would report significantly better mood than participants in the neutral and negative conditions, and that participants in the negative condition would report significantly worse mood than participants in the neutral and positive condition; in short:

Positive > Neutral > Negative.

Following the mood measure we asked demographics questions (gender, age, ethnicity), and a final question asking what the participant thought was the hypothesis of the present study. This final question was an important one because it allowed us to verify that participants were unaware of the connection between the memory questions and the mood question. If only a small percentage of participants were able to identify the study hypothesis, we would have greater confidence that any effects on mood were in fact achieved covertly.

3. Results

3.1. Awareness of study hypothesis

A small number of participants (12/326; 3.6%) correctly guessed the hypothesis of the present study (e.g., "Something about answering these questions . . . will affect my mood"); typical incorrect guesses missed the mark widely, given the between subjects design and the apparent randomness of the questions, and included responses such as "some type

of survey of American culture”, “how many people will agree to fill out a survey in a train station”, “matching ethnicity with habits”, and “short term versus long term memory”. Participants who correctly guessed the hypothesis were excluded from subsequent analyses, leaving a final sample size of 314 individuals.

3.2. Mood manipulation effects

An alpha level of .05 (two-tailed) was used for all tests of statistical significance. There were no significant differences between the groups on age, gender, or ethnicity (all $ps > .49$), and so these variables were excluded from subsequent analyses. We first performed a one-way ANOVA with memory condition (positive, negative, neutral) as the independent measure and mood as the dependent variable. As hypothesized, we found a significant main effect of condition, $F(2, 311) = 6.38, p < .002$ (see Fig. 1). Planned contrasts based on our hypothesis revealed a trend toward better reported mood in the positive versus the neutral memory condition, $d = .26, p = .06$, and a similar trend toward better reported mood in the neutral versus the negative condition, $d = .23, p = .09$. The contrast between the positive and negative conditions revealed a highly significant difference, $d = .49, p < .0005$. Therefore we rejected the null hypothesis that valence of recalled memories had no effect on subsequent mood, as well as the competing hypothesis of a memory incongruent effect on mood.

4. Discussion

As predicted, individuals who were induced to recall more positive memories reported better mood than those induced to recall neutral or negative memories. The design of the

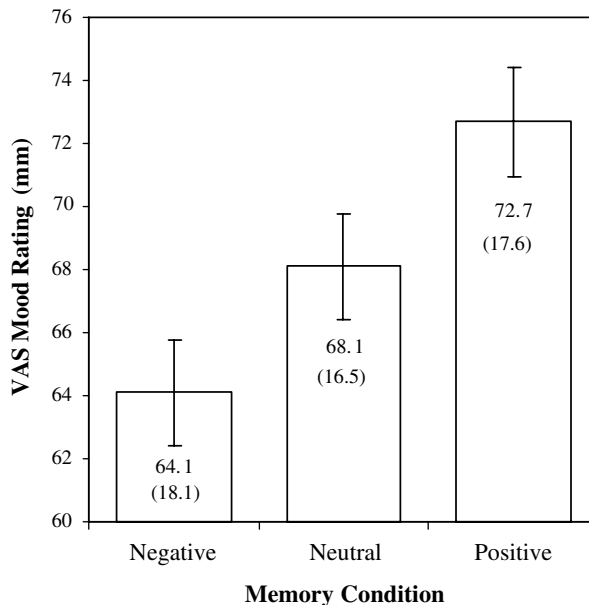


Fig. 1. Participants' average mood ratings (\pm standard error of the measure) by memory questionnaire condition. The top number in each bar is the group mean, with the group standard deviation below in parentheses.

current study allowed us to distinguish between the mood-altering effects of memory recall per se and other factors such as *motivational* components that are involved in more explicit efforts to use memories to influence one's mood.

These results have several important implications. First, they suggest that thinking of positive memories is an effective mood-altering strategy that operates outside of deliberate effort to improve one's mood. This interpretation of the present results reinforces Parrott and Sabini's (1990) hypothesis that mood-incongruent recall might be an "automatic or unconscious" (p. 333) mood-regulation strategy, operating outside of individuals' awareness.

Second, there are reasons to expect that the kinds of memory effects observed in this study could be larger in real-world settings. The current study used the same relatively mild mood-relevant questions across subjects; it is likely that positive and negative memories that have more specific salience for individuals would exert a stronger effect on mood. Also, the ability to focus for an extended period of time on a positive or negative memory, with all the related associations, suggests that the medium-sized effect observed here between the negative and positive conditions could spiral into bigger and longer-lasting effects in everyday life. For example, recalling the memory of one's last visit to the doctor could bring to mind the pain the person experienced, the depression that resulted from an extended illness and time off from work, possible financial hardships associated with the illness, other times one was sick, and so forth. The "rapid-fire" design of our memory questionnaire discouraged the participants from dwelling on any particular memory and its associations.

Finally, these findings have implications for researchers who use laboratory mood inductions. The present findings suggest that even subtle positive and negative autobiographical memory questions—ones that alert fewer than 4% of study participants to the purpose of the questions—can have significant effects on mood. Recalling autobiographical memories is a particularly effective means of manipulating study participants' moods (see, e.g., Brewer, Doughtie, & Lubin, 1980), and works well as a covert procedure, in contrast to several other effective means of mood manipulation (e.g., the Velten mood induction procedure, watching positive or negative movie clips). Therefore the procedure used in the current study (or an adaptation thereof) may be used effectively by other researchers to manipulate participants' moods without their awareness.

4.1. *Strengths and limitations*

Strengths of the present study, in addition to the design aspects already discussed, include the diversity of the sample in terms of gender, age, and race, as well as the respectable sample size ($N = 314$). The present study also has several limitations. First, the current results do not provide information about the duration of the observed mood effects. Also, the effect sizes between the neutral condition and the other two conditions were modest (in the $d = .25$ range) and were statistically significant only at a trend level. However, the nicely linear nature of the graph in the Figure illustrates strong support for the effect of memories on mood, in a direction congruent with the valence of the memories; moreover, the medium-sized (Cohen, 1988) and highly significant difference in mood reported by individuals in the positive and negative memory conditions points to the crucial difference between focusing on positive or negative memories.

Finally, we cannot attribute causality to valence of recalled memories in the strictest sense, for two reasons. First, although we took precautions to disguise the intent of the memory questionnaires and excluded participants who correctly guessed our hypothesis,

we cannot entirely rule out the possibility that other participants may have been aware of the valence of the memory questions and may have realized that their subsequently reported moods should be affected by the questions. Second, we did not measure mood prior to the memory questionnaire (due to the concern about alerting participants to our intent). However, the blind administration of questionnaires and the absence of significant group differences on extraneous factors such as demographics support the causal effect of memory valence on subsequent mood.

4.2. Future directions

While the present design allowed us to address the primary research question, several additional questions are not addressed. It cannot be known from the present data how long the memory effect lasts, or whether valenced memory recall is a “good” mood-regulation strategy in the long term. Future research in this area should explore the relative merits of different mood-regulation strategies, both in the short and the long term. This research could include comparisons of other methods of experimental assignment to covert mood induction, such as the musical mood induction used by Parrott and Sabini (1990), to see which procedures are more effective. An additional methodological consideration is the question of “dose–response” in terms of how many positive or negative memories are required to influence mood; an important consideration when addressing this question would be whether a greater number of questions results in more participants’ realizing the intended purpose of the memory questions.

A corollary to the dose–response consideration is the question of whether a more potent “dose” of covertly induced negative memory recall could push participants’ moods into the “below average” range, which would increase the usefulness of the current paradigm as a covert mood induction technique. As can be seen in the figure, all three groups reported average mood ratings that were “above average” (where average is 50 on our 100 mm VAS). Given the mean ratings of the negative memory questions obtained in the pilot study—which were not only more negative than the positive memory questions but were rated in the negative half of the Likert-type scale—it is evident that there are many other factors that determine mood besides the valence of recently recalled memories. Future work in this area could determine the relative potency of these other factors compared to that of valenced memories.

Additionally, the present study did not induce positive or negative moods prior to the memory manipulation, and therefore cannot answer the question of memory effects at more extreme positive and negative moods. Future work in this area could use covert mood inductions (e.g., music, weather; Martin, 1990; Parrott & Sabini, 1990) to induce positive and negative moods, and then investigate the effects of covert random assignment to recall specifically valenced memories. Finally, the present paradigm lends itself well to hypotheses about individual differences in mood reactivity as a function of variables such as neuroticism and depression history—for example, that magnitude of the negative memory effect will be positively associated with depression risk. The answers to these and other questions await further research on the effects of memories on mood.

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Appendix. Memory Questionnaires

Positive

1. Have you ever been out of the country? Yes No
2. Do you know how to make an omelet? Yes No
3. What was the best present you have ever received?
4. Did you own or rent your previous home? Own Rent
5. What is your favorite TV show?
6. At what age do you think kids are the cutest?
7. What color pen do you prefer to use?
8. Have you ever laughed out loud at an e-mail message? Yes No
9. How do you take your coffee?
10. Which grade in school did you like the most?
11. When was the last time you bought a piece of furniture?
12. What was your favorite vacation?
13. What was the last good movie you saw?
14. When was the last time you went to a barbecue?
15. What did you eat for breakfast this morning?
16. When was your most enjoyable summer?
17. What is the name of your hometown?
18. When was the last time you went to the grocery store?
19. What color was the first car you drove after getting your license?

Neutral

1. Have you ever been out of the country? Yes No
2. Do you know how to make an omelet? Yes No
3. When was the last time you bought a newspaper?
4. What time did you wake up yesterday?
5. When was the last time you bought a piece of furniture?
6. What did you eat for breakfast this morning?
7. What is your home state?
8. How often do you go to the grocery store?
9. Do you usually watch the evening news? Yes No
10. How long did you watch TV last night?
11. Did you own or rent your previous home? Own Rent
12. How do you take your coffee?
13. When you were in high school, how did you get to school?
14. About how many items did you take the last time you went to the cleaners?
15. Have you ever been to Nebraska? Yes No
16. When was the last time you went out for dinner?
17. How long has it been since you have taken a train (before today)?

18. Who was the leading actor in the last movie you saw?
 19. Have you ever installed an air conditioner? Yes No

Negative

1. Have you ever been out of the country? Yes No
2. Do you know how to make an omelet? Yes No
3. When was the last time you had the stomach flu?
4. What time did you wake up yesterday?
5. When were you last stuck in traffic?
6. When was the last time you bought a piece of furniture?
7. What is the worst job you have ever had?
8. What did you eat for breakfast this morning?
9. Have you ever been stood up on a date? Yes No
10. What grade in school did you like the least?
11. When was the last time you bought a newspaper?
12. Have you ever broken a bone?
13. When was the last time you did laundry?
14. How old were you the first time you went to a funeral?
15. How do you take your coffee?
16. When was the last time you needed to go to the doctor?
17. How often do you go to the grocery store?
18. When was your first breakup with a significant other?
19. Have you ever been involved in a car accident?

References

- Boden, J., & Baumeister, R. (1997). Repressive coping: distraction using pleasant thoughts and memories. *Journal of Personality and Social Psychology*, *73*, 45–62.
- Bower, G. (1981). Mood and memory. *American Psychologist*, *36*, 129–148.
- Brewer, D., Doughtie, E. B., & Lubin, B. (1980). Induction of mood and mood shift. *Journal of Clinical Psychology*, *36*, 215–226.
- Buchwald, A. M., Strack, S., & Coyne, J. C. (1981). Demand characteristics and the Velten mood induction procedure. *Journal of Consulting and Clinical Psychology*, *49*, 478–479.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Eich, E., & Metcalfe, J. (1989). Mood dependent memory for internal versus external events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 443–455.
- Erber, R., & Erber, M. W. (1994). Beyond mood and social judgment: mood-incongruent recall and mood regulation. *European Journal of Social Psychology*, *24*, 1–24.
- Forgas, J. P. (2000). Managing moods: toward a dual-process theory of spontaneous mood regulation. *Psychological Inquiry*, *11*, 172–177.
- Forgas, J. P., & Ciarrochi, J. V. (2002). On managing moods: evidence for the role of homeostatic cognitive strategies in affect regulation. *Personality and Social Psychology Bulletin*, *28*, 336–345.
- 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.
- Martin, M. (1990). On the induction of mood. *Clinical Psychology Review*, *10*, 669–697.

- McFarland, C., & Buehler, R. (1997). Negative affective states and the motivated retrieval of positive life events: the role of affect acknowledgement. *Journal of Personality and Social Psychology*, *73*, 200–214.
- Parkinson, B., & Totterdell, P. (1999). Classifying affect-regulation strategies. *Cognition and Emotion*, *13*, 277–303.
- 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.
- Polivy, J., & Doyle, C. (1980). Laboratory induction of mood states through the reading of self-referent mood statements: affective changes or demand characteristics? *Journal of Abnormal Psychology*, *89*, 286–290.
- 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.
- 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.
- Singer, J. A., & Salovey, P. (1988). Mood and memory: Evaluating the network theory of affect. *Clinical Psychology Review*, *8*, 211–251.
- Thayer, R. E., Newman, J. R., & McClain, T. M. (1994). Self-regulation of mood: strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology*, *67*, 910–925.
- Watson, D., & Clark, L. A. (1994). Manual for the Positive Affect and Negative Affect Schedule (expanded form). Unpublished manuscript, University of Iowa.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063–1070.
- Westermann, R., Kordelia, S., Stahl, G., & Hesse, F. W. (1996). Relative effectiveness and validity of mood induction procedures: a meta-analysis. *European Journal of Social Psychology*, *26*, 557–580.